



United States  
Department of  
Agriculture

Forest  
Service

**Southwestern  
Region**



# **Environmental Assessment for Jacob Ryan Vegetation Management**

## **Kaibab National Forest**

**North Kaibab Ranger District, Kaibab National Forest  
Coconino County, Arizona**

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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 agencies 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. 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.

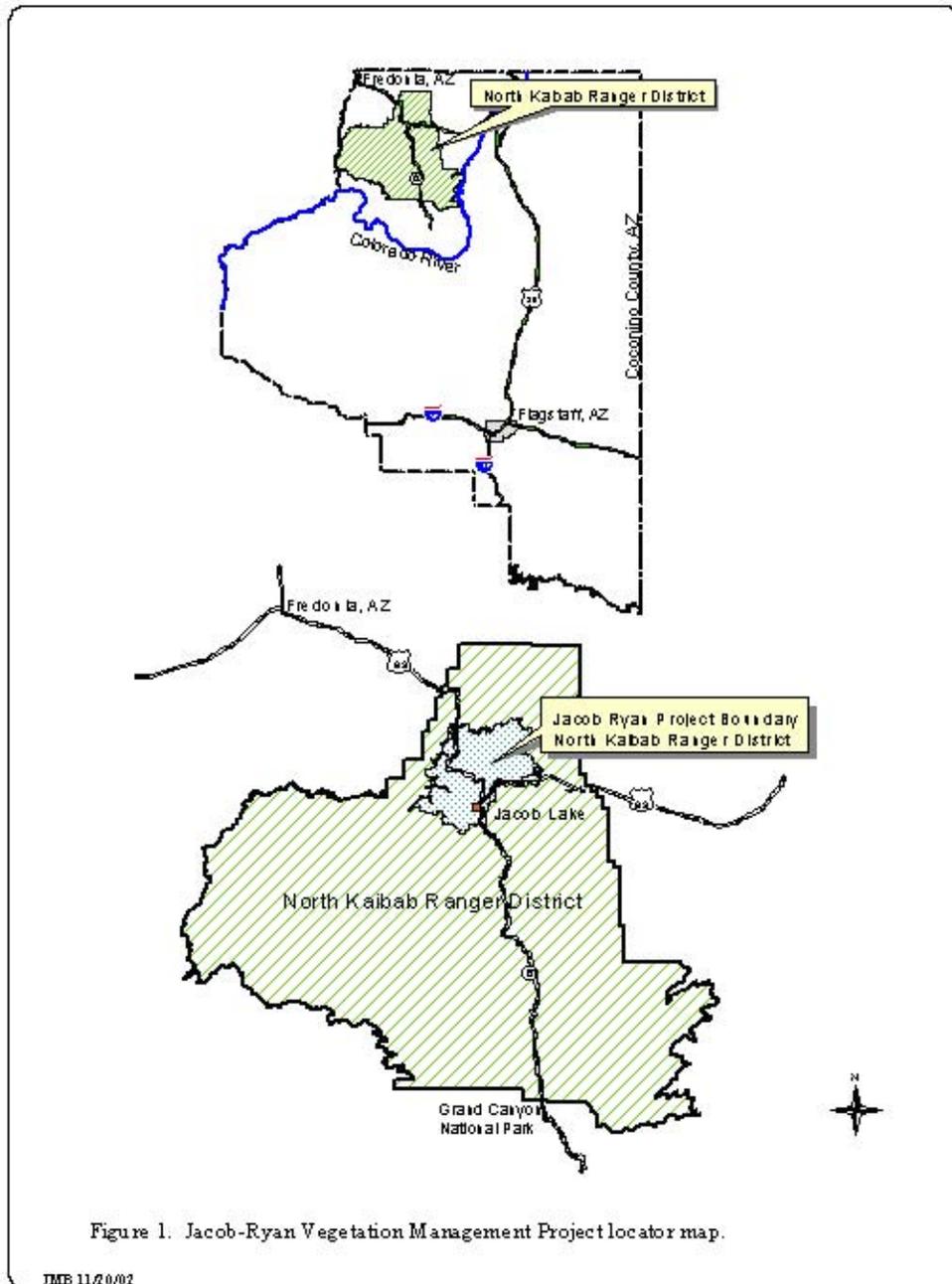
**Agencies and Persons Consulted:** This section provides a list of preparers and agencies consulted during the development of the environmental assessment.

Additional documentation, including more detailed analyses of project area resources, may be found in the project planning record (PR) located at the North Kaibab Ranger District Office, 430 South Main, Fredonia, Arizona.

## Background

The Jacob Ryan Vegetation Management project began in 1998 when the North Kaibab Ranger District completed a landscape assessment for the planning area. The assessment (see Project Record (PR)) defined the existing condition, desired condition, and possible management activities that could be undertaken to bring the planning area closer to the desired condition. District Ranger Jill Leonard initiated the NEPA process on December 14, 1998 when she issued the 1<sup>st</sup> Project Initiation Letter (PIL). District Ranger Leonard issued a second PIL on November 16, 2000 after substantial interdisciplinary team (IDT) member changes. A proposal was sent to the public on March 29, 2001 for scoping comments.

The Jacob Ryan Planning Area is located in the northern part of the North Kaibab Ranger District, Coconino County, Arizona; Townships 38, 39 and 40 North; Ranges 1, 2, & 3 East and 1 West (Figure 1 –not to scale). The Planning Area includes a large portion of the northern end of the Kaibab Plateau, an elongate, north-south trending anticline that was uplifted during the last few million years. The vegetative components divide the Planning Area into Rocky Mountain montane ponderosa pine forest and conifer (pinyon-juniper) woodland.



The vegetation is in various stages of recovery from prior disturbance. Fire, wind, insects, disease, ungulate browsing, and human activity have had impacts on the landscape. Historically, fire has been the dominant disturbance in the Jacob Ryan area. Tree ring data indicates that fires burned through much of the Planning Area with great frequency, but with relatively low intensity. Such fires ceased, for the most part, nearly a hundred years ago and tree density has continued to increase to present day. Before fire

suppression and other human-induced changes to the landscape, the vegetation was apparently a matrix of medium-sized to very large ponderosa pine trees (or scattered pinyon and juniper in the lower elevations) with meadows and holes in the canopy where groups of younger trees were growing (PR-Jacob Ryan Landscape Assessment) (Table 1.1). Increases in tree density in the ponderosa pine (PP) and pinyon juniper (PJ) cover types has had a profound effect on the Jacob Ryan Planning Area. High tree densities have increased competition between trees. Intertree competition has: 1) reduced tree growth; 2) increased tree insect and diseases susceptibility; and 3) increased the potential for intense stand replacing wildfire (PR-Jacob Ryan Landscape Assessment).

Many trees in the planning area are infected with dwarf mistletoe. In ponderosa pine, moderate to high infestations can reduce tree vigor and increase insect kill potential. Stands with heavy infestations of dwarf mistletoe increase the dead-to-live fuel ratios and the potential for crown fires and the torching of trees (Roth 1996, Harrington and Hawksworth 1990) (see Dwarf Mistletoe Infection in the Jacob Ryan Analysis Area letter in the PR for an account of dwarf mistletoe benefits).

Historic accounts and early photographs of the planning area indicate wider tree spacing and fewer ladder fuels, which made the ponderosa pine forest more resistant to crown fire than it is today. Large fires now spread over more extensive areas than in previous times and become more intense (e.g., the Willis Fire of 1988, the Big Fire, Alternate, Plateau, and Apron fires of 2002). Some fires are now likely to be intense and damage the forest and the government and privately owned facilities within the planning area.

Increased tree density also has an indirect effect on human safety in the planning area. Large numbers of trees beside the highway decrease site distance, and create a potentially dangerous situation for vehicles and their occupants. Hazards include winter ice retention and build-up, from tree shading along the highway, potential dead trees falling on vehicles, and vehicle-tree collisions in the highway right-of-way. For example, two hazard trees fell across State Highway 67 south of the planning in the summer of 2003 and one fell across the highway in fall 2003. One tree fell across Highway 89A in the project area during the fall of 2003.

Dense stands and areas with few openings in the overstory canopy inhibit the presence and growth of shrubs, forbs, and grasses and thus limit foraging opportunities for goshawks, goshawk prey species, and other wildlife species. For example, most of the limited numbers of aspen clones in the project area are tending to become overtopped and shaded out by ponderosa pine. Also, many historic meadows have been encroached by dense stands of young ponderosa pine effectively removing this important habitat component from a portion of the planning area.

Existing conditions and past events that have led to the need for treatment (or sometimes to a need not to treat) include: a general increased density of trees on the Kaibab Plateau, several past timber harvests west of Jacob Lake, the Willis wildfire of 1988, the presence of hundreds of thousands of visitors in the area during the summer months, the presence of several pairs of nesting goshawks, a border of trees along Highway 89A that creates winter shading and subsequently ice retention, a build-up of fuels because of fire suppression, and updated Forest Plan direction concerning old growth.

The Jacob Ryan area's road density is approximately 6 miles of road/square mile. Existing roads provide access to most of the Planning Area. Several of these roads were developed as system roads for timber harvesting, but they also provide safe public access to many parts of the forest, as well as support for resource management and protection. The condition of the roads ranges from poor to good. Unfortunately, the access provided by the extensive existing road system has an effect on wildlife. Arizona Department of Game and Fish estimates road densities are probably twice as high as desired for big game security, and the road density is also affecting turkeys (PR-Jacob Ryan Landscape Assessment).

Table 1.1. Comparison of the Jacob Ryan Project Area’s existing average Trees per Acre (TPA) with the 1909 Lang and Stewart average TPA by Vegetative Structural Stages.

	Vegetative Structural Stages					
	VSS 1	VSS 2	VSS 3	VSS 4	VSS 5	VSS 6
Existing Jacob Ryan Project Area Average TPA	571	220	67	19	11	7
1909 TPA (Lang and Stewart)*	54	53	21	13	8	4

\*The 1909 Lang and Stewart Timber Survey data provides an estimate of the Natural Range of Variability of the number of trees that were formerly present on the North Kaibab Ranger District prior to settlement. See the Silviculture report in the PR for a detailed discussion of tree density in the planning area.

## Purpose and Need for Action

The *Landscape Assessment for Jacob-Lake Planning Area* (see PR) identified the existing and desired conditions within the Jacob Ryan planning area. The “on-the-ground” difference between the existing and desired conditions defines the need for change – i.e., the need to treat the existing condition to create, or place it on a trajectory toward, the desired condition. The proposed treatments in the Jacob Ryan Planning area address the aforementioned need for change. There is a need to modify the forest vegetation to put it on a trajectory toward the desired conditions for: 1) Reduced tree density (as defined by the Kaibab National Forest Land and Management Plan (KNFLMP) – e.g., because the existing vegetative structural stages (VSS – see glossary) differ from the percentages recommended in the KNFLMP - see Table 1.2; 2) Sustained old growth forest, 3) Enhanced wildlife habitat (northern goshawk, goshawk prey species and other species), 4) Reduced wildfire risk; and 5) Improved scenic integrity and in turn recreation opportunities.

This action is needed to: 1) reduce the fuel loading across the Jacob Ryan area (especially in the understory) and in the area surrounding Jacob Lake to reduce the threat of fire to structures, property, and lives; 2) decrease the sources of dwarf mistletoe infection; 3) reduce the threat of fire to the power lines in the Jacob Lake vicinity; 4) maintain and enhance the existing aspen component in the Jacob Lake area by removing young coniferous trees; 5) remove young trees from selected areas that were formerly meadows; 6) maintain and enhance scenic integrity and recreation opportunities; 7) reduce the likelihood of ice on the highway by removing trees that shade the highway; 8) allocate old growth in accordance with the KNFLMP and manage for the old growth characteristics defined in the Plan; 9) Utilize vegetation treatments to enhance habitat for the northern goshawk and its prey species by providing a mix of cover and more open foraging areas in accordance with the KNFLMP; 10) provide a maintainable level of forest access while closing unneeded roads to enhance wildlife habitat and reduce wildlife harassment; and; 11) enhance and maintain fuelbreaks designed to slow the spread of wildfire.

This action responds to the goals and objectives outlined in the Kaibab National Forest, Forest Plan (pages 17-20) for the following resource elements: Visuals – *“Design resource activities to maintain and enhance visual quality”*; Outdoor Recreation - *“Manage the recreation resource and provide facilities to increase opportunities for a wide variety of developed and dispersed experiences, Establish off road vehicle [OHV] closures as needed to maintain other resource objectives, Inventory, evaluate, nominate, protect, study, interpret, and enhance heritage resources in accordance with management prescriptions.*

*Inventory, evaluate, nominate, protect study, interpret, and enhance heritage resources in accordance with the management prescriptions. Coordinate planning for these activities with the State Historic Preservation Office, State Archaeologist, and other State and Federal agencies”; Wildlife and Fish – “Improve wildlife habitats...through development of habitat quality and diversity...”; Timber - “Apply integrated resource management to improve age-class distribution, density, and to reduce losses from forest insect and disease pests.”; Transportation and Administrative Facilities – “Provide and manage a serviceable road transportation system that meets the needs for public access, land management, resource protection, and user safety”; and Fire Protection and Fire use - “Use prescribed fire and wildland fire use as resource management tools where they can effectively accomplish resource objectives. Fire management, prevention, and control are used to protect life, property, and resources.”*

There are five Ecosystem Management Areas (EMAs) within the project’s analysis boundary: 12, 13, 16, 21, and 22. The Jacob Ryan Vegetation Management Project proposes treatments in EMA 13, 21, and 22. All proposed project activities except meadow restoration are consistent with the KNFLMP in EMAs 13, 21, and 22 (See Jacob Ryan Alternatives Plan Consistency Check in the PR). No treatments are proposed for EMAs 12 or 16. Portions of the Jacob Ryan planning area are within two Inventoried Roadless Areas (IRA): Burrow Canyon and Willis Canyon. No activities are proposed within the IRAs under any alternative of the Jacob Ryan Project; however, IRA effects were considered in the analysis.

Table 1.2. Existing Vegetative Structural Stages for Post-Fledging Family Area (PFA), Foraging Area Audit Unit (FAAU), and the entire Jacob Ryan project area. The desired condition VSS percent for VSS stages 1-6 is 10, 10, 20, 20, 20, and 20 respectively.

Audit Unit	VSS Classes							VSS Summary Classes		
	PFA/FAAU	VSS1	VSS2	VSS3	VSS4	VSS5	VSS6	VSS1/2	VSS3/4	VSS5/6
A	002	26.4%	10.1%	23.1%	12.2%	10.3%	17.8%	36.5%	35.3%	28.1%
	004	1.4%	6.0%	39.3%	25.3%	14.0%	14.0%	7.4%	64.6%	28.0%
	104	3.9%	17.9%	6.6%	23.0%	19.5%	29.2%	21.8%	29.6%	48.7%
	129	0.0%	35.9%	26.8%	19.0%	0.0%	18.3%	35.9%	45.8%	18.3%
	FAAU	31.0%	7.6%	23.7%	14.3%	8.6%	14.8%	38.6%	38.0%	23.4%
	Total	15.9%	11.5%	23.1%	18.6%	12.2%	18.7%	27.4%	41.7%	30.9%
B	008	1.0%	7.0%	24.0%	32.6%	34.4%	0.8%	8.0%	56.6%	35.2%
	111	0.0%	2.5%	24.4%	44.9%	12.6%	15.6%	2.5%	69.3%	28.2%
	144	0.0%	2.1%	30.9%	24.9%	32.8%	9.3%	2.1%	55.8%	42.1%
	FAAU	0.0%	9.8%	16.4%	45.9%	27.9%	0.0%	9.8%	62.3%	27.9%
	Total	0.4%	4.3%	26.2%	33.4%	28.3%	7.3%	4.7%	59.6%	35.6%
C	005	0.0%	18.6%	36.8%	9.8%	16.3%	18.5%	18.6%	46.6%	34.8%
	006	2.6%	3.9%	13.2%	34.2%	29.7%	16.4%	6.5%	47.4%	46.1%
	007	0.0%	6.4%	38.8%	31.4%	20.6%	2.8%	6.4%	70.2%	23.4%
	124	14.9%	10.3%	14.2%	22.8%	22.6%	15.2%	25.2%	37.0%	37.8%
	134	18.0%	10.2%	19.6%	16.3%	27.1%	8.8%	28.2%	35.9%	35.9%
	145	6.8%	5.9%	26.0%	21.0%	27.7%	12.5%	12.7%	47.0%	40.2%
	FAAU	13.9%	6.6%	20.2%	24.7%	24.5%	10.1%	20.5%	44.9%	34.6%
	Total	10.5%	7.9%	22.6%	23.6%	24.2%	11.1%	18.4%	46.2%	35.3%
D	003	7.2%	11.7%	18.0%	24.6%	16.5%	22.0%	18.9%	42.6%	38.5%
	010	5.0%	14.0%	22.0%	21.0%	17.0%	21.0%	19.0%	43.0%	38.0%
	011	8.9%	8.9%	27.0%	6.5%	20.7%	28.0%	17.8%	33.5%	48.7%
	012	10.3%	1.7%	26.6%	20.0%	26.9%	14.5%	12.0%	46.6%	41.4%
	110	31.9%	9.7%	12.4%	14.2%	18.6%	13.3%	41.6%	26.6%	31.9%
	126	0.0%	10.3%	19.7%	17.9%	29.1%	23.1%	10.3%	37.6%	52.2%
	146	18.7%	10.6%	33.4%	6.1%	16.1%	15.0%	29.3%	39.5%	31.1%
	FAAU	8.0%	12.1%	19.7%	20.4%	17.8%	22.1%	20.1%	40.1%	39.9%
	Total	9.0%	10.4%	22.7%	17.4%	19.5%	21.0%	19.4%	40.1%	40.5%
E	009	24.3%	1.0%	35.6%	11.8%	16.5%	10.8%	25.3%	47.4%	27.3%
	013	17.6%	10.1%	22.3%	14.4%	16.7%	18.9%	27.7%	36.7%	35.6%
	014	17.9%	10.2%	30.3%	12.9%	12.2%	16.4%	28.1%	43.2%	28.6%
	015	16.0%	3.8%	28.2%	18.8%	19.0%	14.2%	19.8%	47.0%	33.2%
	016	19.6%	4.9%	17.0%	9.6%	24.3%	24.6%	24.5%	26.6%	48.9%
	067	19.7%	5.6%	30.5%	16.3%	21.5%	6.3%	25.3%	46.8%	27.8%
	100	5.7%	8.7%	23.7%	18.3%	30.3%	13.2%	14.4%	42.0%	43.5%
	FAAU	21.1%	5.6%	25.2%	13.3%	22.5%	12.3%	26.7%	38.5%	34.8%
Total	19.6%	6.0%	26.3%	13.8%	20.7%	13.6%	25.6%	40.1%	34.3%	
F	019	11.5%	2.7%	15.4%	21.1%	23.1%	26.1%	14.2%	36.5%	49.2%
	063	22.3%	4.2%	23.7%	16.6%	7.3%	25.9%	26.5%	40.3%	33.2%
	FAAU	16.4%	11.0%	25.7%	16.1%	14.8%	16.0%	27.4%	41.8%	30.8%
	Total	16.0%	7.7%	22.7%	17.5%	15.9%	20.2%	23.7%	40.2%	36.1%
PFA Total		10.5%	8.2%	24.9%	19.5%	20.6%	16.2%	18.7%	44.4%	36.8%
FAAU Total		17.1%	7.7%	22.8%	18.4%	20.5%	13.7%	24.8%	41.2%	34.2%
Overall		13.4%	8.0%	24.0%	19.0%	20.5%	15.1%	21.4%	43.0%	35.6%

This table represents percent of acres existing in each VSS class for each PFA and Foraging area (FA). It is important to note that individual trees can be thinned from a PFA or Audit Unit without decreasing the existing structural stage percentages and effectively maintaining the original VSS percentages (see Appendix 1 for an explanation of how VSS distribution interfaces with treatment options).

## Proposed Action

The Forest Service proposes to use vegetation treatments to reduce tree density in the project area to meet the purpose and need. The proposed action would perform vegetation treatments on approximately 30,000 acres in the following manner (see Figure 2):

- Approximately 22,000 acres of commercial thinning (9"+trees), precommercial thinning (see silviculture report in PR), and group selection (approximately 330 acres) in ponderosa pine are proposed. Of the 22,000 acres, 2,000-2,200 acres would receive only precommercial thinning (Figure 2). Move the vegetation toward Goshawk guideline VSS distribution in PFA and Audit Units. Only perform group selection in VSS 3, VSS 4 or VSS 5 groups in PFA/FAAUs that have a clear surplus of VSS 3, 4, or 5s in the PFA/FAAU and have a clear deficit in VSS 1 (see table below). No VSS 6 groups would be used for regeneration and no dominant or codominant trees within VSS 6 groups would be thinned (except for hazard trees along Highways 89A and 67) in the Jacob Ryan Area because of the existing deficit of VSS 6 groups at the EMA 13, Jacob Ryan Planning Area, and Goshawk Foraging Area scales. Reserve tree selection will be based on the largest trees available when regenerating groups. This will retain most, if not all, of the largest trees in treated PFA/FAAUs. This proposal would allow thinning from below in all VSS groups.

This alternative would authorize VSS 3, VSS 4 and VSS 5 group selection in the following audit units and PFAs.

Audit Unit	PFA/FAAU Number	VSS 3	VSS4	VSS5
A	004	Authorized	Authorized	Not Authorized
	129	Authorized	Not Authorized	Not Authorized
B	008	Not Authorized	Authorized	Authorized
	111	Not Authorized	Authorized	Not Authorized
	144	Authorized	Authorized	Authorized
	FAAU	Not Authorized	Authorized	Authorized
C	005	Authorized	Not Authorized	Not Authorized
	006	Not Authorized	Authorized	Authorized
	007	Authorized	Authorized	Not Authorized
	134	Not Authorized	Not Authorized	Not Authorized
	145	Not Authorized	Not Authorized	Not Authorized
	FAAU	Not Authorized	Not Authorized	Not Authorized
D	003	Not Authorized	Authorized*	Not Authorized
	011	Not Authorized	Not Authorized	Not Authorized
	012	Authorized*	Not Authorized	Authorized
	126	Not Authorized	Not Authorized	Authorized
	146	Not Authorized	Not Authorized	Not Authorized
E	009	Not Authorized	Not Authorized	Not Authorized
	014	Not Authorized	Not Authorized	Not Authorized
	015	Not Authorized	Not Authorized	Not Authorized
	067	Not Authorized	Not Authorized	Not Authorized
	100	Authorized	Not Authorized	Authorized

\*Field review of these stands indicates that there is a need to regenerate in these PFAs. Therefore, these PFAs do not follow the regeneration rules in the proposal above.

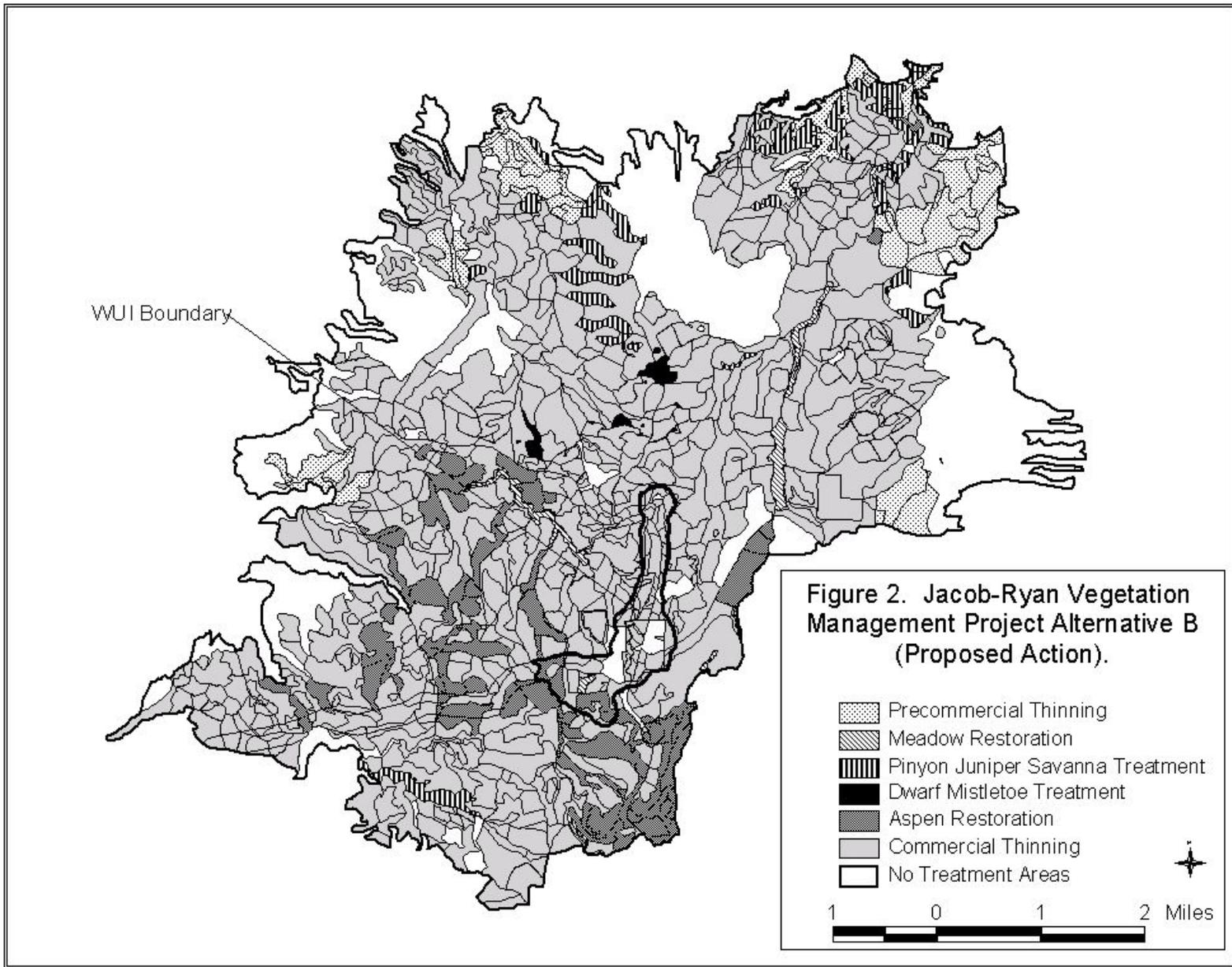
- Perform sanitation treatments on 70% of 749 acres (524 acres) of dwarf mistletoe infected stands; (72 acres heavily infected –see Table below; 452 moderately infected with dwarf mistletoe Figure 2). Sanitation treatments will be a combination of group selection (23 acres of the 72 heavily infected acres) and thinning (501 acres of the 524 acres). No VSS 6 groups will be used for regeneration to treat mistletoe infection in the Jacob Ryan area because of the existing deficit of VSS 6 groups at the EMA 13, Jacob Ryan Planning Area, and Goshawk Foraging Area scales. Sanitation treatments are an adjunct to thinning or regeneration activities. They are reflected in the thinning and regeneration acres included in the first bullet, above.

Heavy Mistletoe Infection	PFA 005	PFA 006	PFA 134	Total Acres
Audit Unit C Infected Acres	30.5	23.0	18.0	<b>72</b>

- Restore watershed condition by thinning 1,143 acres of pinyon juniper woodland.
- Restore and maintain 263 acres of meadows by reducing encroaching blackjack pines, leave all trees >16 inches dbh in the meadows.
- Amend the Kaibab National Forest Land and Resource Management Plan to restore approximately 187 acres (included in restoration acres above) of timber component 500 lands (Suited Forest Land - Timber Emphasis) to grassland/savannah – timber component 800 lands (Incompatible).
- Maintain, enhance and restore 3,300-3,400 acres of aspen groups (included in the 22,000 thinning acres above) using mechanical treatments. All “blackjack” ponderosa pine 12 inches dbh and less will be removed from the understory in or within 20 feet of the perimeter of existing aspen groups.
- Remove hazard trees and trees shading the highway within 50 ft. of the centerline where needed for day-lighting hazardous portions of the highway or for increasing sight distance along 12 miles of highways 89A and 67. Create an uneven edge along the cleared areas.
- Snags outside the right-of-way of the utility corridor (GarKane Powerline) may be removed within one-and-one-half tree lengths on the south and west side of the power line.
- Reduce live and dead hazardous fuels on approximately 995 acres in the Wildland Urban Interface (WUI) Zone. (Acres are included in the thinning acres above.) Treat most intensely, those acres within 300 feet of structures and campgrounds. Treat periodically (about once every 5 years) to maintain satisfactory conditions.
- Reduce fuels to levels consistent with Forest Plan guidelines (5-7) tons/acres) on 50-80% of the acreage outside of the Wildland Urban Interface (WUI).
- Prescribed burning hazardous fuels reduction on 24,141 treated acres and 9,149 non-treated acres.
- Maintain 56 miles of fuelbreaks (2,140 acres – included in thinning acres above) by removing all limbs lower than 5 feet and by removing most trees less than 9” diameter (except in limited areas to be managed for trees less than 9” in diameter) in a corridor approximately 330 feet wide generally along selected roadways and highways.
- Close or re-close all roads within the project area except: Hwy 89A, Hwy 67, 461, two short roads to J.L. Lookout Tower, roads in Jacob Lake Campground & Group Area, ADOT yard access road, 2098, 2284, 2333, 2366, 246, 246E, 246L, 246LA, 246T, 247, 248, 248A to bottom of canyon, 249, 249E, 257, 257G, 260, 264, 264H, 279, 279A, 280, 282, 282A, 282F, 3709, 3726, 3730, 3847, 3878, 3894, 3911, 3917A, 3989, 461, 461B, 461G, 461I, 461N, 462, 482, 482G, 482M, 487, 487A, 579, 579A, 603, 603E, 628, 628C, 634, 636, 639, 800, 800B, 800K, 8116, 9603, 9303M, 9604, 9607N, D155, D202, D261, D282, D284, D627, D447, D475, D476, D674, D679, D684, D688, D689, and D738.
- Utilize MASS model (see glossary) to analyze and compare old growth characteristics with KNFLMP ROD old growth characteristics in the Jacob Ryan analysis area. Unit of measure will

be stand level, audit unit, and PFA. Distribution of phases within various levels, based on stand averages, and points used at audit unit and to give more information about the groups within the stand.

- Maintain at least 20 percent of old growth in patterns that provide for a flow of functions and interactions at multiple scales across the landscape through time by forest type.
- Improve scenic integrity over time. Meet retention visual quality objectives for highway corridors, and partial retention for major forest roads. Improve recreation opportunities by creating a more natural appearing landscape in which to recreate



## Decision Framework

Given the purpose and need, the Kaibab National Forest, Forest Supervisor will review the proposed action and the other alternatives in order to make the following decisions:

- 1). Whether or not the Jacob Ryan Vegetation Management project will proceed as proposed or modified.
- 2). Whether or not the Jacob Ryan Vegetation Management project will proceed as described in one of the alternatives to the Proposed Action.
- 3). Whether or not to amend the Kaibab National Forest Land and Resource Management Plan to restore approximately 187 acres (Appendix 2) of timber component 500 lands (Suited Forest Land - Timber Emphasis) to grassland/savannah – timber component 800 lands (Incompatible).
- 4). Which mitigation and monitoring requirements are necessary to reduce project effects.

## Public Involvement

The proposal was listed in the October 2000 Schedule of Proposed Actions. The proposal was provided to the public and other agencies (totaling 90 groups or interested parties) for comment during scoping on March 29, 2001 (see scoping letter and mail list in the PR). The Forest received six comment letters. The Jacob Ryan ID team made three slight changes to the original proposal scoped in March 2001. On October 20, 2003, the Forest sent a letter detailing these slight changes to the six commenters. We received one response from Arizona Department of Game and Fish supporting the proposed changes (see record of conversation in the PR).

The Forest Service consulted with the Hopi Tribe about this project on January 22, 2003. The Hopi “closed” this project to further consultation, as per our National Historic Preservation Act MOU (see Hopi MOU in PR). We will continue to provide status reports on project progress as per the Tribe’s request.

The Forest Service consulted with the Kaibab Paiute Tribe about this project on July 28, 2003 as per the Forest’s National Historic Preservation Act MOU (see Kaibab Paiute MOU in the PR). The Kaibab Paiute did not raise any issues about the Jacob Ryan Vegetation Management Project. We will continue to provide status reports on project progress as per the Tribe’s request.

In addition, as part of the public involvement process, the District initiated discussions with key stakeholders with the objective of collaboratively defining old growth characteristics and identifying potential treatment activities that could be “tested” within old growth vegetation as part of the Jacob Ryan Vegetation Management Project in the summer of 1998 (see letter dated July 2, 2003 in the PR). This collaborative effort seemed prudent given the 1987 Forest Plan, subsequent Settlement Agreement, 1996 Amended Forest Plan that superceded the Agreement, the controversy surrounding management of old growth, and the nature of the North Kaibab RD----having old and very large trees.

The on-going discussions and subsequent field trips occurred generally every 3-6 months, with the final collaborative group meeting in August 2000. The outcome resulted in development of a model that identified phases of old growth based on identifiable characteristics. Theoretically, potential prescribed treatment activities would depend on which phase of old growth the vegetation “fits” in. The District received an alternative based on the old growth collaborative group results from the Southwest Forest Alliance on November 14, 2001 (see SWFA Alternative in the PR). This alternative is analyzed below in Chapter 3 in Chapter 3.

Using the comments from the public, other agencies, the interdisciplinary team developed a list of issues to address (see *Issues* section below). A list of preliminary “internal” concerns was presented in the March 29, 2001 scoping letter.

We received 25 comment letters before the close of 30-day Notice and Comment Period, and two letters after the close. We included clarification to the proposed action as a result of public comments (see Proposed Action above).

After public comment, we reviewed the results of the vegetation analysis and found that the model cut large trees that were not intended to be cut under the Proposed Action. The model, used for the analysis, cut surplus large trees from each stand regardless of spatial arrangement and diameter distribution of trees at all scales. This resulted in an over estimate of large trees cut under the Proposed Action. Therefore, we clarified the Proposed Action to leave these trees.

The clarified proposal would only perform group selection in VSS 3, VSS 4 or VSS 5 groups in PFA/FAAUs that have a clear surplus (see table in the proposed action). No VSS 6 groups will be used for regeneration and no dominant or codominant trees within VSS 6 groups will be thinned (except for hazard trees along Highways 89A and 67) in the Jacob Ryan Area because of the existing deficit of VSS 6 groups at the EMA 13, Jacob Ryan Planning Area, and Goshawk Foraging Area scales. Reserve tree selection will be based on the largest trees available when regenerating groups. Based on previous experience, this will retain most (>99.5%) of the largest trees in treated PFA/FAAUs.

We also clarified mistletoe sanitation treatments because the proposal was confusing. The proposal would treat approximately 500 acres of moderate to high mistletoe infected stands (Figure 2) but we constrained the application of group selection (regeneration) of VSS 6 groups as a method of sanitation.

## **Issues**

The Forest Service separates issues into two groups: significant and non-significant issues. Significant issues are used to formulate alternatives, prescribe mitigation measures, or analyze environmental effects. Issues are “significant” because of the extent of their geographic distribution, the duration of their effects, or the intensity of interest or resource conflict. Non-significant issues are: 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; 4) conjectural and not supported by scientific or factual evidence; 5) the issue is a comment, opinion, or position statement or 6) addressed during processes or analyses routinely conducted by the ID Team;. The Council for Environmental Quality (CEQ) NEPA regulations require this delineation in Sec. 1501.7, “...identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)...”. A list of non-significant issues and reasons regarding their categorization as non-significant may be found in the PR (see Comment Tracking Matrix in the PR).

The Forest identified 3 significant issues during scoping. These issues are:

### **Issue Statement 1**

*Managing only 20 % of the Plateau for old growth will result in the lost opportunity to develop additional old growth:* This issue was raised in the collective response from the 6 environmental groups (See letter dated 4/30/2001 in the PR). The Forest Service will analyze the Southwest Forest Alliance Alternative in detail (see Alternatives section below) to address this significant issue. We will use the change in the percent of old growth through time as an indicator to track this issue.

## **Issue Statement 2**

*The proposed WUI treatment area is too large, and will remove more trees than necessary for the protection needed.* This issue was raised in the collective response from the 6 environmental groups (See letter dated 4/30/2001 in the PR). As a direct response to this issue, the Jacob Ryan Interdisciplinary Team (ID team) reevaluated the extent of WUI needed to protect the Jacob Lake development and power line. This issue was resolved by reducing the WUI size and reevaluating the treatment intensity within and outside the WUI boundary (see Scoping Letter and Fuels Report supplement in PR). Goshawk prescriptions coupled with defensible space treatments should be adequate to protect structures under most fire situations (see Fuels Report in PR). These changes are reflected in the revised proposal (see letter dated 10/20/2003 in the PR).

## **Issue Statement 3**

*Livestock grazing in the Jacob Ryan area may affect the ability to reach the ecosystem goal of meadow restoration.* This issue was raised in the collective response from the 6 environmental groups (See letter dated 4/30/2001 in the PR). This issue was resolved through the development of a project specific mitigation measure. The Forest will reseed any restored meadows that lack sufficient native seed stock (do not regenerate naturally) and exclude cattle grazing as the meadows become reestablished.

# **Chapter 2 – Alternatives**

This chapter describes and compares the alternatives considered for the Jacob Ryan Vegetation Management project. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public.

## **Alternatives**

The Jacob Ryan Interdisciplinary Team (IDT) considered 5 alternatives (including no action) in the Jacob Ryan analysis. Two were eliminated from detailed study and three were analyzed in detail.

### **Alternatives Considered and Eliminated for Detailed Study**

The IDT considered a range of alternatives before determining which should be considered in detail. Those alternatives eliminated from detailed study, along with the rationale for their elimination, are presented below.

#### **Original Proposed Action**

The original Proposed Action was sent to the public for scoping comments on March 29, 2001. The resultant public comments (see “Issues” above) and internal IDT concerns caused the ID team to reevaluate this alternative and make minor changes (see letter dated 10/20/2003 in the PR).

This alternative was eliminated from consideration because of the changes in the WUI and roadless area treatments. The IDT developed a revised Proposed Action that included the minimized WUI and no manipulation management activities within roadless areas.

#### **Hybrid Alternative**

The Hybrid alternative was identical to the Proposed Action, with the exception it would have implemented the Southwest Forest Alliance (SWFA) alternative treatments in audit unit D. This alternative was developed in response to IDT questions about the “on-the-ground” difference between the

Proposal and the SWFA alternative. It would have allowed a direct comparison of the affect of implementing the Forest Service proposal with the Southwest Forest Alliance alternative.

The Hybrid alternative was eliminated from detailed study because it was considered redundant. The Hybrid alternative's effects would already be disclosed through the Proposed Action and the SWFA alternative analyses and didn't warrant a stand-alone alternative.

Although it was eliminated as a stand-alone alternative, the Responsible Official could select a hybrid scenario based on the individual analyses presented for the two action alternatives below.

## **Alternatives Considered in Detail**

The Jacob Ryan IDT analyzed three alternatives in detail for the Jacob Ryan Vegetation Management Project.

### **Alternative A: No Action**

Under the No Action alternative, current management plans would continue to guide management of the project area. No vegetation management would occur. Subsequently there would be no fuels reduction, Wildland Urban Interface treatments, hazard tree removal/icing treatments, wildlife habitat improvements, or road closures to accomplish project goals.

### **Alternative B: Proposed Action**

Alternative B is the Proposed Action identified in Chapter 1 above.

### **Alternative C: Southwest Forest Alliance**

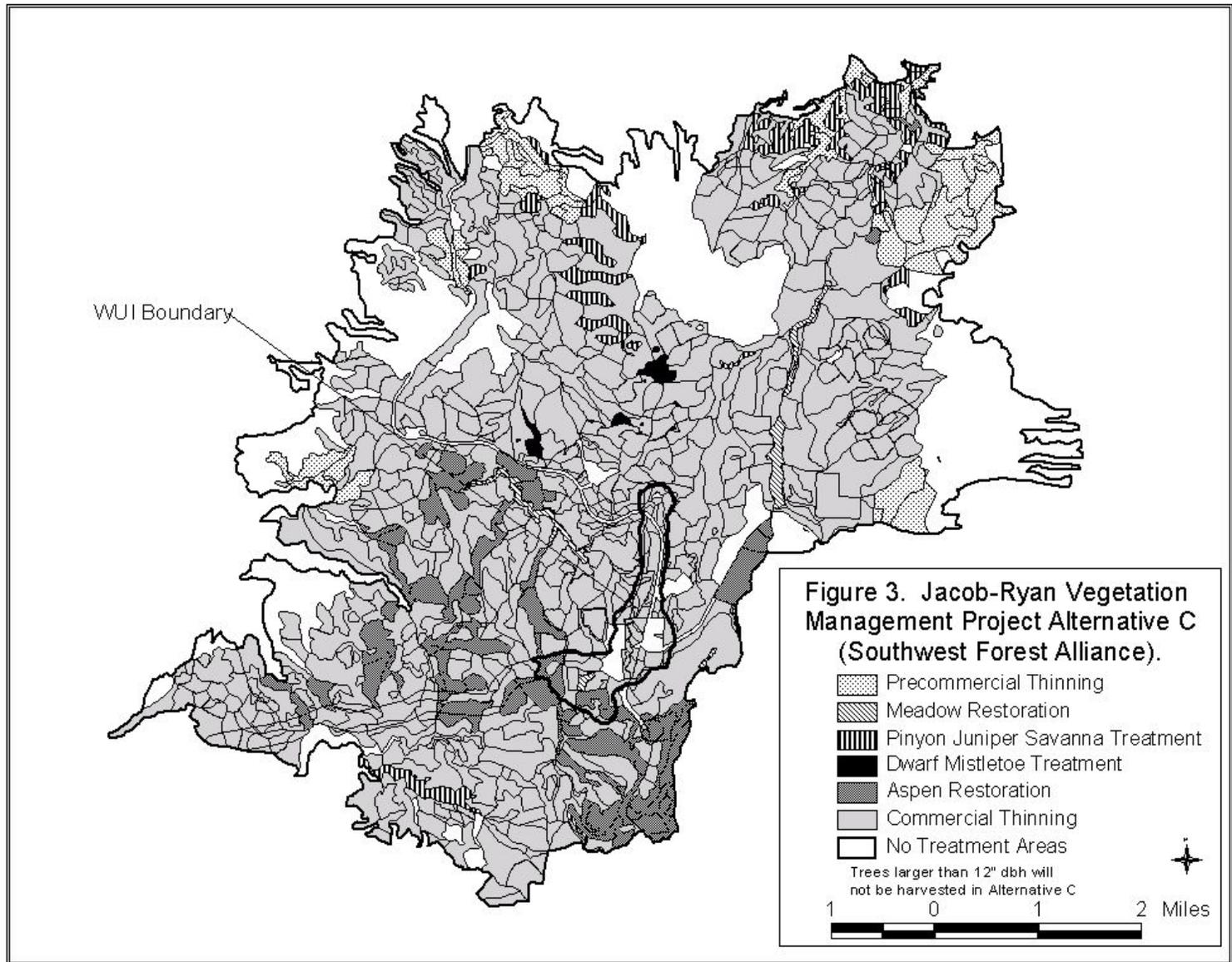
The District received the Southwest Forest Alliance Alternative on November 14, 2001. The alternative contained some general position statements embedded in the "action items" of the alternative. Therefore, on 3/26/2002, The North Kaibab Ranger District Environmental Coordinator met with the Southwest Forest Alliance to clarify the implementable portions of their proposal (see meeting notes PR). The ID team removed all general position statements, comments, and opinions at a meeting on April 2-4, 2002 (see notes in PR). The results of those meetings are presented below as Alternative C.

Alternative C is very similar to the Proposed Action but limits vegetative manipulation to ponderosa pine trees, 12 inches dbh and less with no hazard tree removal adjacent to Highway 89A and 67. Alternative C uses the MASS model to designate old growth (See Figure 3).

- Use the MASS Model to designate Phases 1,2,3,4 as old growth or recruiting old growth
- Retain all old growth ponderosa pine, including yellow or yellowing pines.
- Retain all tree species over 100 years old (Note: The District does not keep tree age data so we will assume ponderosa pine age based on size, and color of the bark for pines).
- Provide fire protection, and release from competition for yellow ponderosa pine by cutting doghair thickets and pines less than 12 inches dbh from within the dripline of the yellow pines.
- Retain all yellow pine and pine trees greater than 12" dbh (*Note: this provision should meet bullet 3*).
- Thin and /or remove doghair ponderosa pine thickets. Retain a small component of doghair thickets at the stand level for wildlife cover and structural diversity.
- Retain a basal area (ba) of 60-120 sq ft/acre in thinned ponderosa pine stands. Thinned stands should represent the full range of basal areas from 60 to 120 square feet. Do not thin ponderosa pines in sites that currently have basal areas below 60 square feet (in trees greater than 5" dbh)

*(Note: This provision loses the distinction between goshawk nesting area tree density guidelines and foraging areas tree density guidelines).*

- Avoid cutting one or more individual ponderosa pine trees from a group with interdependent crowns.
- Create openings for VSS 1 and 2 in the PFA's by thinning and cutting doghair thickets and small diameter ponderosa pine. This can occur primarily in sites that were previously opened through harvesting.
- Thin ponderosa pine less than 5" dbh throughout the planning area. Retain significant component at the stand level for wildlife cover, tree replacement, and structural diversity.
- Use prescribed fire to reduce fuel loads and the potential for high intensity forest fire throughout the planning area. Prescribed fire may be used alone or in conjunction with thinning treatments.
- Use prescribed fire on all acres that are thinned.
- Remove ladder fuels and duff from around yellow ponderosa pine prior to prescribed fire.
- Do not expand fuelbreaks along roads or power lines.
- Manage stands adjacent to roads through thinning and burning in order to enhance the effectiveness of existing fuelbreaks. Thin understory trees and prune low branches.
- Treat the intensive zone within 660 feet of structures and campgrounds. Remove ladder fuels and thin small diameter understory trees.
- Retain old growth ponderosa pine with mistletoe as future snags.
- Clear a 20-ft. radius around aspen clones. Retain all yellow pines and all trees over 12" dbh
- Defer livestock grazing in the treated aspen stands.
- Minimize the soil disturbance and compaction of thinning treatments by using hand thinning and rubber tired machinery where possible.
- Build no new roads for thinning treatments.
- Defer livestock grazing on all areas after thinning treatments, in all meadow and aspen restoration sites, and in all areas with populations of exotic/invasive plant species.
- Close/re-close roads proposed above.



## **Mitigation Measures Specific to Alternative B**

- Defer livestock grazing from restored meadows and aspen regeneration sites by locating salt and herding away from treated areas until grasses become established.
- Tree removal along the highways will create an uneven and irregular edge that undulates 20' to 300' from the centerline of the highway.

## **Mitigation Measures Specific to Alternative C**

- Defer livestock grazing on all areas after thinning treatments, in all meadow and aspen restoration sites, and in all areas with populations of exotic/invasive plant species.
- Minimize the soil disturbance and compaction of thinning treatments by using hand thinning and rubber tired machinery where possible.

## **Mitigation and Monitoring Measures Common to Alternatives B and C**

In response to public comments on the proposal, mitigation measures were developed to ease some of the potential resource impacts the various alternatives may cause. The mitigation measures may be applied to any of the action alternatives.

## **Vegetation Resources**

- Within 15 days after completion of any skidding or landing operation, installation of erosion control structures will occur, unless on-the-ground conditions warrant more immediate action.
- The purchaser will lay out skid trails in advance of felling. The Timber Sale Administrator will approve skid trail layout before skidding begins.
- Logs will be endlined as appropriate to avoid undesirable impacts from equipment in sensitive areas (slopes greater than 30 percent, aspen stands, the Arizona Trail, meadows, wet areas).
- Incorporate "Noxious Weed Strategic Plan Working Guidelines" (see plan in PR) Weed Prevention Measures/Best Known Practices 19, 19.1, 20, 20.1, 21, 21.1, 21.2, 22, and 22.1.
- Monitoring during and after harvest will follow KNFLMP guidelines. Effectiveness of harvest treatments will be evaluated using techniques such as stand examinations and inventories, or site inspection by the appropriate resource specialist during and after harvest operations (see Silviculture Report's monitoring section in the PR).

## **Wildlife Resources**

- A limited operating period from March 1 to August 15, inclusive will be in effect for all purchaser operations and activities within ¼ mile of active nest trees for northern goshawks. Operations will be allowed if surveys document no goshawk nesting.
- If a new pair of northern goshawks or nesting goshawks are located prior to or during project implementation, the LOP will be imposed and the District Wildlife Biologist will be consulted to determine whether or not a nest area or PFA should be created.
- During thinning operations of ponderosa pine VSS1 and VSS2 clumps, avoid removing trees from within the interior of clumps or groups. Thin from the outside and shape clumps or groups to maintain adequate hiding and nesting cover. This is particularly important for turkeys and low nesting songbirds.
- In areas deficient of VSS1, VSS2, and shrub cover, utilize slash piles to provide cover for turkey.
- Avoid harvesting ponderosa pine trees that occur as stringers within pinyon-juniper habitat, particularly if on slopes greater than 30%.
- For nesting turkeys, maintain horizontal green cover possible ¼ mile of water sources.
- The Forest Service will monitor occupancy and reproductive success for all goshawk territories that are within or partially within the Jacob Ryan Planning Area during and after treatment.

## **Fire Fuels and Air Quality**

- Schedule burns to avoid meteorological conditions which would impact smoke sensitive areas.
- Control the ignition and consumption rates (ie. control the emission rate) or schedule for meteorological conditions to permit dilution of smoke to tolerable concentrations in designated areas.
- Remove material (fuel) or burn using an efficient firing technique which minimizes the amount of area and the amount of fuel burning in the smoldering phase (emission reduction).
- Monitoring after fuels treatments will follow KNFLMP guidelines. Effectiveness of fuels treatment will be evaluated using techniques such as photo points, post treatment fuel inventory, transects for soil coverage, or site inspection by the appropriate resource specialist the year following treatment.

## **Soil and Watershed**

- No new roads or skid trails will be placed in drainage bottoms or meadows, except for designated skid trails crossing drainages.
- Native seed mixtures stipulated by the Forest Service will be used for seeding closed and obliterated roads, skid trails, landings, and other areas where seeding may be needed. All seed will be certified as weed-free. The Sale Administrator will determine seeding needs.
- There will be no cutting in sinkholes. Slash and debris will not be pushed into the sinkholes for disposal.
- All skid trail locations will be approved by the Timber Sale Administrator in advance of falling and skidders will be restricted to the skid trails.
- Skid trails will be waterbarred based on the slope, the amount of disturbance, and the professional judgment of the Timber Sale Administrator.
- To protect soil and water resources, several specific mitigation activities will be universally applied, including: 1) one-end suspension of all skidded logs and biomass except during lateral yarding and endlining operations; 2) scarifying and grass-seeding, by purchaser, of all landings used that are outside the roadbed of permanent roads; 3) post-project scarifying and grass-seeding of selected landings not expected to be used within 5 years; and, 4) post-project scarifying, grass-seeding and closure of all temporary roads.
- Landings must meet the following criteria in order to minimize effects to water quality from land-disturbing activities: a) the landing will not exceed the size needed for safe and efficient skidding and loading operations; b) where reasonable choices exist, landing locations will be approved by the sale administrator which involve the least amount of excavation and least erosion potential; c) landings will usually be located outside of specified View Areas; d) landings are located where the least number of skid roads are required; e) if possible, the skid road approach to the landing is nearly level; f) new landings are designed and constructed as part of permanent roads; and, landing size or equipment restrictions, if any, are adhered to. After landings have served sale needs, the Purchaser will ditch, scarify and/or slope the landings to permit drainage, infiltration and dispersion of water. Unless otherwise agreed, cut and fill banks around landings will be sloped to remove overhangs and otherwise minimize erosion. Existing landings not used by Purchaser, but in need of treatment, will be treated by the Forest Service.

## **Visual and Recreation**

- View and Public-Use areas (the area within 200' from visible view areas such as Highways 67 and 89A or public use areas) and within 50' of the Arizona Trail shall require treatment of visible slash. The first 25' from the edge of the road or centerline of the trail will have contractor generated slash completely removed. Slash beyond this 25' area will be treated by removing,

chipping, piling, machine piling or a combination of these means unless a method is specified or prohibited. Logging slash not readily treated by the selected or specified method shall be removed to designated areas outside of view or public-use areas or treated as agreed. Boundaries of such areas are shown as distance limitations in the timber sale contract.

- Dispose of slash along the highway as soon as possible after treatment (in the first year). In partial retention VQO areas, dispose of slash within 1-2 years after treatment is completed.
- Logs will not be skidded on the tread of the Arizona Trail. Designated skid trails may cross only at designated trail crossings and will be perpendicular to the trail where possible. If logs are skidded across the trail, the number of crossings will be limited. Trail crossings would be mitigated by reshaping to the original contour. Signs will be posed along the trail warning trail users that harvest operations are occurring. Directionally fell trees away from the trail. Minimize equipment use within 25' of the trail; endline logs out. Trail improvements such as fencing, signs, parking areas, restrooms, etc. that are damaged during harvest activities will be restored or replaced by the contractor to their original condition.
- Place one of the mobile interpretive signs at the Highway 89A, Arizona Trailhead during the project activities.
- At the meadow restorations or openings created by mistletoe treatments, feather edges of residual trees so there is a gradual reduction in tree density up to the opening. Sharp contrasts in tree density should be avoided. There is also an opportunity to do a similar kind of feathering in stands adjacent to old seed tree cuts.

### **Roads and Access**

- Any traffic use increases from log trucks and support vehicles that create traffic safety problems will be mitigated by signing and traffic control, and if appropriate, by contractual limitations, such as road and public use restrictions.
- Scarify and seed roads only to the extent necessary to close designated roads.

### **Cultural Resources**

- All eligible or unevaluated sites will be marked for avoidance by North Kaibab Ranger District heritage specialists prior to the initiation of any project activities within the Jacob Ryan Planning area that may affect the physical integrity of these sites.

### **Facilities**

- Protect all range facilities and improvements in the project area during project implementation. Repair or replace facilities inadvertently damaged as per the timber sale contract (see Range Needs and Fence Information map in PR).

### **Comparison of Alternatives**

This section provides a summary of the effects of implementing each alternative. Information in Table 2.1 is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 2.1. Summary of Key Differences Between Alternatives.

Management Activity	A No Action	B Proposed Action	C Southwest Forest Alliance
<b>Harvest Related</b>			
Approximate harvested (Acres) (Ponderosa Pine Cover Type, EMA 13)	0	22,000	22,000
DBH Limit	NA	None	12" dbh
PFA Harvested (#/Acres) (Acres Included Above)	0	29/16,161	29/16,161
FAAU Harvested (#/Acres) (Acres Included Above) (Ponderosa Pine Cover Type Only)	0	6/9,652	6/9,652
Northern Goshawk Replacement Nest Stands Harvested (#/Acres) (Acres Included Above)	0	66/2,392	66/2,392
Dwarf Mistletoe Sanitation Acres Harvested (Acres Included Above)	0	72	72
Meadow Restoration (Acres) (Acres Not Included Above)	0	263	263
Aspen Restoration (Acres) (Acres Included Above)	0	3,345	3,345
Pinyon-Juniper Restoration (Acres) (Acres Not Included Above)	0	1,143	1,143
Total Wildland Urban Interface Acres Harvested (Acres Included Above)	0	994	994
Maintenance of Existing Fuelbreaks Harvested (Miles/Acres) (Acres Included Above)	0	56/2,140	56/2,140
Highway 89A Hazard Tree Removal (Miles)	0	12.5	0
Precommercial Thinning Only (Acres)	0	2,000-2,200	2,000-2,200
Total Biomass Removal (Tons)	0	48,000 - 53,000	26,000 - 31,000
Total Sawtimber Removal (MMBF)	0	10.5 - 15.5	2-3
<b>Post Harvest Related</b>			
Total Harvest Acres Machine Piled	0	250	0
Total Harvest Acres Prescribed Burned	0	22,000	22,000
Total Non-Harvest Acres Prescribed Burned	0	9,149	9,149
Northern Goshawk Existing Nest Stands Prescribed Burned (#/Acres) (Acres Included in Total Non-Harvest Acres Prescribed Burned)	0	66/2,819	66/2,819
<b>Fire and Fuels</b>			
Acres Active Crown Fire Risk After Treatment	334	0	368
Acres Passive Crown Fire Risk After Treatment	11,660	6,622	13,304
Acres Surface Fire Risk After Treatment	15,762	21,324	14,274
Acres WUI Treatment	0	995	995
<b>Soil and Watershed</b>			
Tons/Year Potential Soil Loss (w/o mitigation applied)	30,000	63,444	63,167
<b>Visual</b>			
Amount of Visual Diversity	Lack of Visual Diversity	Improved visual diversity/quality over time	Improved visual diversity/quality over time
Meets Visual Quality Objectives	Partially	Meets over time	Meets over time
Meets Recreation Opportunity Spectrum	Yes	Yes	Yes
<b>Roads and Access</b>			
Miles Road open after Treatment	330	110	110
Total Miles Road/Sq mile After Treatment	6	2	2
Miles of Road Construction	0	0	0

Table 2.1. Summary of Key Differences Between Alternatives.

Management Activity	A No Action	B Proposed Action	C Southwest Forest Alliance
Safety – Hazard Tree Removal Along Highways 89A and 67	No Hazard Trees Removed	Hazard Trees Removed Along Highways 89A and 67	No Hazard Trees Removed
<b>Economics</b>			
Benefit/Cost Ratio	0	1.05	0.23

## Chapter 3 - Environmental Consequences

This section summarizes the physical, biological, social, and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for the comparison of alternatives presented in the chart above.

### Cumulative Effects Overview

This section provides an overview of the past, and present actions that have shaped the existing condition of the analysis area. For a detailed cumulative effects analysis specific to each resource, see the resource sections below and/or the detailed specialist reports in the PR.

Potential cumulative effects were analyzed by considering the proposed activities in the context of the past, present, and reasonably foreseeable actions in the Jacob Ryan Management Planning Area and within the three larger Arizona 5<sup>th</sup> level watersheds that include the entire planning area (see the cumulative effects map in the PR) (Table 3.1). The cumulative effects analysis area includes Forest Service, Bureau of Land Management, and State of Arizona Lands. We limited the cumulative effects analysis to projects that were within the analysis area and on the Kaibab Plateau; because, the projects occurring off of the Kaibab Plateau would have no additive effect to the Jacob Ryan impacts because of spatial distinctness. The three watersheds were used to limit the cumulative effects analysis because the ground disturbing impacts associated with vegetation management are generally limited to the watersheds that contain the treatment area. However, the paucity of running water on the North Kaibab Ranger District actually limits the effects to a much smaller area.

Table 3.1 summarizes the past, present and reasonably foreseeable activities (over the next five years) on lands managed by the Forest Service and BLM. Table 3.1 does not include non-ground disturbing activities such as special use permit reissuances, water tank replacements, or lease reissuances because there would be no cumulative effects from these undertakings.

Table 3.1. Past, present, and reasonably foreseeable activities on lands within the three Arizona 5<sup>th</sup> Level Watersheds that contain the Jacob Ryan Planning Area.

Project Type	Project Name and Brief Project Description	Implementation Date or Status
Multiple Timber and Salvage Sales	Multiple timber sales using varying harvest practices: timber and salvage sales have shaped the existing condition in the Jacob Ryan Planning Area and are one component of the subsequent need for change.	Past: 1970s-1990s
Multiple Fires	Several big fires have shaped the existing condition in the Jacob Ryan Planning Area and are one component of the subsequent need for change e.g. The Willis fire of 1987 and the Hidden fire of 2001.	Past: 1987-2001
Hidden Salvage	Hidden Salvage is within the Jacob Ryan Planning area. These dead and dying tree harvest and subsequent planting should bring the site closer to the desired condition faster than if left to regenerate naturally.	Past 2003
Grazing Allotments	Cattle Grazing on FS and BLM Administered Lands. There are two allotments in the Jacob Ryan analysis area – Central Summer and Ryan	Present Action
Active Vegetation Management	Dry Park Vegetation Management Project. Project is moving the vegetation closer to the Forest Plan desired condition for MSO habitat, goshawk habitat, goshawk prey species habitat and old growth. Approximately ¾ of the Dry Park analysis area is within the Jacob Ryan cumulative effects analysis area.	Present Action
Fuels Reduction	Cancoop fuels reduction will reduce fuels in the PJ on the north end of the District and improve watershed condition. Will improve the watershed condition in and around the Jacob Lake project area.  Jack Jolly, Lookout, and Burnt Saddle will reduce fuel loads and reduce the risk of catastrophic wildlife.	Reasonably Foreseeable
Vegetation Management	Telephone Hill Vegetation Management Project. Project will move the vegetation closer to the Forest Plan desired condition for MSO habitat, Goshawk habitat, and old growth.  Billy West will move the vegetation closer to the Forest Plan desired condition for MSO habitat, Goshawk habitat, and old growth.  East Rim Vegetation Management will move the vegetation closer to the Forest Plan desired condition for MSO habitat, Goshawk habitat, and old growth.	Reasonably Foreseeable
Wildlife Habitat Improvement	Houserock Wildlife Habitat Improvement: PJ treatments to enhance cliffrose production for wildlife. Outside the mixed conifer habitat vegetation type.	Reasonably Foreseeable
Jacob Lake Inn Expansion	Replace some existing facilities within the permitted area and construct new buildings. Project restricted to existing impact area.	Reasonably Foreseeable

Fire suppression, road building, timber sales, wildfires, and cattle grazing represent the primary past management activities that contributed to the cumulative effects of the proposed Jacob Ryan Vegetation Management project (see Background section above). These activities had a great influence in developing the existing condition in the Jacob Ryan Planning area.

Ongoing and future activities within the project area also include harvest of special forest products, dispersed recreation, campground maintenance, concessionaire facility maintenance and road maintenance (Table 3.1).

The following section summarizes the affected environment and environmental consequences (effects) of the alternatives on the issues discussed above and on other components of the human environment.

## Old Growth Significant Issue

*Managing only 20 % of the Plateau for old growth will result in the lost opportunity to develop additional old growth:*

### Old Growth Affected Environment

For purposes of this document, “old-growth” will utilize the two definitions and parameters outlined in Table 3.2: KNFLMP ROD definition and MASS old growth phase definition. *The 1996 Regional Amendment of Forest Plans, Arizona and New Mexico* (On file at the Kaibab National Forest Supervisors Office – see note in PR) requires a landscape management approach to old growth. This approach allocates no less than 20 percent of each forested ecosystem management area (EMA) to old growth characteristics (KNFLMP page 32). The landscape approach allows for the dynamic regeneration, growth, attainment, and senescence of old growth characteristics across the EMA and Forest; rather than designating static blocks (acres) that only exhibit old growth characteristics for a finite period until the stand senesces and dies. The North Kaibab Ranger District is committed to maintain, enhance, and restore old forest conditions within the Jacob Ryan project area. The general characteristics of old growth are displayed in Table 3.2: The reader is referred to the KNFLMP for a complete discussion of old growth management direction on the Kaibab National Forest.

In the late 1990s, the Forest Service, Arizona environmental groups, Arizona Game and Fish, Northern Arizona University, and forest industry representatives collaborated to develop an improved definition of old growth because of their dissatisfaction with the Forest Service definition. As a result of this collaborated effort by the “Old Growth Working Group”, the definition of late seral (old growth) habitat conditions were separated into five phases of development for ponderosa pine cover type. A forest succession model was developed to display the changes in these phases of forest characteristics of late seral habitat conditions. This model is known as the MASS model (Sesnie, 2001). Table 3.2 displays the two definitions (ROD and MASS) of old growth characteristics.

EMA 13 contains approximately 248,785 acres, of which, the dominant cover types include ponderosa pine and mixed conifer. Currently, approximately 27.6% of EMA 13 meets the ROD old growth habitat characteristics. This includes ROD old growth in ponderosa pine, quaking aspen, and mixed conifer cover types. Ponderosa Pine cover has approximately 28.6% ROD old growth.

The Jacob Ryan project area contains approximately 32,142 acres of ponderosa pine cover type, of which, 24% meets the ROD definition.

Sesnie provides a detailed discussion of the five phases of MASS old growth habitat characteristics. As shown in Table 3.3, the existing acreages and percentages of the five phases of MASS old growth within the Jacob Ryan project area based upon stand examinations and field reviews.

The ecological attributes of the two definitions will be used to assess the effects of the proposed project upon ROD and MASS old growth forests.

Table 3.2. Classification of Old Growth Characteristics using ROD and MASS Model Definitions

Vegetation Attributes	ROD Definition	MASS Model Definition of Old Growth					
		Phase 0	Phase 1	Phase 2	Phase 3	Phase 4	
<b>Upper Canopy – Older Component</b>							
Minimum Trees per Acre:							
>=18”dbh	20		<7-2	12-20	16-20	<12	
>=30”dbh					2-3		
Range of Oldest Trees, Years	180		0-150	150-300	250(oldest)	250(oldest)	
Canopy Cover (percent)	50		-	-	-	-	
Basal Area (sq.ft./ac)	90		20-60	60+	60+	20-60	
Decadence – Dead broken or deformed tops and/or bole or root rot	ND		Remnant	Low	Important	Important	
<b>Stand Dead</b>							
Minimum Trees per Acre		Not Old Growth					
Desirable >=7”dbh			5	7	9	3	
Minimum >18” dbh	1		2-0	0-2	2-4	4-6	
<b>Down Woody Material</b>							
Minimum number of pieces (number per acre) >=12” diameter and >=15’ long	2			10-4	2	4	6
<b>Stand Structure</b>							
Desired Canopy Layers	ND		1-2	2-3	3	1-2	
<b>Landscape</b>							
Initial estimate of range in total landscape (percent)			25-35%	25-35%	25-35%	5-15%	
Length of time within stage (years)	180		Up to 150	50-150	50-150	25-75	

Stages are defined as: *Phase 1 – Replacement*, where blackjack-sized trees dominate ecological processes; *Phase 2 – Developing*, where blackjack and yellow bark trees codominate ecological processes; *Phase 3 – Prime*, where yellow pines are ecologically dominant; and, *Phase 4 – Decaying*, where the ecological process of death and decay peaks.

*Phase 0* is not considered old growth, but historically forested, where there is no remnant of large trees or standing snags. Commonly caused by catastrophic fire or blowdown with sanitation salvage, or from previous seed tree shelterwood harvests. This phase can transition into an old growth cycle as phase 2 given time.

Table 3.3. Percent MASS Old Growth Acreage within Jacob Ryan Project Area.

Phase	Description	% Of Area
0	Not Old Growth	14.7
1	Replacement	22.4
2	Developing	57.8
3	Prime	4.4
4	Decadent	0.7
Total		100

### Old Growth Effects

The following old growth discussion will be separated for each of the two definitions of old growth on the project, PFA, and FAAUs levels. Effects at the landscape level, applies to ROD old growth and not MASS old growth. Please see the Silviculture report in the PR for a graphic description of the change in ROD and MASS old growth over time.

## **Alternative A**

### **ROD Old Growth**

There would be a minimal change in the acreage of ROD old growth as an indirect effect of Alternative A at the landscape, project, PFA, and FAAU levels in the short-term.

It is estimated that at the landscape level, total ROD old growth acreage would increase from 24 to 28% (Silviculture Report Graph 1). Old growth is expected to increase greater under the no action, than the action alternatives because under the action alternatives stands on the threshold of going into old growth (greater than or = 90 ba - greater than or = 20 TPA) that are thinned would not achieve old growth 90 ba in the next 20 years and some stands that are at 90 ba may be thinned to below 90 ba and thus will not meet the definition of ROD OG (see JR EA and Decision Notes 12-01-2004 in the PR).

If a wildfire occurred, the old growth characteristics would shift toward an early seral state in the areas intensively burned. If such an event occurred, the majority of the project area would consist of artificially reforested lands, grasslands, and brush fields. Old growth forest conditions would require the passage of 100 or more years. The amount of time required to reestablish old growth forest conditions would be dependent upon future reforestation choices and management decisions, but the passage of decades would be unavoidable.

### **MASS Old Growth**

There would be a slight change in the acreage of MASS old growth as an indirect effect of Alternative A at the project, PFA, and FAAU levels in the short-term.

Some long-term indirect effects are expected. As indicated in Table 27 of the Silviculture report, it is estimated that at the project, PFA, and FAAU levels, All phases of MASS old growth acreage would see moderate shifts in the long-term, assuming ponderosa pine cover type acreage does not change drastically.

If a wildfire occurred, the old growth characteristics would shift toward an early seral state in the areas intensively burned. If such an event occurred, the majority of the project area would consist of artificially reforested lands, grasslands, and brush fields. Old growth forest conditions would require the passage of 100 or more years. The amount of time required to reestablish old growth forest conditions would be dependent upon future reforestation choices and management decisions, but the passage of decades would be unavoidable.

## **Alternative B**

### **ROD Old Growth**

Short-term effects would occur and have been partially described above. Short-term effects on the amount of ROD old growth at the landscape level (EMA 13) are expected to be beneficial because of mitigation designed into the Proposed Action.

The proposed action would only perform group selection in VSS 3, VSS 4 or VSS 5 groups in PFA/FAAUs that have a clear surplus, no VSS 6 groups would be used for regeneration, and no dominant or codominant trees within VSS 6 groups would be thinned (except hazard trees along Highways 89A and 67). This would result in a change in the overall amount of Jacob Ryan old growth reported in the silviculture report Graph 1 (see JR EA and Decision Notes 12-01-2004 in the PR). The reduction in mistletoe treatments and the retention of most, if not all, 24 inch + trees under Alternative B would result in 25 % Jacob Ryan old growth at year 2014. Alternative B thinning from below in groups dominated by trees 12-18" (VSS4) should provide additional release of remaining trees; thus, accelerating diameter growth and increasing the percent of ROD OG in the Jacob Ryan to 23 % at year 2024.

Prescriptions are intended to perpetuate the large tree element characteristic of late seral forests. Other elements commonly associated with late seral forests, such as a high number of snags and down logs, trees 18 inches dbh and larger, moderately high basal areas, and relatively high canopy closures, will not characterize the stands treated in this alternative. The treated stands will be more open and parklike in the long-term. Both treated and untreated stands will continue their development toward maturity and senescence. These changes have been previously described in the indirect effects of the plant community composition and structure section (above). Since large blocks of late seral forest habitat are rare in the relatively lower elevations of ponderosa pine cover types, treatments that improve their condition are considered beneficial, especially to wildlife.

**Cumulative Effects:** At the cumulative effects analysis area, landscape, project, PFA, and FAAU levels, the amount of ROD old growth would not be reduced. Effects upon ROD old growth by present actions and foreseeable future actions would be beneficial and the amount of ROD old growth would be sustained over the long-term, resulting in a net beneficial effect.

If a wildfire occurred, the old growth characteristics would shift toward an early seral state in the areas intensively burned. If such an event occurred, the majority of the project area would consist of artificially reforested lands, grasslands, and brush fields. Old growth forest conditions would require the passage of 100 or more years.

### **MASS Old Growth**

Alternative B's MASS old growth effects are expected to be very similar Alternative C's MASS old growth effects. The tree retention mitigation moots Alternative B's MASS analysis from the Silviculture Report. The Proposed Action's effects closely mimic Alternative C's effects when considering the proposed action would only perform group selection in VSS 3, VSS 4 or VSS 5 groups in PFA/FAAUs that have a clear surplus, no VSS 6 groups would be used for regeneration, and no dominant or codominant trees within VSS 6 groups would be thinned (except hazard trees along Highways 89A and 67).

It is estimated that at the project, PFA, and FAAU levels, all phases of MASS old growth acreage would see moderate shifts in the long-term, assuming ponderosa pine cover type acreage does not change drastically.

If a wildfire occurred, the old growth characteristics would shift toward an early seral state in the areas intensively burned. If such an event occurred, the majority of the project area would consist of artificially reforested lands, grasslands, and brush fields. Old growth forest conditions would require the passage of 100 or more years. The amount of time required to reestablish old growth forest conditions would be dependent upon future reforestation choices and management decisions, but the passage of decades would be unavoidable.

Prescriptions are intended to perpetuate the large tree element characteristic of late seral forests, including other elements commonly associated with late seral forests, such as high numbers of snags and down logs, trees 18 inches dbh and larger, moderately high basal areas, and relatively high canopy closures. The treated stands will be more open and parklike in the long-term. Both treated and untreated stands will continue their development toward maturity and senescence. These changes have been previously described in the indirect effects of the plant community composition and structure section (above). Since large blocks of late seral forest habitat are rare in the relatively lower elevations of ponderosa pine cover types, treatments that improve their condition are considered beneficial, especially to wildlife.

**Cumulative Effects:** Foreseeable future and existing management actions will not reduce the amount of MASS old growth phases within the PFAs, FAAUs, and project area.

## Alternative C

### ROD Old Growth

Direct effects to ROD old growth in Alternative C are effectively identical to Alternative B at all levels of analysis (see JR EA and Decision Notes 12-01-2004 in the PR). It is estimated that at the landscape level, total ROD old growth would increase as a result of implementing Alternative C as indicated in Graph 1 of the Silviculture report. This is primarily due to effects upon ponderosa pine cover type. The other cover types are unaffected by implementing Alternative C; therefore, no direct effects occur.

Alternative C old growth drops from 24% to 23% at year 2024 (Silviculture Report Graph 1). This drop is due to mistletoe infection acceleration in infected stands that were not adequately sanitized.

Prescriptions are intended to perpetuate the large tree element characteristic of late seral forests. Other elements commonly associated with late seral forests, such as high number of snags and down logs, Trees 18 inches dbh and larger, moderately high basal areas, and relatively high canopy closures, will not characterize the stands treated in this alternative. The treated stands will be more open and park-like in the long-term. Both treated and untreated stands will continue their development toward maturity and senescence. These changes have been previously described in the indirect effects of the plant community composition and structure section (above). Since large blocks of late seral forest habitat are rare in the relatively lower elevations of ponderosa pine cover types, treatments that improve their condition are considered beneficial, especially to wildlife.

Cumulative Effects: Foreseeable future and existing project effects upon ROD old growth would be minor because Forest Plan direction allocates no less than 20 percent of each forested ecosystem management area (EMA) to old growth characteristics. The current projects all comply with the Forest Plan direction and future projects will comply with the old growth direction.

### MASS Old Growth

Short-term effects would occur and have been partially described above. Short-term direct effects on the amount of MASS old growth for PFAs, FAAUs, and the project area are indicated in Table 3.4. In the short-term, acreages in phases 0, 1, 3, and 4 decreases, while phase 2 increases.

Table 3.4. Alternative C - Change in MASS Old Growth Acreage in PFAs, FAAUs, and Project Area.

<b>PFA</b>					
	<b>Old Growth Phase</b>				
YEAR	0	1	2	3	4
2002	2,865	2,832	10,521	649	83
2014	2,249	2,277	12,055	321	48
2024	1,413	2,321	12,526	608	83

<b>FAAU</b>					
YEAR	0	1	2	3	4
2002	3,195	2,309	9,060	555	73
2014	2,608	1,815	10,515	236	19
2024	1,728	1,956	11,054	419	35

<b>Project Area</b>					
YEAR	0	1	2	3	4
2002	6,060	5,141	19,581	1,205	156
2014	4,856	4,092	22,570	556	68
2024	3,140	4,276	23,580	1,027	118

Some long-term effects will occur and are expected and have been partially described above. It is estimated that at the project, PFA, and FAAU level, phase 0, 1, 3, and 4 decrease, while phase 2 increases.

Cumulative Effects: Foreseeable future and existing projects will have a minimal affect upon MASS old growth at the project, PFA, and FAAU levels. Forest Plan direction allocates no less than 20 percent of each forested ecosystem management area (EMA) to old growth characteristics. The current projects all comply with the Forest Plan direction and future projects will comply with the old growth direction.

## Vegetation Resources

The JR EA tables and figures illustrating VSS and ROD OG effects by alternative do not display error terms or variance. These statistics were omitted for the following reasons:

- VSS was designed to describe habitat conditions in even aged stands or patches. Stand level VSS do not evenly track evenly through time in uneven or irregular aged stands because VSS is based upon on which class has a plurality of site occupancy and which is highly variable in nonlinear directions through time – i.e., VSS 1 will not logically grow into 2, 3, 4, 5, 6 in a linear order in an additive way.
- A stand by stand VSS analysis (stand averages) tends to minimize VSS 1 and VSS 6 and the PFA and FAAU scale (data from Burnt Saddle confirm).
- Because of the VSS rules, a stand which has more than 10 percent of stand density index (SDI) max. (45 in pine) of trees greater than 1 inch diameter, it must be assigned to some other VSS than 1. So very open stands that have a lot of area of seedlings or grass will not be assigned as VSS 1.
- There are two definitions for VSS 6. In the database and in most FS nomenclature VSS 6 is primarily determined by the number of trees per acre greater than 18 inches in diameter for PP on average and high sites in the southwest. The threshold is 20 or more TPA. For MRNG the definition is areas dominated by trees 24 inches and larger.
- There is often confusion about what is VSS 6. When we evaluate VSS under MRNG and use its definitions, we use the numbers from the stand database (which uses a different definition for VSS 6) we seldom find VSS 6 at the stand level.
- Twenty 18-inch trees per acre is the minimum number of trees required for a stand to be classified as VSS 6 group/stand to be classified as ROD old growth. VSS 6 ROD old growth stands are rare in the southwest Ponderosa pine belt. Under the MRNG VSS is created at the group level. Several groups of VSS 6 can exist in a stand without the stand being classified as a VSS 6 in the database. The net result is that VSS 6 (MRNG def.) is under represented by the VSS classification in the database.

In conclusion, minor differences in VSS displayed in the analysis are probably meaningless on the ground, because the resolution of the data and the differences in definitions (MRNG vs. ROD OG) results in differences of 5 percent or less.

Public comment and resultant clarifications to the proposed action will retain more groups of VSS 6 and individual trees greater than 24 inches than the proposed action sent for public comment under the 30-day Notice and Comment Period. Because of the minor differences displayed above, the following discussion qualitatively displays the effects of the Proposed Action (Alternative B) with the clarifications. Alternatives A and C modeled effects did not change and are retained in the analysis as previously reported during the Jacob Ryan Notice and Comment Period.

## Vegetation Resources Affected Environment

The project area is predominantly ponderosa pine (89.4%), with some pinyon-juniper (8.3%), and very small amounts of hardwoods, aspen, meadow/grassland, rocky mountain juniper, water, and unidentified cover types (Table 3.5).

Table 3.5. Forest Cover Type Distributions for the Jacob Ryan Project Area on the North Kaibab Ranger District.

Forest Cover Type	Cover Type Code	Acres	Percentage
Non-Forest Service Ownership	???	27.4	0.08%
Meadow/Grassland	GRA	195.8	0.54%
Aspen	TAA	43.6	0.12%
Other Hardwoods	TOH	274.3	0.76%
Oak Woodland	TOW	193.0	0.54%
Pinyon-Juniper	TPJ	2,976.9	8.28%
Ponderosa Pine	TPP	32,142.4	89.42%
Forested (undefined)	TRE	25.8	0.07%
Rocky Mountain Juniper	TRJ	46.2	0.13%
Water	WAT	20.6	0.06%
<b>TOTAL</b>		<b>35,946.0</b>	

Quaking aspen (*Populus tremuloides* Michx.) is a minor component of the vegetation across the project area. In a number of instances, quaking aspen is the dominant cover type existing in pure stands greater than 1 acre, but generally less than 4 acres. In the majority of situations, quaking aspen exists as clumps (plant aggregations) intermingled with overtopping young and old growth ponderosa pine.

Gambel oak (*Quercus gambelii* Nutt.) is a minor component of the vegetation within the project area and occurs in pure stands between pinyon-juniper woodlands and ponderosa pine stands. It also exists as clumps (plant aggregations) intermingled with overtopping young and old growth ponderosa pine or in association with pinyon-juniper woodlands.

Meadows and grasslands account for approximately 196 acres or about ½ of 1% of the project area. In most areas, ponderosa pine and pinyon pine/juniper are slowly encroaching and will eventually dominate these areas if left unimpeded. *The Terrestrial Ecosystem Survey of the Kaibab National Forest* predicts approximately 1,000 pounds of herbaceous production per acre. Currently, no more than half of the potential is being produced and analysis shows that these areas are in poor range condition (see Jacob Ryan Landscape Assessment in PR). More recent monitoring indicates conditions have improved over a large portion of the Willis and Central Summer (north pasture) allotments. The plots measured in the last 2 years indicate conditions are in the fair or good categories.

The North Kaibab Ranger District recognizes that pinyon-juniper woodlands are key areas for habitat enhancement or improvement, and identifies four primary needs for such activities. Pinyon-juniper woodlands provide important habitat for a variety of wildlife species. Pinyon-juniper woodlands contain transition areas for migrating mule deer, winter range for mule deer and Merriam's turkeys, breeding habitat for many migratory bird species, and year-round habitat for several species of birds, reptiles, and small mammals.

Pinyon-Juniper occupies approximately 2,947 acres of the Jacob Ryan project area. Vegetative treatments are proposed on approximately 1,144 acres. Readers are referred to the Jacob Ryan and Woodlands Planning Area Landscape Assessments for detailed discussions of the pinyon-juniper forest within the project area and on the North Kaibab Ranger District.

Ponderosa pine (*Pinus ponderosa* var. *scopulorum* Engelm.) is the principle forest cover type within the Jacob Ryan project area, covering over 32,000 acres or about 90% of the project area.

The estimation of the existing Vegetative Structural Stages (VSS) within the Jacob Ryan project area were estimated utilizing the procedure outlined in the KNFI&I (see PR) for ponderosa pine cover type only. Field reconnaissance of the FAAUs and PFAs occurred to determine the VSS when no stand exam data was available and to verify the database estimates. The percentages of VSS by PFA and FAAUs utilizing the stand examination database were derived from computing the VSS for stand examination points and summing the acreages that each VSS represented by the points. Although the number of points sampled within each stand was generally too small to estimate the percentage of each VSS within the stand, the number of stand examination points within each FAAU and PFA was larger, providing a functional correspondence with the VSS on the ground within each PFA and FAAU. On the Jacob Ryan project area, 6,209 stand examination points were used to estimate the existing percentage by VSS. See the Silviculture report for the percentage of land area occupied by the VSS classes in each PFA, FAAU, and Audit Unit.

## **Vegetation Resources Environmental Effects**

Vegetation effects were modeled at present time, 5-years (short-term) and 20 years (long-term). Models were run to 20 years from present because each landscape within EMA 13 has a 20-year cutting cycle. On a site basis, management prescriptions would not be the same for each entry every 20 years. Prescriptions would be based upon inventories conducted every 20 years due to changes in the condition of the vegetation composition and structure, stochastic events such as insect kill, diseases, catastrophic fires, and political events such Endangered Species Act species listings. Therefore, prescriptions would likely be different from 1 cutting cycle to the next (see 20-year rational in the PR).

### **Alternative A**

#### **Plant Community Composition and Structure**

*There would be no direct effects upon vegetation, plant community composition and structure or timber from implementing Alternative A.* Therefore, in the discussion that follows, only indirect and cumulative effects are presented. The effects of catastrophic fire are described as an indirect effect, and because there are an infinite number of wildfire scenarios, the discussion presented is of a general nature.

Plant community composition and structure would remain unaltered, except by the processes of succession. Short-term effects of this alternative would be displayed as continued high levels of tree mortality in the suppressed and intermediate tree classes, as well as moderate levels of mortality in the co-dominant and dominant crown positions due to dwarf mistletoe. A great number of understory trees would continue to survive, although their growth rates would be extremely slow. There would be no major shifts in tree species or stand growth. Some individual trees that are in dominant crown positions would continue to grow well. However, insect and disease mortality would continue to take tolls on the trees with low vigor and experiencing inter-tree competition, even if they are in dominant or co-dominant positions. Long-term effects of this alternative would be evidenced by stands wherein the number of suppressed trees have diminished substantially because of natural mortality caused by inter-tree competition of light demanding ponderosa pine trees. The over-story and mid-story would experience substantial amounts of natural thinning in addition to competition from the understory trees growing under the crowns of the over-story.

The forest floor would generally be absent of natural regeneration because of heavy fuels and a deep duff layer, except in those areas where windthrow or insect or diseased-caused tree mortality had sufficiently opened the stand to allow for regeneration of ponderosa pine.

Diameter and height growth would vary greatly in the stand and be largely dependent upon crown position of the tree. The understory trees would experience a substantial decrease in diameter and height growth due to competition for natural resources by the over-story and mid-storied trees. The overstory and mid-storied trees would experience only nominal change in diameter and height growth. Basal area growth would be nominal in the understory and smaller diameter classes; while in the overstory and mid-storied trees basal area growth would be minimal causing the stand basal area growth to be low.

Cumulative Effects: There would be no cumulative effects due to the Jacob Ryan project within the Jacob Ryan cumulative effects analysis area. Present and future vegetation management actions would have cumulative effects. By implementing KNFLMP and the Northern Goshawk Management Recommendations, in addition to mitigation measures stated in each of the project NEPA documents, no adverse cumulative effects are expected to occur. Dispersing and phasing of present and future project activities over time and space would further decrease the potential for adverse cumulative effects and increase net beneficial effects.

### **Vegetation Structural Stage (VSS) and Stand Density**

There would be short and long-term effects in the acreage of the various VSS classes within PFAs, FAAUs, and the project area. In the short-term, VSS 1 shows a reduction in acreage due to diameter growth, while VSS 2-6 shows an increase in acreage in PFAs, FAAUs, and the project area.

If a wildfire occurred, the VSS shift would occur in VSS 1, 2 and 3. Under the No Action Alternative, fire behavior modeling reveals that a potential catastrophic fire could burn the entire project area. If such an event occurred, extensive mortality would occur in VSS 1, 2, and 3 and moderate to high amounts of mortality would occur in VSS 4, 5, and 6.

Cumulative Effects: The only cumulative effects to VSS would be a continuation of the conditions described above within the Jacob Ryan project area. Over the long-term, beneficial effects from other vegetation management actions within the cumulative effects analysis area are expected to improve the distribution of VSS. Applying KNFLMP standards and guidelines as well as the Northern Goshawk Management Recommendations, it is assured no adverse effects would occur, resulting in positive cumulative effects.

### **Meadows and Grasslands**

In the short-term there will be no measurable changes. In the long-term, there would be a minimal change in the size or character of meadows and grasslands, in addition to those vegetative changes previously presented. Ponderosa pine would continue to have a negative effect due to encroachment on meadow and grassland habitats.

If a wildfire occurred, an increased amount of forage will be available for a period of 5-10 year period as meadows and grasslands regenerate from previously timbered areas. Dead and dying ponderosa pine will continue to fall. In time, the density of down material would become a barrier impeding wildlife movement and distribution.

Cumulative Effects: There would be no foreseeable cumulative effects to meadows and grasslands by any present or future management actions within the project area or cumulative effects analysis area.

### **Snags and Down Logs**

Short-term direct effects upon snags and down logs would not occur under the No Action Alternative. Long-term direct effects upon snags and down logs would occur under the No Action Alternative.

Existing snags and down logs would nominally increase in numbers. Snags 18 inches dbh and larger would increase from approximately 1.6 to 2.7 snags per acre, primarily due to mortality caused by insect and diseases. Down logs 12 inches in diameter would only slightly increase due to normal snag fall. The recruitment rate of snags and down logs would continue to be dependent upon the interplay of precipitation levels, stand density and other natural elements, such as the incidence of insect attack, natural mortality, and amounts of windthrow.

Additional long-term effects would be likely, but difficult to predict. The general upward trend in snags and down logs would continue until conditions suitable for tree growth improve. This change could occur with increased rainfall levels or less competition for the available moisture.

Cumulative Effects: No effects upon existing snags and down log numbers, because the removal of snags and down logs would not occur and would be protected in all project implementation management actions. Within the cumulative effects analysis area, the overall effects would be minor by employing management actions that would mitigate adverse effects.

### **Quaking Aspen**

There would be a change in the size and character of seral quaking aspen clones as an indirect effect of the No Action Alternative, other than those vegetative changes previously presented. Understory ponderosa pine would continue to overtop aspen groups and clumps. Aspen would persist in a suppressed condition, however aspen is relatively short-lived compared to ponderosa pine trees and therefore, aspen trees would continue to decrease primarily due to competition, insects, and diseases.

Within a 5-year period it would be expected that the changes in the even-aged aspen groups and clump would be relatively minor. Individual stems within the clone would continue to die creating snags that do not last long. Re-sprouts and suckers would continue to develop and be browsed by deer.

Over a 20-year period, the changes in the quaking aspen population within the project area would be high due to competition, herbivory, insects, and diseases on the existing groups and clumps of aspen clones. Aspen is very sensitive to fire, because of its thin bark. If a wildfire occurred, the aspen population would be dramatically changed in areas intensively burned. Most groups and clumps of aspen would be entirely eliminated. As a result, prolific root suckering would be expected causing the amount of aspen to increase assuming competing ponderosa pine is not present.

Cumulative Effects: No measurable cumulative effects upon overall aspen clone groups and clumps are anticipated within the cumulative effects analysis area (CEAA) and there would be no cumulative effects from other present or future management actions.

### **Oak Woodlands**

In the short-term there will be no measurable changes. In the long-term, regeneration of gambel oak would continue to be poor. Since gambel oak is a sunlight demanding species, it will tend to diminish in abundance and extent under Alternative A as conifer stands continue to achieve crown closure and site dominance. It is expected where gambel oak dominates certain areas, gambel oak has an ecological advantage over the competing ponderosa pine and will not greatly diminish. Over a 20-year period it is expected that the basal area of black oak would slightly decrease from its current 1.3% representation within the project area. In addition, the accumulation of increased duff layers would also preclude gambel oak regeneration.

A wildfire would create large amounts of mortality through topkill of many, if not all, standing gambel oak trees. Regeneration sprouting usually results after topkill. Root sprouts often result in short lived and

poorly formed oak trees. Trees would break apart at a young age because of the large number of sprouts and the fact that rot usually manifests itself in the regenerated stump.

Cumulative Effects: There are no other actions planned that will affect oak woodlands in terms of cumulative effects from present and future actions within the project area. Within CEAA and over the long-term, it is unknown whether cumulative effects created by vegetation present and future management actions would improve the oak woodland habitat matrix over the CEAA. However, utilizing mitigation measures and enhancement strategies in accordance with the KNFLMP, it is expected the overall cumulative effects would be reduced. Furthermore, the nature of these vegetation management actions would be beneficial and would improve the suitability and availability of the habitat for plant species that are presently absent due to the existing stand densities.

## **Alternative B**

### **Plant Community Composition and Structure**

The effects of implementing this alternative are nominally different for the PFAs and FAAUs. Short-term effects selectively thinning 22,000 acres of ponderosa pine stands located within PFAs and FAAUs within the project area would result in a harvest of approximately 12 to 19 MMBF of trees in the 9 to 18 inch range and 48,000 - 53,000 Tons of biomass 4-8.9”.

For most of the proposed treatment areas, approximately 92-95% of the trees removed by harvesting would be from 4-12” d.b.h class, 4-6% from 12-18” dbh class, less than 2% from 18-24” dbh class, and less than 2/10<sup>th</sup> of 1% from trees larger than 24” dbh. A nominal number of trees less than 4” dbh would be removed by harvest activities. However, since the typical tree selected for removal would be smaller than the stand average, the actual basal area reduction would not be directly proportional. The estimated reduction in basal area is expected to be about 16 percent. Average tree sizes in PFAs and FAAUs would increase as a result of harvest. Average quadratic mean diameter increases from about 5” to 19”. This change in size occurs because the average tree diameter of the leave trees would be larger than the average tree size of the existing stands. This is a direct result of harvesting smaller trees and not a growth response.

Changes in the percentage of canopy closure would vary among the PFAs and FAAUs. Since most of the trees that would be removed are in the understory and smaller diameter classes, the overall reduction in canopy closure would not be proportionate to the reduction in the number of trees or the basal area. For some stands, groups and clumps, canopy closure would be virtually unchanged, while for others, particularly those areas within the WUI, the reduction may approach 20-30%.

Long-term effects of decreased tree density would cause a corresponding decrease in inter-tree competition, particularly competition between groups and clumps. Reduced competition would permit individual trees, groups, and clumps greater access to light, water and nutrients. The result would be displayed by increased rates of diameter and height growth with observable growth responses 2-10 years after harvest. The rate of height growth would not change substantially in VSS classes 4, 5 and 6; however, because of a reduction in natural pruning, the live crown ratio and overall crown dimensions would be expected to increase. The rate of height growth would be expected to increase in VSS classes 1, 2, and 3, with an overall increase in live crown dimensions corresponding to an increase in cubic volume and diameter growth.

Since the PFAs and FAAUs would have improved growing conditions, the overall resistance of the timber stands to environmental stress, including insect attack, drought, or disease would improve. As a result,

mortality levels would decrease and net cubic volume and gross cubic volume growth of the timber stands would become more nearly the same.

In the long-term as the heavy fuel loads are reduced with a corresponding decrease in the amount of understory vegetation, seedbed conditions for ponderosa pine and other tree species would be improved.

The implementation of this alternative would substantially reduce the likelihood of tree mortality caused by insect attack or stand replacement wildfires within the project area. The effects of this reduced risk would be substantial in terms of timber management implications. Some of these effects would include the following:

- The substantial reduction in the likelihood of an insect epidemic and/or wildfire would provide better assurance that the existing stands could be carried through to maturity. The long-term sustained yields that are planned from these PFAs and FAAUs would then be sustained.
- By reducing the risk of a major fire, the lost investments associated with the destruction of high value seed tree shelterwood stands and plantations would be curtailed.
- Vegetation in the project area would be managed as a mosaic, rather than large blocks of contiguous, even-aged stands dominating the landscape. The clumps and groups, whose site conditions would be tempered by adjacent clumps and groups, allowing greater variation in structure and function. This should provide additional resilience against insect or disease problems.
- A more constant flow of forest products would be assured, thus facilitating long-term timber management.

**Cumulative Effects:** Those effects listed above could be expected to continue. Other present and future management actions within the Jacob Ryan project area will have minor cumulative effects to plant community composition and structure. Within the cumulative effects analysis area, present and future vegetation management actions would have cumulative effects. By implementing KNFLMP and the Northern Goshawk Management Recommendations, in addition to mitigation measures or enhancement strategies stated in each of the project NEPA documents, no adverse cumulative effects are expected to occur. Dispersing and phasing of project activities over time and space would further decrease the potential for adverse cumulative effects and increase net beneficial effects. It is expected that some recovery will begin to occur prior to initiation of the later phases of the project actions.

### **Vegetation Structural Stage (VSS) and Stand Density**

Short-term effects will include an increase in the average diameter of the residual trees (this short-term increase results from removal of smaller trees rather than from growth). The degree of increase varies from PFA to PFA and FAAU to FAAU depending on the existing distribution of tree diameters and the intensity of proposed harvest. In PFAs and FAAUs that consist of the approximate numbers (and area) of trees desired in the 6 VSS categories, the increase in average diameter of the PFA or FAAU would be small. In PFAs and FAAUs where the majority of the trees are in the smaller VSS classes, the increase in residual tree diameter would be large.

Since the short-term effects of proposed management activities on VSS acreage allocations within PFAs, FAAUs, and the project area are minor; analyzing the effects in year 2014 would highlight effects more clearly. Therefore, in the discussion that follows, short-term effects will be approximately 10 years after completion of treatment activities.

Table 3.6. Alternative B – Acreage percent by VSS for Jacob Ryan at years 2002, 2014, and 2024

Location	Year	VSS 1	VSS 2.	VSS 3	VSS 4.	VSS 5	VSS 6
Overall	2002	13	8	24	19	21	15
	2014	3	12	20	19	21	25
	2024	2	19	16	18	20	25
Desired Condition %		10%	10%	20%	20%	20%	20%

Short and long-term effects of harvest on the VSS classes within ponderosa pine cover type would include changes as indicated in Table 3.6 (see JR EA and Decision Notes 12-01-2004 in the PR). Regeneration treatments will be carried out at the group level. This is not expected to increase the number of stands in VSS 1. However VSS 1 will increase as trees grow (see discussion above). The big jump in VSS 6 (15-25) is due to non-linear nature of VSS (see discussion above). For example, alternative B thinning with mitigation will remove smaller material (1-18 inches) and the stands will shift in VSS because the plurality of site occupancy will be comprised of the larger retained trees.

Though estimates of percent canopy closure after harvest are difficult to determine, it is estimated that canopy closure for most of the clumps and groups of VSS 4, 5 and 6 would remain unchanged. PFA clumps and groups would retain at least 50% canopy closure and FA clumps and groups would retain at least 40% canopy closure, thus they will all be maintained as desired levels of crown closure in the short and long-term.

There would be increases and decreases in the acreage of the various VSS classes through the growth of live trees. Using the timber growth model *Forest Vegetation Simulator*, all VSS classes, except VSS 1, would have an increase in acreage on a trajectory toward the desired conditions of PFAs, FAAUs, and the project area as a whole. In 20 years, at the expected time of the next cutting cycle within Jacob Ryan, the VSS classes are expected to be at the approximate levels as displayed in Table 3.6.

Several of the attributes of early seral successional stage, such as small forbs, grasses, and seedlings, will be enhanced by harvest under this alternative.

Cumulative Effects: No measurable adverse cumulative effects are anticipated upon overall VSS and tree densities within PFAs, FAAUs within the project area from any past or foreseeable future management actions. Over the long-term, beneficial effects from other vegetation management actions within cumulative effects analysis area are expected to improve the distribution of VSS. Applying KNFLMP standards and guidelines as well as the Northern Goshawk Management Recommendations, it is assured no adverse effects would occur, resulting in positive cumulative effects by bringing the vegetation structural stages closer to the KNFLMP desired condition.

### **Meadows and Grasslands**

Short-term effects of removing black jack ponderosa pines that are 16 inches dbh and less from 263 acres would result in the harvest of approximately 200 MBF for the meadow and grassland restoration areas and approximately 630 tons for the meadow and grassland restoration areas. Approximately 90% of the existing ponderosa pine trees would be removed. Those portions of meadows and grasslands free of ponderosa pine encroachment will be protected.

Removing the competing black jack ponderosa pine trees provides a beneficial effect by increasing soil and water resources for meadow and grassland vegetation development. In addition, all of these activities have a positive effect on transitory range by providing openings, thus increasing forb and grass

production, as well as rejuvenating browse species and making them more palatable to livestock and wildlife.

The timber component would change from 500 and 803 to 200 on approximately 187 acres (see Appendix II. This is a direct result of harvesting 187 acres timber typed as ponderosa pine that were identified as meadows and grasslands prior to fire exclusion and other management practices.

Deferring livestock grazing for 1 year and artificially planting native grasses as a rate of 10-12 lbs. per acre would have a beneficial effect by restoring and increasing the amount of native grasses and improving productivity within 1-2 years after treatment. This increase in available native forage will improve palatable forms of forbs and grasses for both cattle and wildlife.

Long-term effects of this alternative include a substantial increase in diameter growth and development of residual trees, beginning about 5 years after thinning. Several attributes of meadows and grasslands, such as forbs and grass productivity, will be enhanced by harvest and removal of ponderosa pines even with a remnant component of yellow ponderosa pine being retained within the treated areas.

Wildlife browsing and livestock grazing will supplement to a minor degree the effects of prescribed fire by maintaining browse species in an available, palatable form for both cattle and wildlife.

Cumulative Effects: There would be no foreseeable cumulative effects to meadows and grasslands by any present or future management actions; only those effects noted above can be expected to continue. There would be no foreseeable cumulative effects to meadows and grasslands by any present or future management actions within the project area or cumulative effects analysis area.

### **Snags and Down Logs**

Short-term direct effects upon snags and down logs would occur. This alternative would require the falling of snags that are adjacent to roads open to the public if the snags represent a hazard. Once the snags are felled, the snags will be retained on site to meet down logs guidelines in accordance with the KNFLMP and MRNG unless the existing down log levels exceed the KNFLMP guidelines. Because not all snags in the roadside strip would be considered hazardous to the public, actual numbers of soft and hard snags felled for safety reasons will be nominal.

Additional direct effects on snag numbers are likely to occur as part of the prescribed burning. With low intensity prescribed burning, the majority of existing snags would be retained, although the burn would consume a few. In addition, the burning would also create some snags, although snag replacement may be delayed for 2-3 years. The specific number of created or lost snags and down logs is impossible to predict because of variations in tree age, size, fuel moisture levels, duff depth, location of snags and down logs within the treatment areas. Outside of harvest and prescribed burn areas, the snag and down log levels will be maintained at the existing levels. It is anticipated that those down logs consumed by the fire (most of which will be in the smaller size classes) would be quickly replaced by snags falling after the burn is complete. These newly created down logs would be in a younger age class than those consumed by burning and would not immediately have the same ecological function. However, it can be presumed that in the long-term, location of individual snags and down logs remaining within the prescribed burn areas will closely approximate the natural range of variability that existed prior to the time of fire exclusion.

Indirect effects may include an increase in fuel loading through the short term as a result of management actions (e.g., slash, needle cast and down wood resulting from fire, etc.) but over time reductions in down log numbers should result in reductions in fuel loads. Reductions in fuel loads should reduce future fire intensity, thereby reducing snag loss and down log recruitment.

Reduction in tree numbers and stand densities through harvest would reduce the competition between trees and the development of future snags. There would be a dramatic decrease in the number of new snags formed, once stand density is reestablished within the normal range of variability. The lower numbers of snags would then approximate the number of snags that existed prior to the development of over-dense stands of timber. It is expected that the average snag dbh will increase over time due to the removal of the numerous, small diameter trees. However, insects and diseases will continue to occupy the project area. Even though difficult to predict, it can be expected conifer mortality due to insect, diseases, and drought to continue at current levels. These newly created snags would be protected unless the snags levels exceed the LMP and MRNG guidelines.

**Cumulative Effects:** No appreciable effects are expected beyond those identified above or from any existing and foreseeable future management actions. No effects upon existing snags and down log numbers, because the removal of snags and down logs would not occur and would be protected in all project implementation management actions. Within the cumulative effects analysis area, the overall effects would be minimal by employing management actions and enhancement strategies that would mitigate or minimize adverse effects.

### **Quaking Aspen**

Aspen stems are not designated for harvest; however, some minor damage may occur to individual aspen stems during harvest of adjacent black jack conifers within and around the aspen stands, groups, and clumps. Major aspen stands having no black jack ponderosa pine will not be entered, thus these areas of concentrated aspen will be protected. Removing the competing conifers provides a beneficial effect by increasing soil and water resources for aspen growth and development.

It is expected that there will be some losses of individual aspen stems through the post-harvest burning of timber stands. Immature aspen stems may be severely damaged by relatively cool ground fires. Fire may weaken the stem and make the aspen more susceptible to pathogens. However, burning also provides a beneficial effect by killing a declining overstory and stimulates the sprouting of a new stand.

In the long-term, the return of a fire regime and stand conditions that mimic those of the pre-European era will return aspen to the extent that it previously held. Reducing the competition from conifers through harvest and burning will improve the competitive position of aspen. The more open conditions will favor aspen and this will be evidenced by reduced mortality, increased crown spread and increased aspen suckering. Over time, aspen will become a larger component of the timber stands.

**Cumulative Effects:** There are no other activities planned that will affect aspen in terms of cumulative effects. The indirect effects from implementing this alternative, identified above, can be expected to continue. No measurable cumulative effects upon overall aspen clone groups and clumps are anticipated within the CEAA and there would be no cumulative effects from other present or future management actions. Utilizing mitigation measures and enhancement strategies in accordance with the KNFLMP, it is expected the overall cumulative effects would be beneficial. Furthermore, the nature of these vegetation management actions would improve the suitability and availability of the habitat for plant species that are presently absent due to the existing stand densities and competition.

### **Oak Woodlands**

Gambel oak trees are not designated for harvest; however, some minor damage may occur to individual trees during harvest of adjacent ponderosa pines. Major gambel oak woodland stands will not be entered, thus these areas of concentrated oak will be protected.

It is expected that there will be some losses of individual gambel oak trees through the post-harvest burning of ponderosa pine timber stands. Immature gambel oak trees may be severely damaged by relatively hot ground fires. Fire may weaken the stem and make the oak more susceptible to pathogens. However, burning also provides a beneficial effect by removing pests that infest the acorn crop and by removing competing vegetation. Since some of post-harvest burning is proposed within and adjacent to oak stands, it is expected that some mortality and root crown sprouting of gambel oak will occur.

In the long-term, the effects would be similar to those of quaking aspen. In addition, increased acorn production and root crown sprouting would occur. Over time, gambel oak will become a larger component in the project area.

**Cumulative Effects:** There are no other actions planned that will affect oak woodlands in terms of cumulative effects. The indirect effects from implementing this alternative, identified above, can be expected to continue. Present and foreseeable future actions will have insignificant cumulative effects upon oak woodlands. There are no other actions planned that will affect oak woodlands in terms of cumulative effects from present and future actions within the project area. Within CEAA and over the long-term, it is unknown whether cumulative effects created by vegetation present and future management actions would improve the oak woodland habitat matrix over the CEAA. However, utilizing mitigation measures and enhancement strategies in accordance with the KNFLMP, it is expected the overall cumulative effects would be reduced. Furthermore, the nature of these vegetation management actions would be beneficial and would improve the suitability and availability of the habitat for plant species that are presently absent due to the existing stand densities and competition.

## **Alternative C**

### **Plant Community Composition and Structure**

Alternative C has many of the same effects as Alternative B. The primary difference between the two alternatives in terms plant community composition and structure is the 12-inch dbh diameter cap imposed in all harvest activities. The differences in effects between Alternative C and Alternative B are discussed below.

The effects of implementing this alternative are nominally different for the PFAs and FAAUs, therefore, the discussion below pertains to PFAs and FAAUs. Short-term effects selectively thinning 21,429 acres of ponderosa pine stands located within PFAs and FAAUs within the project area would result in a harvest of approximately 140 board feet per acre of sawtimber (3,000 MBF for the project area) and approximately 2.4 tons per acre of biomass (53,000 tons for the project area).

For the proposed treatment areas, 100 percent of ponderosa pine trees removed by harvesting would be from 4-11.9 inch d.b.h class (black jack pines). No yellow ponderosa pines would be harvested regardless of size class. There would be minimal increases in average quadratic mean diameter.

All other direct effects within the proposed treatment areas are the same as those identified in Alternative B, except that no hazard tree removal will occur adjacent to Highway 89A in Alternative C.

Indirect effects upon the proposed treatment areas are the same as described in Alternative B, except that no hazard tree removal will occur adjacent to Highway 89A in Alternative C.

**Cumulative Effects:** The cumulative effects of Alternative C slightly differ as those described for Alternative B because of the enforcement of a 12" dbh cap on all vegetation management actions. However, utilizing mitigation measures and enhancement strategies, no adverse cumulative effects are expected to occur. Within the cumulative effects analysis area, present and future vegetation management actions would have cumulative effects. Utilizing mitigation measures or enhancement

strategies stated in each of the project NEPA documents, no adverse cumulative effects are expected to occur. Dispersing and phasing of project activities over time and space would further decrease the potential for adverse cumulative effects and increase net beneficial effects. It is expected that some recovery will begin to occur prior to initiation of the later phases of the project actions.

**Vegetation Structural Stage (VSS) and Stand Density**

The only difference in effects on VSS and Stand Density from implementing Alternative C rather than B is the size classes is limited to 4” to 11.9” dbh No trees larger than 12” dbh will be harvested.

Short-term effects will include a slight increase in the average diameter of the residual trees (this short-term increase results from removal of smaller trees rather than from growth). The degree of increase varies from PFA to PFA and FAAU to FAAU depending on the existing distribution of tree diameters and the intensity of proposed harvest. Since the short-term effects of proposed management activities on VSS acreage allocations within PFAs, FAAUs, and the project area are minimal; analyzing the effects in year 2014 would highlight effects more clearly. Therefore, in the discussion that followings, short-term effects will be approximately 10 years after completion of treatment activities.

Short and long-term effects of harvest on the VSS classes within ponderosa pine cover type would include changes as indicated in Table 3.7. Changes in stand density and VSS over time are not due entirely to harvest, particularly the VSS 1 classes.

Table 3.7. Alternative C –VSS Project Area Change in Years 2002, 2014, and 2024.

Location	Year	VSS 1	VSS 2.	VSS 3	VSS 4.	VSS 5	VSS 6
	2002	13	8	24	19	21	15
	2014	3	17	13	20	22	25
	2024	2	21	16	17	20	24
Desired Condition %		10%	10%	20%	20%	20%	20%

Though estimates of percent canopy closure after harvest are difficult to determine, it is estimated that canopy closure for most of the clumps and groups of VSS 4, 5 and 6 would remain unchanged or slightly increase. PFA clumps and groups would retain at least 50% canopy closure and FA clumps and groups would retain at least 40% canopy closure, thus they will all be maintained as desired levels of crown closure in the short and long-term.

There would be increases and decreases in the acreage of the various VSS classes through the growth of live trees. In 20 years, at the expected time of the next cutting cycle within Jacob Ryan, the VSS classes are expected to be at the approximate levels as displayed in Table 3.7.

Several of the attributes of early seral successional stage, such as small forbs, grasses, and seedlings, will be slightly enhanced by harvest under this alternative.

Cumulative Effects: No measurable adverse cumulative effects are anticipated upon overall VSS and tree densities within PFAs, FAAUs within the project area from any past or foreseeable future management actions within cumulative effects analysis area.

**Meadows and Grasslands**

Direct short-term effects vary slightly from Alternative B. Alternative C proposes to limit tree removal to trees 12 inches dbh and less and restricted to young growth (black jack) ponderosa pine. It would reduce to some degree the restoration and enhancement effects because fewer trees would be removed within the meadow treatment areas than in Alternative B. In the long-term, the benefits of meadow and grassland

restoration would be expected to be of shorter duration, given that Alternative C would leave more cone-producing trees in the meadows and grasslands relative to Alternative B.

The indirect, and cumulative effects to meadows and grasslands are the same in Alternative C as those described in Alternative B.

### **Snags and Down Logs**

The direct, indirect, and cumulative effects to snags and down logs are the similar in Alternative C as those described in Alternative B. However Alternative C will leave the forest denser than Alternative C. The increased tree density has a direct affect on wildfire behavior (see fire and fuels below). More stands will convert to crown fire under Alternative C and therefore the potential of burning up snags and down logs is greater.

### **Quaking Aspen**

The effects of Alternative C on quaking aspen are expected to be similar to those described in Alternative B, with the exception that there are fewer trees removed in and around existing quaking aspen clones and stands because of the 12 inch dbh limits on all vegetative treatment activities.

The indirect, and cumulative effects to quaking aspen are the same in Alternative C as those described in Alternative B.

### **Oak Woodlands**

The direct, indirect, and cumulative effects to quaking aspen are the same in Alternative C as those described in Alternative B.

## **Future Forage Conditions**

### **Alternative A**

Forage conditions under the No Action alternative would continue at current levels with a slight downward trend over the long-term. There would be very little, if any, measurable effects to forage conditions at one year. At five and ten years a slight downward trend is expected as forage species have to contend with increased needle cast and increased light and water competition with encroaching young pine trees (personal communication - Don Smith North Kaibab Range Management Specialist).

The catastrophic fire risk will continue to increase as stand density increases over 5-10 years. Although light fire is beneficial for some forage species, conditions after an intense fire favor invasive, non-native, early seral species such as leafy spurge, spotted and Russian knapweed, cheat grass, and thistle *spp.* Non-native weed species can out-compete the native forage species such as grama, *Poa*, *Fescue*, and *Carex*. Thus, reducing the lands capacity to produce forage.

### **Alternatives B and C (Action Alternatives)**

Thinning favors forage species production by reducing water and light competition with young pine trees (See Vegetation Resources Aspen and Meadows sections above). Therefore Alternatives B and C will have similar effects to forage species.

There will be a period of active native forage species growth and reproduction at year one as stands are opened up and more water and light reaches the forest floor under Alternatives B and C. This growth

period should level out until treated stands are burned (1-5 years). Burning will stimulate another period of active growth and reproduction of forage species. Growth and reproduction is expected to slow to static levels at 10 years time.

However, Alternative C would leave the forest denser and forage will not respond as vigorously to treatment under Alternative C as under Alternative B. The denser forest conditions after Alternative C implementation would also result in a higher likelihood of crown fire (see Fire and Fuels section below), which leads to a greater potential for weed establishment (see No Action above).

**Cumulative Effects:** All present and future foreseeable vegetation management and fuels reduction projects presented in Table 3.1 will reduce tree density and thus increase forage within the cumulative effects analysis area. Jacob Ryan's beneficial forage effects added to the increased forage from other vegetation management projects in the analysis area will result in an increase in forage overall. This large number of acres treated in the cumulative effects analysis area (with or without an action alternative selected) will present a net positive impact, under any alternative including the no action, for all species (mammals and birds) that utilize forage at some point in their life cycles.

## **Wildlife Resources**

The Jacob Ryan analysis area comprises a portion of two specially designated habitats for wildlife, the Grand Canyon National Game Preserve and the Kaibab Squirrel National Natural Landmark, and provides important habitat for a variety of wildlife species. Approximately 197 species have the potential to occur within the analysis area based on habitat associations (see the Wildlife Report in the PR for a detailed list). Some of the more abundant wildlife species encountered within the analysis area include mule deer (*Odocoileus hemionus*), turkey (*Meleagris gallopavo*), red squirrels (*Tamiasciurus hudsonicus*), chipmunks (*Tamias* spp.), Kaibab squirrels (*Sciurus aberti kaibabensis*), and golden-mantled ground squirrels (*Citellus lateralis*). Spring bird transects conducted from 1995 to 1998 identified 29 songbird species. Additionally, 12 species of bats were captured during mist-netting surveys from 1994 to 1999 (see the Wildlife Report in the PR for details).

### **Specially Designated Habitats**

#### **Grand Canyon Game Preserve (GCGP)**

The Jacob Ryan analysis area is located completely within the boundary of the Grand Canyon National Game Preserve. The Grand Canyon National Game Preserve was proclaimed by President Theodore Roosevelt on June 23, 1908; and was intended to provide for the protection of game species and their habitat. Important sections of the Act and Presidential Proclamation are as follows:

***Section 1:***

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that the President of the United States is hereby authorized to designate such areas in the Grand Canyon Forest Reserve as should, in his opinion, be set aside for the protection of game animals and be recognized as a breeding place therefore.*

***Section 2:***

*...hunting, trapping, killing, or capturing of game animals upon the lands of the United States within the limits of said areas shall be unlawful, except under such regulations as may be prescribed from time to time by the Secretary of Agriculture; ...*

**Section 3:**

*That it is the purpose of this act to protect from trespass the public lands of the United States and the game animals which may be thereon, and not to interfere with the operation of the local game laws as affecting private, State, or Territorial lands.*

**Presidential Proclamation:**

*Now, therefore, I, THEODORE ROOSEVELT, President of the United States of America, by virtue of the power in me vested by the aforesaid Act of Congress, do hereby proclaim that all those lands within the area of the Grand Canyon National Game Preserve, as indicated on the attached diagram, are designated and set aside for the protection of game animals, and shall be recognized as a breeding place therefore, and that the hunting, trapping, killing, or capturing of game animals upon the lands of the United States within the limits of said area is unlawful, except under such regulations as may be prescribed from time to time by the Secretary of Agriculture.*

The Forest Plan sets goals, objectives, standards and guidelines for management of habitat for numerous wildlife species including mule deer, consistent with the Preserve's purpose of protecting game species like the deer herd. Since the project activities are in compliance with the Forest Plan, the proposed action is in compliance with the purpose of the Preserve. This project also acknowledges the Preserve, and management goals for this project strive to maintain habitat suitable to the suite of species required by policy and law. For effects to particular game species identified as management indicator species or forest sensitive species, the reader is referred to the MIS and Forest Sensitive sections of the document. Game fisheries do not occur within the project area, and would not be affected by any alternative (please see the Wildlife Resources Supplemental Information in the PR for a complete discussion of the Game Preserve and its species).

Game species are identified based on hunting regulations for the State of Arizona (2004-2005 season), with exceptions. Arizona allows hunting on mule and white-tailed deer, antelope, elk, turkey, javelina, bighorn sheep, bison, bear, sandhill crane, pheasant, raptors, mountain lion, bobcat, raccoon, coyote, skunks, foxes, ringtail, weasel, badger, European starling, house sparrow, crow, coati, Gunnison's prairie dog, muskrat, beaver, otter, all quail, dove, blue grouse, chukar partridge, tree squirrels, ducks and geese, and cottontail rabbit. Additionally, game fish are allowed to be taken in the state. Because this list is rather extensive, and because not all species can be found on the NKRD, this project will consider only a subset of these huntable populations under the GCGP Act (Table 3.8).

The only reliable game species of fish on the NKRD is the Apache trout in North Canyon. The reliably huntable populations of animals that will be evaluated in this document include: mule deer, bison, mountain lion, bobcat, coyote, beaver, otter, skunks, weasels, gray fox (red and kit do not occur, Hoffmeister 1986), badger, Gambel's quail, turkey, Kaibab and red squirrels and cottontail rabbit. Of this list, the mountain lion and bobcat will be grouped as Felidae; skunks, weasels, and badger will be grouped as Mustelidae; Kaibab and red squirrels will be grouped as Sciuridae; the coyote and gray fox will be grouped as Canidae; raccoon and ringtail will be grouped as Procyonidae; beaver and otter will be grouped as Riverine; turkey, dove and quail will be grouped as Galliformes; and bison, bighorn sheep, mule deer and cottontail rabbits will be addressed singularly. Table 3.8 lists the species that will be carried forward in this document.

Table 3.8. Species relevant to the Grand Canyon Game Preserve Act that were evaluated in the Jacob Ryan Project

Game Preserve Group or Species	Occurrence in Project Area	Habitat in Project Area	Carried Forward	Remarks
Apache trout	No	No	No	Do not occur in the area – North Canyon
Felidae	Expected	Yes	Yes	Not suitable mountain lion habitat, though they may hunt in the area
Mustelidae	Expected	Yes	Yes	
Sciuridae	Yes	Yes	Yes	Not affecting suitable red squirrel habitat
Canidae	Yes	Yes	Yes	
Procyonidae	No	No	No	Do not occur in the area – South Kanab Creek area
Riverine	No	No	No	Do not occur in the area – South Kanab Creek area
Galliformes	Yes	Yes	Yes	Not suitable quail habitat
Bison	No	No	No	Do not occur in the area – House Rock Valley/Saddle Mtn. Wilderness
Bighorn sheep	No	No	No	Do not occur in the area – South Kanab Creek area
Mule deer	Yes	Yes	Yes	
Cottontail rabbit	Yes	Yes	Yes	

#### Effects to Grand Canyon Game Preserve Species

##### Alternative A – No Action

*Ground-level Components: Felidae, Rabbit, Mustelidae, Canidae, Mule Deer, Galliformes forage and brooding habitats*

No vegetative changes would be made under this alternative beyond natural progression in seral stages and mortality. The potential for stand replacing wildfires would remain high in the project area under this alternative, putting at risk habitats for most game species.

Ground level vegetation would stagnate under this alternative, except in pockets of overstory mortality. Game species using this segment of habitat, or that rely on prey species using this habitat, would experience a slow decline in conditions. Changes would not be considerable over the 20 year planning period, but opportunities to improve conditions for game species would be missed (e.g. pinyon-juniper thinnings, aspen improvement, meadow restoration, etc.).

Rabbits and small mammals like mice are cyclical in reproduction success, and would exhibit the largest changes over time. However, manipulative changes in the habitat may not be as important to their success as climatic variations affecting forage productivity. Reynolds and his crews noted fewer incidental rabbit observations in the course of northern goshawk research activities in years when precipitation was low (pers. comm. 2004). The project area lies along a drier climatic gradient within the ponderosa pine ecosystem on the NKRD.

Changes to conditions for these game species would not be significant in any one year, but might produce cumulative changes that affect reproductive success long-term when coupled with climatic variation. Changes to the reproductive success of rabbits and small mammals lead to changes in the success of

predators including mustelidae, canidae and felidae. Water sources, dens and cover for hunting are not expected to change. Water quantity and quality may vary with climatic changes.

Under the no action alternative, no aspen or pinyon-juniper enhancement would occur. There would be no direct effects to the mule deer under the no action alternative. Indirect effects from this alternative include reduced forage potential over time in both aspen and pinyon-juniper habitat. Pinyon and juniper tree densities are expected to continue to increase based on the current trajectory of these ecosystems. As tree density and canopy cover increase, shrub and herbaceous growth are suppressed through resource competition and canopy shading. Similarly, aspen are expected to be suppressed through resource competition by encroaching ponderosa pines. This translates to a reduction in foraging habitat quality on both mule deer summer and winter range. These habitat trends are recognized in pinyon-juniper and aspen habitat across the Kaibab Plateau. Thus, the cumulative effect of the no action alternative is an overall reduction in habitat quality for mule deer.

This alternative is expected to provide a reduced mule deer population through time because habitat conditions are currently on a trajectory toward reduced suitability. However, this portion of the district provides a winter home to fewer mule deer than either the eastern or western portions of the district. Therefore, the entire herd would not likely suffer from implementation of this alternative.

Galliformes would find reduced seed and insect foraging areas over time with this alternative. Openings in taller vegetation used for drying and loafing would become fewer. Sighting distances to observe and escape from predators would decline. As a result, the reproductive success of this group of species would be reduced through the years under this alternative. However, the change would be minimal and not affect the entire population on the Plateau. Open roads would provide more opportunity for nesting and fawning activities to be disturbed. While this is not a great concern, this alternative would not provide the opportunity to reduce human disturbance from road access.

*Overstory Components: Sciuridae, Galliformes roosting*

Changes to overstory composition would be minimal and associated with natural disturbance events through time. These events would be minor (individual or group tree death) or widespread (stand replacing wildfire) and affect game species accordingly.

Snags and mature trees would remain relatively steady with a slow decline over the 20-year planning period. Snags would decline from existing amounts of 2.15 per acre to 1.8 in 20 years. This remains above the district (1.6) and historic (0.16) averages. Tables 1 and 2 display the changes over time to vegetational structural stages (VSS) for each alternative. This alternative has the largest amount of change of the three alternatives considered in this document in percent composition of VSS 5.

Alternative B – Proposed Action

*Ground-level Components: Felidae, Rabbit, Mustelidae, Canidae, Mule Deer, Galliformes forage and brooding habitats*

Ground level vegetation would increase following treatment in all stands experiencing overstory reductions. Populations of rabbits and small mammals would be expected to increase, thus providing increased food for Mustelidae, Felidae and Canidae. Population increases in each species would not be dramatic because of the slow changes in vegetation under dry conditions. Treating to maintain groups and clumps brings changes to pockets of vegetation rather than whole stands. Reduction in vegetative competition allows better resilience of the vegetation in drought years, directly influencing small mammal success, and indirectly the success of those that prey upon them. Increases in small mammal species would ensure populations of both prey and predator continue to exist in and near the project area.

Mule deer and Galliformes habitat conditions would also improve as a result of treatment activities. More ground level forage would be available for these species, and roosting areas for Galliformes would remain high through retention of larger diameter trees and maintenance of snags near district levels, and higher than historical levels (See Effects section of the Jacob Ryan MIS Report). Meadow treatments would improve open areas for 263 acres in the project, enhancing brooding areas for insect and seed foraging for young Galliformes birds and small mammals.

A temporary reduction would be seen in hiding cover composed of down woody material following fuels reduction and prescribed burning activities. Burning tends to create some down woody material from burned-through snags or through the death of small trees. Project activities would reduce down woody materials from current levels of 15 tons per acre to 5-7 tons per acre. Hiding cover in the form of more dense ground vegetation would increase within the treated areas, allowing animals to have greater use of the improved treated areas. Elderberry and Fendler Ceanothus respond well to prescribed burning activities, increasing biomass within 20 years (Higgins, pers. comm. 2004).

Truffle production would decline in the treated areas for a period of several years. However, adjacent untreated stands provide suitable amounts of truffles for use. Some fungus would increase in the treated area on new down material or material made more suitable by fire, but this is a slow process. Insects and their larvae would increase following burning (Latta et al. 1999:66), and be utilized by Canidae, Mustelidae and Galliformes. Populations would remain stable at a minimum and would likely increase slightly as a result of treatment actions through the 20-year planning period.

Road closures under Alternatives B and C would reduce the potential for human disturbance during nesting and fawning seasons. Reduced disturbance, though a small change, could result in higher realized reproduction. Seasonal disturbance restrictions in place for the northern goshawk nesting season would be observed, and coincide with some of the nesting and fawning periods, therefore, indirectly benefiting other species.

Under Alternatives B and C, approximately 3,345 acres of aspen enhancement and 1,143 acres of pinyon-juniper enhancement would occur. Direct effects to mule deer under these alternatives are short-term disturbance of deer during vegetation treatment and prescribed burning activities. These effects are expected to be limited in area and duration.

Selected removal of overstory trees from overstocked stands is expected to promote growth of understory vegetation, including many plants that mule deer utilize for forage. Therefore, indirect effects from Alternatives B and C are benefits from enhanced forage within aspen and pinyon-juniper habitats. Overall, there would be a long-term benefit to mule deer under both action alternatives.

Possible positive cumulative effects from these alternatives and other present and foreseeable management activities are improved forage conditions for deer in both summer and winter range on the Kaibab Plateau. Disturbance to wildlife from planned prescribed burning activities in other project areas and prescribed burning activities proposed under these alternatives will be minimized by the spatial and temporal separation of scheduled burns. Therefore, no adverse cumulative effects to mule deer are expected from either Alternatives B or C.

Alternatives B and C are expected to result in improved habitat conditions that would maintain a viable mule deer population through time, at greater population levels than are expected under the no action alternative.

*Overstory Components: Sciuridae, Galliformes roosting*

Both action alternatives affect overstory components in similar manner and to similar degrees. The differences are slight (see Vegetation Resources above) so the effects of these two alternatives will be discussed together.

Snags 6" dbh and over would decline slightly after treatment. Currently, the snag component is 2.15 per acre, and would decline to 2.08 under Alternative B, and 1.76 under Alternative C. This would remain above the current district (1.6) and historic averages (0.16). Turkeys and doves utilize snags for roosting and resting, and may occasionally glean bugs, but are not dependent on them.

Past silvicultural treatments focused on shelterwood harvest systems, creating regimented even aged stand structure. Treatments in both alternatives would aim to change stand structure toward groups and clumps favored by Kaibab squirrel as recommended under the goshawk guidelines (Reynolds et al. 1992). Sciuridae and Galliformes would benefit. Squirrels benefit from the interlocking crowns and canopy closure, turkey and dove from the increase in forage associated with canopy gaps between groups while retaining roosting and nesting platforms in the larger trees.

Clumps and groups currently existing in these areas would not decline, providing a continuing benefit to Sciuridae and Galliformes populations. Large trees would be retained sufficiently to satisfy the needs of these species, and would benefit from reduced competition for moisture and nutrients with smaller trees. This would increase the health and longevity of the large tree component within the project area.

Cones are a major source of food for Sciuridae, especially the Kaibab squirrel (Patton 1977). Cone crops would not change appreciably as a result of treatment actions. Truffle production would decrease in treatment areas, but adjacent untreated areas would provide a continued benefit. Increases in other fungi would benefit Sciuridae and Galliformes where new down wood or charred old wood provides new substrates following prescribed burning. An increase in insect production following prescribed fire (Latta 2001) would be beneficial to Galliformes. The overall effect on populations within the treated area would be negligible. A shift in area usage may be noticed for roosting of Galliformes, but would be a very small change. Kaibab squirrel populations would not be expected to change appreciably.

Canidae, mustelidae and felidae benefit when prey species are reproductively successful. Both action alternatives improve chances for prey species to reproduce abundantly. However, climatic variations can affect reproduction beyond what the vegetation may be capable of providing. Overall, changes to any of the game species populations would be small under any alternative. The ability of the Kaibab Plateau to function as the breeding ground for game animals would not be affected by implementation of any alternative. Alternative B provides the greatest opportunity for more game species than the other two, but the differences are small.

Alternative C

*Ground-level Components: Felidae, Rabbit, Mustelidae, Canidae, Mule Deer, Galliformes forage and brooding habitats*

The primary difference between the two action alternatives rests with Alternative C only harvesting trees 12" dbh and under in ponderosa pine habitat. This difference would result in a slight reduction in the amount of ground level forage produced for species utilizing that habitat component. The difference would be slight, but would not be recovered in the 20 year planning period due to slow growing potential for forage species. Alternative C also places these habitats in greater jeopardy for stand-replacing wildfires than the proposed action for the entire planning period. Overall survivability for game species would not be greatly impacted under this alternative, but Alternative B gives game species utilizing ground level forage an advantage over Alternative C.

*Overstory Components: Sciuridae, Galliformes roosting*  
See Alternative B above.

### **Kaibab Squirrel National Natural Landmark**

National Natural Landmarks (NNL) are areas representing the best examples of the ecological and geological features composing our Nation's natural history (USDI Park Service. National Natural Landmarks Program, available: <http://www.nature.nps.gov/partner/nnlp.htm>). An NNL is a nationally significant natural area that has been designated by the Secretary of the Interior.

The NNL Program was established to help identify and encourage the preservation of these significant areas. The objectives of the program, which is administered by the National Park Service, are to encourage the preservation of sites illustrating the geological and ecological character of the United States, to enhance the scientific and educational value of sites thus preserved, to strengthen public appreciation of natural history, and to foster a greater concern in the conservation of the Nation's natural heritage.

In 1962, the Kaibab squirrel's habitat (ponderosa pine) was recommended for NNL status by J. Clark Salyer, Bureau of Sport Fisheries and Wildlife, because of the public interest in the Kaibab squirrel as a unique mammal and because of the spectacular history of the North Kaibab's deer herd. Salyer's evaluation report (see Salyer's report in the PR), stated that:

From a botanical standpoint alone the site might well qualify for inclusion in the Natural Landmark Registry since it is one of the largest and best examples of a climax community, representing the classical "Transition Zone" of Merriam's well-known system of Life Zones.

But the prime criterion for eligibility of this ponderosa pine forest is that of a habitat supporting a rare and restricted species, the Kaibab Squirrel. ... the pertinent and indisputable fact is that the Kaibab squirrel represents an absolutely unique form, found nowhere else in the country or in the world, a classical example of the process of evolution through geographic isolation.

The designation was biological, and consisted of the ponderosa pine forest of the Kaibab Plateau in northern Arizona. Final designation was in October 1965.

The squirrel's habitat consists of approximately 278,458 acres of pure ponderosa pine on the Kaibab National Forest and Grand Canyon National Park, with approximately 226,107 acres (81%) on the Kaibab National Forest. Approximately 32,288 acres or 89% of the Jacob Ryan analysis area is located within the Kaibab Squirrel National Natural Landmark.

The NKRD District Biologist periodically meets with the NNL Coordinator to discuss and review the status of Kaibab squirrel habitat, current management, and effects of wildfire within the NNL. These visits are conducted on-site and are used to supplement scheduled updates or reports by the National Natural Landmark program to the Washington Office. The 2002 Status Report issues a satisfactory rating (see NNL status report and Wildlife Resources Supplemental Information in the PR).

### **Alternative A – No Action**

Under the no action alternative, effects expected to the Kaibab squirrel would be indirect resulting from decline of ponderosa pine communities at all stages from a lack of disturbance. Ponderosa pine is a light intolerant species dependent on disturbance to reproduce. Canopy cover percentages in the larger tree

sizes of pine are expected to increase gradually under this alternative. Restricting natural fire patterns and allowing dense growth in stands, similar to conditions expected under the no action alternative, would lead ponderosa pine areas to stagnate. Stand stagnation may lead to disease and insect infestation. Higher than historic densities of vegetation leave stands vulnerable to severe, stand-replacing fire events on a large scale.

Alternative A reduces the natural variability of stand conditions across the Jacob Ryan project area, leaves areas subject to large-scale intense wildfires, with a long-term result of wide-spread loss to Kaibab squirrel habitat. Components important to the squirrel (interlocking crowns, tree grouping and canopy cover) would not change appreciably under this alternative. Outside of winter mortality, populations would not change appreciably in the short term, but could drop precipitously in the long term, especially with a high-intensity wildfire. In the long-term, selection of Alternative A would result in the loss of the qualities associated with the designation of the NNL. Short-term changes to the NNL qualities are not expected to be significant with this alternative.

### **Alternative B – Proposed Action**

This alternative seeks to restore natural function to the ponderosa pine community in the project area by reducing (temporarily) stocking levels in young pine stands through thinning. Thinning reduces the risk of stand-replacing intense wildfires by reducing the potential for crown fires, creating natural fuel breaks in the canopy that allow sporadically intense fire areas to return to lower intensity ground fires, and by reducing the potential for an area to carry a high intensity fire by reducing fuel levels. Thinning and other vegetative manipulation treatments also approximate natural disturbance patterns, leaving a mosaic of young and old trees scattered across the landscape. This mosaic pattern improves the ability of the stand to meet all life-stages of the Kaibab squirrel, reduces the risk to large areas of ponderosa pine mortality by increasing individual tree and stand health, and encourages retention of old trees upon which the squirrel depends. The squirrel may be temporarily disturbed by harvest activities, but as reported by Patton et al. (1985), squirrels return to their home ranges after harvesting is completed. Similar responses would be expected from prescribed burning activities, with shorter disturbance periods.

Truffle production and mistletoe brooms used by the squirrel would be reduced by this alternative where harvesting occurs. Truffle production would slow in the short term, but would increase as a result of mixed-age forest conditions and increased moisture availability. Mistletoe brooms would be reduced in areas treated for mistletoe sanitation, but the project area and district provide sufficient amounts of this habitat to limit negative affects to squirrel populations (See Section 1.3 Evaluation of dwarf mistletoe removal effects to wildlife species in this document). Individuals may move to new tree groups or alter behavior to adjust to changes in their home range (Patton 1984). These effects would impact individuals but would not likely affect the population.

Patton (1977 and 1984) demonstrated careful application of uneven-aged harvest activities can maintain suitable squirrel habitat. Reynolds et al (1992) supported this theory and defined appropriate harvest methods while considering the squirrel as an important prey species for the northern goshawk. Treatments in this alternative were designed according to Reynolds et al. (1992) and incorporate uneven-aged stand management activities by retaining groups and clumps of pines identified as important to the squirrel. The number of mature ponderosa pines per acre is projected to decline initially in areas that would be treated, then increase gradually over the 20-year planning period. Canopy closure is expected to follow the same pattern. Components important to the squirrel (interlocking crowns, tree grouping and high canopy cover) would be retained to a large extent in this alternative by implementing the MRNG.

This alternative would not negatively affect the qualities of the NNL in the short or long term, but would actually improve the overall health of conditions associated with the NNL. This alternative would enhance the character of the Landmark over time and restore natural ecosystem functions upon which the qualities of the Landmark depend.

### **Alternative C**

The effects of this alternative are expected to be similar to Alternative B for the Kaibab squirrel and ponderosa pine. Reductions in truffle production and mistletoe brooms would be slightly lower with this alternative than in Alternative B. Components important to the squirrel (interlocking crowns, tree grouping and high canopy cover) would be retained to a slightly greater extent in this alternative than in Alternative B because of harvesting trees less than 12" dbh. However, the risks of high intensity, crowning fires that lead to widespread habitat loss for the squirrel and loss of older ponderosa pine would be more likely under this alternative. Short-term risk of loss of qualities associated with the NNL would be low, while the long-term risk to those qualities is likely to be higher under this alternative due to increased threat of high-severity crown fires.

### **Wildlife Effects**

Management activities proposed under each alternative could affect wildlife and plant species that have been documented within the Jacob Ryan analysis area or that have suitable habitat within the analysis area. Therefore, potential effects of Alternatives A-C were assessed for Threatened, Endangered, and Candidate species; species managed under a Conservation Agreement; Forest Sensitive species; Management Indicator Species (MIS); and migratory bird Priority Species of Concern that occur within the Jacob Ryan analysis area or potentially have suitable habitat within the analysis area. (Selected species and habitats and the rationale for their use are described in detail in the following sections.)

The effects of management alternatives on the selected species and habitats were assessed by comparing existing vegetative conditions with conditions predicted to occur through the implementation of each proposed alternative. Assessment criteria (indicators) were selected for each species or habitat in order to facilitate comparisons. Comparisons were made across four time periods: (1) current or existing, yr 2002; (2) immediately following implementation, yr 2007; (3) short-term, yr 2014; and (4) long-term, yr 2024 (See Silviculture Report in the PR). While reading this section please refer to Appendix 4, which provides a summary comparison of alternatives based on the selected indicator variables for each species or habitat. Appendix 4 does not reflect the new mitigation for VSS 6 groups and mistletoe designed into the Proposed Action (see discussion above in the vegetation section above).

### **Federally Listed Species and Species Managed under a Conservation Agreement**

No Threatened, Endangered, or candidate species have designated or primary habitat within the Jacob Ryan analysis area. The California condor (*Gymnogyps californianus*) has an extremely large home range size and is known to utilize habitat across the Kaibab Plateau. Therefore, it is likely that condors occasionally use habitat within the analysis area. Migrating bald eagles (*Haliaeetus leucocephalus*) may occasionally use habitat within the analysis area for foraging. However, there is no suitable breeding or nesting habitat within the analysis area for either species.

Because there is no designated habitat or suitable breeding/nesting habitat for any Threatened, Endangered, or candidate species within the Jacob Ryan analysis area, the proposed alternatives for the Jacob Ryan Vegetation Management Project will have no effects to such species (see the Wildlife Report for further details).

The Kaibab Plains cactus (*Pediocactus paradinei*), which is both a species managed under a Conservation Agreement and a Forest Sensitive species, is known to occur along the northeastern perimeter of the Jacob-Ryan analysis area. Approximately 508 acres of the analysis area is located within the Kaibab Plains Cactus Conservation Area. Because there are no management activities proposed within the Kaibab Plains Cactus Conservation Area or within suitable Kaibab Plains cactus habitat under any of the

alternatives, the Jacob Ryan Vegetation Management Project will have no effects to the Kaibab Plains cactus.

## **Forest Sensitive Species**

The northern goshawk, a Forest Sensitive wildlife species, has been documented within the Jacob Ryan analysis area. There are no populations of Forest Sensitive plants within the analysis area, and there is no suitable habitat for such species.

### **Northern Goshawk**

The northern goshawk is a common breeding resident on the Kaibab Plateau within ponderosa pine, mixed conifer, and spruce fir forests. The goshawk utilizes a variety of forest age classes, structural conditions, and successional stages (Reynolds et al. 1992; see Wildlife Resources Supplemental Information in the PR for a discussion of goshawk habitat use). Research indicates that the northern goshawk requires areas of mature forested habitat characterized by large trees, closed canopy cover, and an open understory (Reynolds et al. 1992, Crocker-Bedford 1990, DeStefano and McCloskey 1997).

Approximately 30% of the documented northern goshawk PFAs on the North Kaibab Ranger District are located within the Jacob Ryan analysis area. Over the last five years, the percentage of active or occupied PFAs has ranged from 28% in 2000 to 7% in 2003 (Joy 2002). (Note that this is comparable to activity levels of other areas of the Kaibab Plateau.)

Effects of proposed alternatives to the northern goshawk were analyzed at 2 scales: the goshawk Foraging Area (FA) and Post Fledging Area (PFA). There are 29 PFAs within the Jacob Ryan analysis area, totaling 18,980 acres. Because goshawk territories or PFAs overlap or share foraging areas (FA), foraging areas and PFAs are combined into Foraging Area Audit Units (FAAUs). The Jacob Ryan analysis area is divided into 6 FAAUs. The following criteria were used to assess effects of proposed management alternatives on goshawk FAAUs and PFAs: (1) number and percentage of PFAs treated; (2) VSS size class distribution; (3) number of mature trees ( $\geq 18''$  dbh) per acre (TPA); (4) number of very large trees ( $> 24''$  dbh) per acre.

At the PFA scale, existing conditions are estimated to closely approximate the desired condition for the northern goshawk of VSS distributions in the following classes: VSS 1, VSS 4, and VSS 5. Existing conditions are estimated to be below desired distributions of VSS2 and VSS 6 classes. Finally, the VSS3 class is estimated to occur in excess of the desired distribution. (See Appendix 4.)

At the FAAU scale, only the distribution of VSS 5 is estimated to closely approximate the desired condition for the northern goshawk. Existing conditions at the FAAU scale are estimated to be below desired distributions of VSS2, VSS4, and VSS 6 classes. Finally, the VSS1 and VSS3 classes are estimated to occur in excess of the desired distribution (See Appendix 4).

### **Alternative A**

Under the No Action alternative, no PFAs (0%) would be treated. No direct effects are expected to the northern goshawk under the No Action alternative. Indirect effects of the No Action alternative are decreased habitat suitability, decreased foraging opportunities, and continued risk of habitat loss from catastrophic fire. Because ponderosa pine forests across the Kaibab Plateau are unsustainable in their current condition, the cumulative effect of the No Action alternative to the northern goshawk is adverse due to the potential for large-scale loss of habitat from wildland fire, insects and disease, and intertree competition.

### **Alternative B**

Under Alternative B, 29 PFAs (100%) would be treated. Alternative B improves forest health and sustainability by reducing the risk of catastrophic wildfire, allowing for increased diversity of the herbaceous understory, and providing for a mosaic of vegetation structural stages that might more closely approximate historic forest conditions.

Under Alternative B, all known goshawk nest sites would be protected by a buffer zone and vegetation treatment activities would be seasonally restricted to prevent disturbance at active nests. However, disturbance during prescribed burning activities might result in short-term direct effects to individuals. Short-term ( $\leq 5$  yrs) indirect effects to this species are habitat disturbance and possible changes in prey species composition and populations. Possible adverse long-term indirect effects may result from the removal of mature mistletoe-infected trees. These trees provide many species of goshawk prey with important structure for nesting. Adverse effects from mistletoe sanitation are expected to be limited to individuals. Possible positive long-term indirect effects to this species from Alternative B are improved habitat suitability (e.g., foraging opportunities would be increased as a result of a greater number of small openings in the forest canopy) and reduced threat of habitat loss from catastrophic fire. Potential cumulative effects resulting from implementing Alternative B and other vegetation management projects in ponderosa pine habitat may be both detrimental (e.g., overall reductions in prey habitat from mistletoe sanitation treatments will reduce foraging opportunities for goshawk across the Kaibab Plateau) and beneficial (e.g., overall habitat quality and availability will be increased, and risk of habitat loss will be reduced in ponderosa pine across the Kaibab Plateau). Potential increases in habitat availability might provide for increases the regional goshawk population.

### **Alternative C**

Under Alternative C, 29 PFAs (100%) would be treated. Under Alternative C, direct effects to the northern goshawk are expected to be analogous to those discussed for Alternative B. The number of mature ponderosa pine trees and trees greater than 24" dbh per acre are expected to be greater than under Alternative B. This may provide positive indirect effects in the form of increased habitat availability and improved quality for goshawks and prey species in the short-term. However, the forest conditions assumed to be created through implementation of Alternative C may not be sustainable because the modeled fire behavior indicates that the risk of stand-replacing wildfire. Therefore, long-term benefits to the goshawk and associated prey species will not be recognized. Instead, indirect adverse effects are expected because of the continued risk of habitat loss from stand-replacing wildfire. Further, because the majority of ponderosa pine habitat on the Kaibab Plateau exists in an unsustainable condition, the cumulative effect of implementing Alternative C with existing conditions across the Plateau is likely to be adverse to the northern goshawk.

### **Management Indicator Species**

The Kaibab National Forest Land Management Plan (USDA Forest Service, 1987) identifies 18 MIS, including 11 birds, five mammals, one plant, and one group of invertebrates (see Wildlife Report in the PR). Selection of these species was based primarily on: (1) representation of the condition and health of a particular vegetation type and seral stage; (2) representation of the effects of management activities on other species within that habitat type and seral stage. A complete description and analysis of Management Indicator Species trends and habitat conditions on the Kaibab National Forest is provided in *Management Indicator Species For The Kaibab National Forest*, Version 1.2, October 15, 2003 (See copy in the PR).

The Kaibab National Forest is divided into 17 Ecosystem Management Areas (10 in the south zone and 7 on the North Kaibab Ranger District). Management Indicator Species were selected to represent the dominant habitat types and conditions of each Ecosystem Management Area (EMA). The Jacob-Ryan analysis area is comprised of portions of EMAs 12, 13, 16, 21, and 22, with over 90% of the analysis area located in EMA 13. The following Management Indicator Species are identified for those EMAs: aquatic

macroinvertebrates, hairy woodpecker (*Picoides villosus*), juniper titmouse (*Baeolophus ridgewayii*, formerly plain titmouse), Kaibab squirrel, Lincoln's sparrow (*Melospiza lincolni*), Lucy's warbler (*Vermivora luciae*), Mexican spotted owl (*Strix occidentalis lucida*), mule deer, northern goshawk, pronghorn antelope (*Antilocapra americana*), pygmy nuthatch (*Sitta pygmaea*), red-naped sapsucker (*Sphyrapicus nuchalis*), red squirrel, wild turkey, and yellow-breasted chat (*Icteria virens*). However, there is no representative habitat within the Jacob Ryan analysis area for aquatic macroinvertebrates, Lucy's warbler, Lincoln's sparrow, Mexican spotted owl, pronghorn antelope, red squirrel, or yellow-breasted chat. Only those MIS with representative habitat in the analysis area were considered in the analysis of potential effects of the alternatives. (See the Wildlife Report and the Jacob Ryan Management Indicator Species Report for detailed life histories and habitat requirements of those MIS.)

Table 3.9 presents information on the measurement indicators for each species identified as an MIS for the Jacob Ryan Project. Data come from Forest Vegetation Simulation runs conducted on information collected in the field during common stand exams (exam dates 1985-2000, most in 1991). These data represent the most recent, site specific information available to field managers for this project area.

This project area represents 6.4% of forest-wide pinyon-juniper dominated habitat, 0.16% of the aspen habitat, and 6.2% of the ponderosa pine habitat. Alternative B promotes changes to 2.5% of the pinyon-juniper habitat, 0.16% of the aspen habitat, and 4.1% of the ponderosa pine habitat, forest-wide. Alternative C affects a similar percentage of acreage, but to a slightly lower intensity (no harvest over 12" diameter). Treatments within the project area affect 38.8% of the pinyon-juniper, and 66.9% of the ponderosa pine. Snag habitat is not readily quantifiable in a similar manner because it is not inventoried separately from the habitat within which it is found.

The aspen improvements from this project are greater than 0.16% of the forest-wide aspen component shown above. The amount of improvement at the forest level cannot be determined because interspersed aspen clones are not reported at the forest level for comparison. Approximately 3,345 acres of aspen interspersed in stands of other dominant vegetation will be improved by reducing competition from other tree species. Therefore, the aspen improvements from this project are greater than 0.16% of the forest-wide aspen component shown above. The amount of improvement at the forest level cannot be determined because interspersed aspen clones are not reported at the forest level for comparison. Only mapable stands of aspen (1 acre or larger) are available for comparison at the forest level (43.6 acres within this project area, or 0.16% of the forest-wide aspen).

Alternative B was adjusted based on comments received during the Jacob Ryan 30 day Notice and Comment Period. FVS runs were not recomputed to reflect the change in ponderosa pine harvest; however, we conducted a new analysis to reflect the clarifications to the Proposed Action (see Jacob Ryan EA and Decision Notes, 12-1-2004 in PR). Therefore, Alternative B data presented in Table 3.9, for ponderosa pine treatments only, are based on the original Alternative B in the EA submitted to the public for comment (Jacob Ryan EA and Decision Notes, 12-1-2004, PR), but the MIS effects analysis is based on the original FVS runs and the 12-01-2004 analysis.

Conditions after implementation of this Alternative B will be very similar to Alternative C. The primary change to Alternative B was decreasing mistletoe treatments in ponderosa pine habitat from 524 acres to 72. No VSS 6 groups will be used for regeneration and no dominant or codominant trees within VSS 6 groups will be thinned (except for hazard trees along Highways 89A and 67) in the Jacob Ryan Area because of the existing deficit of VSS 6 groups at the EMA 13, Jacob Ryan Planning Area, and Goshawk Foraging Area scales. Reserve tree selection will be based on the largest trees available when regenerating groups. This will retain most, if not all, of the largest trees in treated PFA/FAAUs.

**Table 3.9. Management Indicator Species Attributes for Jacob-Ryan.**

Species	Habitat Type	Habitat Indicator	Existing			2007			2024		
			A	B	C	A	B	C	A	B	C
Mule Deer	Early-seral Aspen	tpa (<10"dbh) aspen	24.3	23.8	12.5	23.9	21.1	11.9	22.2		
	Early-seral Pinyon-Juniper	tpa (<16"drc) pinyon	-	-	-	-	-	-			
		tpa (<16"drc) juniper	-	-	-	-	-	-			
Kaibab Squirrel	Early-seral Ponderosa Pine	tpa (<12"dbh) ponderosa	422.3	409	221	259	360	202	239		
		SDI (<12"dbh) ponderosa	-	-	-	-	-	-	-		
Wild Turkey	Late-seral Ponderosa Pine	tpa (>18"dbh) ponderosa	19.6	20.3	16.0	20.4	22.6	18.4	23.2		
		SDI (>18"dbh) ponderosa	82.72	85.67	71.73	86.01	95.31	82.05	97.95		
Northern Goshawk	Late-seral Ponderosa Pine	tpa (>18"dbh) ponderosa	19.6	20.3	16.0	20.4	22.6	18.4	23.2		
		SDI (>18"dbh) ponderosa	82.72	85.67	71.73	86.01	95.31	82.05	97.95		
Hairy Woodpecker	Late-seral Ponderosa Pine	tpa (snags) ≥6" dbh	2.15	2.10	2.03	2.08	1.80	2.08	1.76		
		SDI (snags)	-	-	-	-	-	-	-		
		tpa (>18"dbh) ponderosa	19.6	20.3	16.0	20.4	22.6	18.4	23.2		
		SDI (>18"dbh) ponderosa	82.72	85.67	71.73	86.01	95.31	82.05	97.95		
Red-naped Sapsucker	Late-seral Aspen	tpa (aspen snags)	0.04	0.02	0.01	0.01	0.01	0.00	0.01		
		tpa (>18"dbh) aspen	0.05	0.07	0.04	0.07	0.16	0.10	0.16		
		SDI (>18"dbh) aspen	-	-	-	-	-	-	-		
Pygmy Nuthatch	Late-seral Ponderosa Pine	tpa (>18"dbh) ponderosa	19.6	20.3	16.0	20.4	22.6	18.4	23.2		
		SDI (>18"dbh) ponderosa	82.72	85.67	71.73	86.01	95.31	82.05	97.95		
Juniper Titmouse	Late-seral Pinyon/Juniper	tpa (>16"drc) pinyon	-	-	-	-	-	-	-		
		tpa (>16"drc) juniper	-	-	-	-	-	-	-		
		tpa (snags >6"dbh)	-	-	-	-	-	-	-		

### Mule Deer

Mule deer were selected because they are economically important and represent species using early-seral stages of aspen and pinyon-juniper habitats. Mule deer are a generalist species that also use ponderosa pine, mixed-conifer, woodland, and chaparral habitats. Forage items mostly consist of woody browse (Hoffmeister, 1986).

Mule deer occur across the KNF, but are especially important on the NKR, much of which is within the boundaries of the Grand Canyon Game Preserve. The North Kaibab deer herd is famous for providing quality hunts and has a long history of management aimed at promoting large numbers of deer.

Game Management Units (GMUs) for the South Zone display a decreasing trend in mule deer numbers. The survey data reflects decreasing sightings per hour of survey effort. Although different survey techniques make comparisons between GMU 8 and other South Zone GMUs difficult, trend can be assessed within individual GMUs. GMUs 6B, 7, and 8 show an overall decreasing trend. This is consistent with mule deer numbers around Arizona. In contrast, GMU 9 displays a variable but increasing trend. Data from the NKRD indicate an increasing trend since the early 1990s (see the *2003 Management Indicator Species for the Kaibab National Forest Report*).

Mule deer is an MIS of two habitat types within the Jacob-Ryan project area: early-seral aspen and early seral pinyon-juniper woodland (Table 3.9). Habitat attributes identified to evaluate potential impacts to mule deer include trees per acre (tpa) for aspen <10" dbh, and trees per acre for pinyon and juniper with <16" diameter at root crown (drc). Existing aspen stand exam data utilized for the Jacob-Ryan project is limited, and based upon only 44 acres of aspen that exist as stands of 1.0 to 4.0 acres in size. Within the majority of the project area, quaking aspen occurs as scattered, small groups of trees less than 12" dbh, often intermingled with ponderosa pine. Estimated aspen component within the project area is approximately 36 trees per acre. One of the objectives of the Jacob-Ryan project is to promote quaking aspen vegetation within the project area. In order to enhance existing aspen stands, groups, and clumps, all ponderosa pine  $\leq 12"$  dbh will be removed within 20 feet of the perimeter of existing aspen vegetation. The purpose of this removal is to protect existing aspen trees and stimulate aspen clone generation. Approximately 3,345 acres of aspen enhancement is estimated for the Jacob-Ryan project area (Howard 2003).

Stand exam data was not available for pinyon-juniper woodland within the Jacob-Ryan project area. Of the almost 3,000 acres of pinyon-juniper woodland within the project area, 1,144 acres are proposed for vegetative treatment. The objective of these treatments is to reduce tree densities through selective thinning of younger age class trees. Thinning ratio will include 75% juniper and 25% pinyon. Estimated reduction of basal area is approximately 20%. The purpose of these treatments is to enhance wildlife habitat through browse release and understory herbaceous cover.

#### **Alternative A – No Action**

No direct effects are expected to mule deer from Alternative A. Indirect negative effects from Alternative A include reduced understory browse and herbaceous cover and increased risk of wildfire. No negative cumulative effects are expected to mule deer from any of the alternatives. The current trends for mule deer and associated vegetation would not change in the short-term compared to those reported in the 2003 Forest MIS report. In the long-term, conditions in the pinyon-juniper would decline as tree species crowd out useful browse and herbaceous plants, and aspen conditions deteriorate from competition for nutrients and light. This project area represents 6.4% of forest-wide pinyon-juniper dominated mule deer habitat, 0.16% of the aspen habitat, and 6.2% of the ponderosa pine habitat. Changes to the forest trends and conditions would be small given the percent compositions, and would not affect overall trends at the forest level to a large degree.

#### **Alternative B – Proposed Action**

Potential negative direct effects to mule deer in the pinyon juniper habitat under Alternative B include the short-term displacement of mule deer from activity areas during vegetation harvesting and prescribed burning activities. Changes to the vegetation would affect deer negatively by reducing windbreaks and cover, but the project design will retain adequate levels of hiding and wind-blocking vegetation in the pinyon-juniper habitat (20% reduction from present, a small change). Temporary disturbance would affect 2.5% of mule deer habitat forest-wide.

In aspen habitat, similar short-term displacement during management activities would be expected. Vegetative treatments would produce a flush of growth during the first growing season following treatment, thus providing an immediate benefit to mule deer in the form of forage. A substantial increase

in the quality of aspen available for deer to use (3,345 acres, 12.4% of the forest-wide acreage) would occur, but the overall acreage aspen occupies within the project area and forest-wide would not change. These changes would provide more quality nutrition to mule deer during the growing season within the project area, but would not likely result in a change in the number of animals at the district or forest level because of limitations of other habitat components (e.g. water, snow levels, predation, etc.) and spatial arrangement on the landscape. Closure of roads following management activities will reduce disturbance during fawning, thus allowing doe and fawn to maximize energy resources (deVos et al. 2003). Again, this affects a small percentage of habitat at the forest level, so changes to trends are not expected to be recognizable.

Positive indirect effects from Alternative B include the enhancement of forage within aspen, pinyon-juniper, and ponderosa pine habitats from thinning and prescribed fire activities. Improvement of forage within all treatment areas will slightly reduce grazing pressure on deer forage, but would not lead to a change in trends for animals or forage at the forest-wide level. No negative cumulative effects are expected to mule deer from any of the alternatives.

### **Alternative C**

This alternative would treat aspen and pinyon-juniper habitats in the same manner and same intensity as Alternative B. Therefore, all effects would be expected to have the same impacts as noted above.

### **Red-naped Sapsucker**

Aspen habitat and the associated snag component have been decreasing across the Western States and on the KNF specifically. The Audubon Society data suggests red-naped sapsucker populations have been variable, but neither increasing nor decreasing. Overall, it is estimated that red-naped sapsucker population trend has been stable or decreasing on the KNF (see the *2003 Management Indicator Species for the Kaibab National Forest Report*).

The red-naped sapsucker is an MIS of late-seral aspen habitat. Habitat attributes identified to evaluate potential effects to this species include trees per acre for aspen snags, trees per acre and SDI for aspen trees >18" dbh. SDI values could not be estimated for this project. Snags and trees per acre were estimated at nominal values within the Jacob-Ryan project area (Table 3.9). The Jacob-Ryan project area is relatively dry, with few large aspen stands.

Suitable habitat for the red-naped sapsucker is limited within the project area. Existing aspen stand exam data utilized for the Jacob-Ryan project is limited, and based upon only 44 acres of aspen that exist as stands of 1.0 to 4.0 acres in size. Within the majority of the project area, quaking aspen occurs as scattered, small groups of trees less than 12" dbh, often intermingled with ponderosa pine. Fewer than 0.1 trees per acre are aspen 18" dbh and over in the project area. Estimated aspen component within the project area is approximately 36 trees per acre. Approximately 3,345 acres of aspen enhancement is estimated for the Jacob-Ryan project area.

### **Alternative A – No Action**

No treatments would occur with this alternative to change the percentage of aspen on the landscape or to improve the purity of the existing aspen areas. Aspen snags per acre would decline at the 10 and 20 year intervals compared to the existing condition from 0.04 to 0.01 per acre. Aspen 18" dbh and over would increase three-fold at the 20-year mark, but this would still be only 0.16 trees per acre across the project area.

Such small changes, in either direction, to the aspen conditions in the project area will not be visible at the Forest level. Therefore, no changes would be predictable to species population or habitat trends at the Forest level.

### **Alternative B – Proposed Action**

Areas of aspen without blackjack ponderosa pine will not be entered for harvest, thus protecting these areas of aspen concentrating, allowing them to grow and create snags. However, this will not result in an increase in trees per acre within those areas. Trees per acre and snag development will be stimulated during prescribed fire that kills immature aspen stems. Some aspen stands will have pines removed from the group to favor development of concentrated aspen habitat. In order to enhance existing aspen stands, groups, and clumps, all ponderosa pine <12” dbh will be removed within 20 feet of the perimeter of existing aspen vegetation. The purpose of this removal is to protect existing aspen trees and stimulate aspen clone generation.

Harvesting would cause temporary disturbance in the area immediately surrounding treatment, but this would be temporary. Aspen trees and snags will not be targeted for cutting, so there should be no recognizable change in the amount of aspen on the landscape. However, some mortality would be expected during prescribed burning operation, and some snags would be created during removal of some pines from aspen pockets from harvest-related injuries. Development of these snags would benefit the sapsucker, but when large trees are affected, there would be a slight reduction from already low numbers of large, living trees. Overall, snags would decline slightly from existing conditions under this alternative (Table 3.9). Trees per acre for aspen 18” dbh and larger would double from existing conditions in 20 years under this alternative.

Changes of such a small amount would not affect the trends for the species or habitat at the Forest level. However, these activities would serve to maintain the existing Forest levels, in improved pure stands.

### **Alternative C**

This alternative would result in snag conditions similar to Alternative B, only 0.01 trees per acre lower than the no action alternative. Trees per acre over 18” dbh would increase similar to the no action alternative. While the differences between the alternatives are very small, this alternative achieves the largest gain in 18” dbh and larger aspen component while improving the purity of the retained clumps of aspen.

Changes of such a small amount would not affect the trends for the species or habitat at the Forest level. However, these activities would serve to maintain the existing Forest levels, in improved pure stands.

### **Kaibab Squirrel**

The *2003 Management Indicator Species for the Kaibab National Forest Report* suggests that, in 1982, the populations on all of the districts were at or above the minimum viable populations. However, it does appear that tassel-eared squirrel numbers are in a declining trend on the KNF, predominately thought to be a result of extended drought conditions. It is assumed that overall habitat trends brought about by the shift in Forest objectives and harvest techniques initiated in 1992 have been positive for each of the MIS associated with the ponderosa pine cover type with the possible exception of elk.

The Kaibab squirrel is an MIS of early-seral ponderosa pine habitat (Table 3.9). Habitat attributes identified to evaluate potential effects to the Kaibab squirrel include trees per acre (tpa) and SDI for ponderosa pine <12” dbh. Existing trees per acre for <12” dbh ponderosa pine within the Jacob Ryan project area is estimated at 422.3 trees. The treatment area is small in comparison to total acres for the forest. However, the Kaibab squirrel occupies only the northern portion of the ponderosa pine on the Kaibab National Forest. While the treatment area only affects 4.1% of the forest acres of this habitat

type, it affects 11.4% of the North Kaibab Ranger District ponderosa pine habitat, thus 11.4% of the Kaibab squirrel's range.

Research studies conducted by Reynolds and his students since the Forest Plan was approved indicate Kaibab squirrels do not depend upon early seral habitat. They primarily rely on older trees (VSS 3) for truffle production, and mature trees (VSS 4-6) for nesting and feeding opportunities. To comply with Forest Plan direction for MIS, this analysis will discuss changes to Kaibab squirrel populations in light of current biological information. Early seral habitat changes will be discussed as well, but will not directly relate to changes in Kaibab squirrel population numbers because the squirrel does not depend much upon that class of trees.

### **Alternative A – No Action**

Under Alternative A there is an estimated gradual decline in habitat as tree densities continue to increase, and growth slows. There are no negative direct effects expected to the squirrel under Alternative A. Potential negative indirect effects under Alternative A include a reduction of suitable habitat and risk of catastrophic fire. There are no cumulative effects to this species from Alternative A.

The short-term trend in squirrel populations is not expected to change with this alternative. However, the long-term trends for both population and habitat may degrade slightly through time. This primarily results from continued overstocking in the smaller diameter tree classes (VSS 2 and 3), leading to a decline in the vigor and growth of larger trees. Past management actions focused on even-aged silvicultural practices that did not yield quality habitat for Kaibab squirrel and other members of the northern goshawk ecosystem. Alternative A would promulgate continuing conditions related to even-aged silviculture. The action alternatives would allow treatments to begin to transition those areas into uneven aged conditions with tree groupings and interlocking crowns favoring Kaibab squirrel.

In the next 10 years, the early seral age class (VSS 1) of ponderosa pine will decline to a large degree (see Jacob Ryan Management Indicator Species Report in the PR). Twenty years from now, the VSS 1 class will be reduced from 13% at present to 2% of the habitat. This decline is seen in each alternative. Early seral habitat will decline in all alternatives, over the 10 and 20-year planning period. At the Forest level, this would not result in much change in habitat trend, affecting only 0.8% of the total ponderosa pine habitat. At the District level, these changes would affect 2.2% of the total habitat (13% of project acres is 4,178.5, divided by 188,105 district acres yields 2.2%). Changes to the trend of early seral habitat at the Forest and District levels would not be appreciable, but a decline from 13% to 2% over 20-years would be important within the project area. However, trees per acre in VSS 1 at year 20 will be 151.1 (Jacob Ryan Silvicultural Report) under no action compared to 1910 estimates of about 32 (Forest MIS Report, 2003).

### **Alternatives B – Proposed Action**

The Kaibab squirrel will benefit from Alternatives B and C. Treatments in both alternatives retain mixed age class forests with a significant mature tree component. The goshawk management guidelines were designed to benefit key goshawk prey species, including the Kaibab squirrel. A primary objective of vegetation management activities under the goshawk guidelines is to promote natural tree grouping with interlocking crowns and high canopy cover, desired by the Kaibab squirrel. Potential short term negative direct effects to this species from Alternatives B and C include habitat and nest site disturbance during silviculture and prescribed burning activities. Positive long-term indirect effects to this species from Alternatives B and C include increased habitat suitability and reduced risk of wildfire.

Both action alternatives treat 4.1% of the ponderosa pine habitat at the forest level, or 11.4% at the district level. The temporary decline in squirrel habitat on a such a small percentage of the Abert's squirrel's range is not expected to cause a decline in the population or habitat trends because the component largely relied upon by the squirrel is retained to a similar degree in both alternatives. For the Kaibab squirrel, an 11.4% change could be important. The cutting method and components retained become the keys to

determining the effects to this MIS. The Jacob Ryan Management Indicator Species Report (PR) displays the changes to VSS percentages by alternative. These percentages are based on the recommended distribution of VSS from the MRNG (Reynolds et al. 1992).

Percent composition for VSS 5 (18-24" dbh) increase in both action alternatives compared to the existing conditions and over expected changes with the no action alternative (see Jacob Ryan Management Indicator Species Report in PR). Habitat conditions in the short-term for the squirrel will decline from disturbance within the project area, but in the long-term will provide an increasing trend within the project area. At the forest level, population trends are not expected to show a change with implementation of either action alternative.

Early seral habitat will decline with both action alternatives, similar to taking no action, over the 10 and 20-year planning period. At the Forest level, this would not result in much change in habitat trend, affecting only 0.8% of early seral ponderosa pine habitat. At the District level, these changes would affect 2.2% of the habitat (13% of project acres is 4,178.5, divided by 188,105 district acres yields 2.2%). Changes to the trend of early seral habitat at the Forest and District levels would not be appreciable, but a decline from 13% to 2% over 20-years would be important within the project area. However, trees per acre in VSS 1 at year 20 will be between 66.4 or 143.2 for Alternative B and C, respectively (Alts. B and C – Jacob Ryan Silvicultural Report) compared to 1910 estimates of about 32 (Forest MIS Report, 2003).

### **Alternative C**

This alternative would treat ponderosa pine habitats similarly but at a slightly lower intensity than Alternative B. Therefore, all effects would be expected to have the similar impacts as noted above. The primary difference between the two action alternatives would be a 5% fewer trees retained under Alternative B in the 1-4.9" diameter (VSS 2) range, and 7% more trees retained under Alternative B in the 5-11.9" diameter (VSS 3) range. Trees in the 1-4.9" diameter range are not heavily relied upon by the squirrel, but are needed to eventually produce the more important 5-11.9" size class. This larger class is fed upon by the squirrels at an estimated 61% (Reynolds et al. 1992). There is a 1% difference between the action alternatives in the retention of trees 12" diameter and above. These sizes of trees are heavily relied upon by the squirrel for nesting and winter feeding. Truffle production would decline in both action alternatives where harvest occurs, but would gradually return to pre-harvest levels.

Percent composition for VSS 5 (18-24" dbh) increase in both action alternatives compared to the existing conditions and over expected changes with the no action alternative (Tables E and F). Habitat conditions in the short-term will decline from disturbance within the project area, but in the long-term will provide an increasing trend within the project area. At the forest level, population trends are not expected to show a change with implementation of either action alternative. The magnitude of change at the District level would be greater, but difficult to quantify given the cyclical nature of squirrel reproduction and climatic variations. However, retention of the primary components in the larger structural sizes and improvement of the groups and interlocking crowns over the project area should benefit the squirrel populations. Therefore, the overall trend for squirrel populations with this alternative is expected to remain steady.

Early seral habitat will decline with both action alternatives, similar to taking no action, over the 10 and 20-year planning period. At the Forest level, this would not result in much change in habitat trend, affecting only 0.8% of early seral ponderosa pine habitat. At the District level, these changes would affect 2.2% of the habitat (13% of project acres is 4,178.5, divided by 188,105 district acres yields 2.2%). Changes to the trend of early seral habitat at the Forest and District levels would not be appreciable, but a decline from 13% to 2% over 20-years would be important within the project area. However, trees per acre in VSS 1 at year 20 will be between 66.4 or 143.2 for Alternative B and C, respectively (Alt C – Jacob Ryan Silvicultural Report) compared to 1910 estimates of about 32 (Forest MIS Report, 2003).

## **Northern Goshawk**

It does appear that the overall goshawk population on the KNF is at least remaining stable and may be increasing on the NKRD. Future precipitation patterns may play a significant role in future population trends. It is assumed that overall habitat trends brought about by the shift in Forest objectives and harvest techniques initiated in 1992 have been positive for each of the MIS associated with the ponderosa pine cover type with the possible exception of elk (Forest MIS Report, 2003).

The northern goshawk is an MIS of late-seral ponderosa pine habitat. Habitat attributes identified to evaluate potential effects to the goshawk include trees per acre (tpa) and SDI for ponderosa pine >18" dbh. Existing trees per acre for >18" dbh ponderosa pine within the Jacob Ryan project area is estimated at 19.6. Estimated existing SDI is 82.72 (Table 3.9). There is little change to these conditions with either action alternative, and a decline over time under the no action alternative. Activities proposed in or near goshawk PFAs should conform to the MRNG (Reynolds et al. 1992). However, this project area has a deficit in VSS 6 conditions, so cutting objectives are restricted to manage toward achieving the goal of 20% in this VSS. As a result, all recommended guidelines for goshawk management are built into the project design. None of the alternatives should result in much change to goshawk habitat.

The project area comprises 6.2% of late-seral ponderosa pine habitat at the Forest level. The action alternatives propose to treat 4.1% of the Forest-wide habitat. Goshawks are not restricted to the North Kaibab Ranger District, but they do exist in very high densities here. Therefore, changes to this habitat are carefully managed. The action alternatives alter conditions on 11.4% of the NKRD ponderosa pine habitat. The project area comprises 17.1% of all ponderosa pine habitat on NKRD. For more information on project effects and management information for the northern goshawk, please read the goshawk account as a sensitive species in the Biological Assessment and Evaluation and the Wildlife Supplemental Reports for the Jacob Ryan Project.

Currently, the Jacob Ryan Project area is out of alignment (deficit) with goshawk guidelines for VSS 2, VSS 4 and VSS 6, at the project level. Some PFAs and FAs have surpluses in these VSS. VSS 3 and 5 are slightly above recommended levels (see Jacob Ryan Management Indicator Species Report in PR). Increasing VSS 2 would be difficult given other deficits, so some treatments to bring VSSs more closely in line with recommendations has been deferred until the next entry (about 20 years). However, some harvesting may still be appropriate to maintain current balances without changing the percentages across the landscape. Management will focus on the PFA level where there are surpluses in VSS compared to the MRNG (see Jacob Ryan Briefing Paper, 9-25-2004, in the Project Record).

In 2004, 152 PFAs were monitored on the District. Of these, 32 had active nesting attempts (29%), and six of those failed (18.8%). In the project area, 29 PFAs occur, of which four actively attempted nesting (13.8%) and one failed (25%) (Project Record, PFA Activity Report, 8-8-2004). While the project area statistics do not parallel the district-wide information, this does not mean the goshawks within the project area are in dire straights. Many of these PFAs exist in less productive habitat (drier segments of the landscape), or in marginal habitat (intermingled with pinyon-juniper components). As a result, these PFAs are not expected to make as many attempts at nesting, nor experience the same potential for success (Reynolds, pers. comm. 2004).

### **Alternative A – No Action**

No direct effects are expected to the northern goshawk from this alternative. Within ten years under all alternatives, VSS 1 would drop significantly from 13% to 3-4%, and decline further in 20 years. However, this VSS usually recovers the fastest after disturbance. VSS 2 would exceed MRNG recommendations within ten years, and continue to climb to almost double the recommended amount. VSS 3 currently exceeds recommendations, and would change little through time (1% drop each 10-year period). VSS 4 is currently just below recommended levels, and would decline 1% after 20 years. VSS 5

would decline 2% at 10 years, and 3% at 20 years compared to existing levels. This would keep VSS 5 near the recommended levels (see Jacob Ryan Management Indicator Species Report in PR). VSS 6 is expected to remain stable. Risk to stand replacing fires under this alternative would not decline over current conditions.

These changes will affect the goshawk indirectly by minimally changing conditions for prey species. The biggest change would be in VSS 1, affecting ground dwelling prey the most. Still, the magnitude of the change is very small and would not appreciably affect goshawk populations at the District or Forest level. Habitat conditions would change 8% in VSS 1 for 17.1% of the District habitat, and 6.2% of the Forest habitat compared to existing conditions. Effects would be similar under the two action alternatives. This is still a very small change occurring gradually over a long time span. The change would be undetectable at the forest-wide level for both the habitat and population levels.

Under Alternative A the estimated trees per acre would increase slightly over the 20 year planning period. Overall, there are negligible differences in trees per acre or SDI between alternatives over the planning period (Table 3.9). The biggest difference between these alternatives occurs in the younger seral stages of ponderosa pine habitat. Changes to late-seral ponderosa pine habitat are between 1 and 3% in composition, affecting 11.4% of the District and 4.1% of the Forest habitat. There are no expected effects to population, habitat quantity or quality appreciably detectable at the Forest level.

#### **Alternative B – Proposed Action**

No direct effects are expected to the northern goshawk from any of the proposed Alternatives. Under Alternative B the number of trees per acre decreases slightly after treatment and then slightly increases over the 20-year planning period (Table 3.9). Seasonal restrictions and specific guidelines pertaining to activities allowed within goshawk PFAs and nesting areas should mitigate any potential direct effects to this species. Positive indirect effects to this species from Alternatives B and C include improved habitat suitability and reduced threat of catastrophic fire.

VSS 1, 4, 5 and 6s would remain essentially even between the existing conditions and all alternatives. Alternative B maintains VSS 3s closer to recommended levels longer than Alternative C, but not as well as Alternative A at the 20-year mark (see Jacob Ryan Management Indicator Species Report in PR). Alternative B maintains VSS 2s closer to recommended levels at the 10-year mark, than both Alternative A and C, but still far exceeds recommended levels by year 20.

Potential positive cumulative effects from Alternatives B and C include improved habitat conditions within ponderosa pine and mixed conifer habitats on the Kaibab Plateau, which could increase available suitable habitat and the regional goshawk population. This change in population, habitat quality and quantity are expected to be minimal, and not appreciably detectable at the District and Forest levels as described for Alternative A. For both action alternatives, the change to late-seral ponderosa pine habitat represents a 1% departure from existing conditions over a 20-year period, affecting 11.4% of the District habitat and 4.1% of the Forest habitat. At the forest level, population numbers and available habitat would not change appreciably.

#### **Alternative C**

No direct effects are expected to the northern goshawk from any of the proposed Alternatives. Under Alternative C the estimated trees per acre would increase slightly over the 20 year planning period (Table 3.9). Other effects to late-seral habitat conditions are described under the two preceding alternatives. No appreciable change would be detectable at the forest-wide level for the population or available habitat.

## **Wild Turkey**

The AGFD survey data suggest that the populations have not yet increased to the desired population levels. Based on the AGFD and BBS data, it appears that populations on the KNF have had an increasing trend. It is assumed that overall habitat trends brought about by the shift in Forest objectives and harvest techniques initiated in 1992 have been positive for each of the MIS associated with the ponderosa pine cover type with the possible exception of elk (Forest MIS Report, 2003).

The wild turkey is an MIS of late-seral ponderosa pine habitat. Habitat attributes identified to evaluate potential effects to turkey include trees per acre (tpa) and SDI for ponderosa pine >18" dbh. Existing trees per acre for >18" dbh ponderosa pine within the Jacob Ryan project area is estimated at 19.6. Estimated existing SDI is 82.72 (Table 3.9). Tables E and F show little change to these conditions with either action alternative, and a decline over time under the no action alternative.

Turkeys prefer a mosaic of habitat conditions within forested habitat, including small openings for foraging, large trees for roosting, and adequate shrub, herbaceous, and down woody material for nesting and protective cover. In ponderosa pine tree habitat, dense clumps of VSS 1 through VSS 2 trees serve as important hiding and resting cover. There is little difference between the alternatives through time for VSS 1 (see Jacob Ryan Management Indicator Species Report in the PR). The biggest difference is in VSS 2, where Alternative B makes the most reduction and Alternative C the most increase compared to existing conditions.

### **Alternative A – No Action**

There are no direct effects expected to the wild turkey under Alternative A. The estimated trees per acre would increase slightly over the 20 year planning period under this alternative (Table 3.9). Potential negative indirect effects to this species under Alternative A would include reduced herbaceous and shrub cover through competition with and shading by increased pine tree densities. Overall, there would be negligible differences in trees per acre or SDI between alternatives over the planning period (Table 3.9). Mature ponderosa pine VSS composition would decline slowly through time compared to the action alternatives (see Jacob Ryan Management Indicator Species Report in the PR). VSS 1 would decline and VSS 2 would increase through time with this alternative. The VSS 1 change would be similar to the action alternatives in magnitude, but VSS 2 increases would be greater than Alternative B and less than Alternative C over the planning period. The differences between alternatives are small (2 and 3%). There are no cumulative effects expected to this species under Alternative A.

Forest-wide changes to habitat would be minimal. The project area encompasses 6.2% of all ponderosa pine habitat for wild turkey on the Forest. Consequently, minimal changes would be expected in turkey population numbers at the Forest level. Habitat quality would decline marginally through time as mast, berries and seeds become less available, hiding cover decreases, and brooding areas grow closed. This is an extremely slow process that is not expected to impact forest-wide trends for population or habitat to a measurable degree.

### **Alternative B – Proposed Action**

Under Alternative B the number of trees per acre decreases slightly after treatment and then slightly increases over the 20-year planning period (Table 3.9). Thinning efforts during the Jacob-Ryan project should maintain an even distribution of VSS 1 and 2 ponderosa pine clumps across the landscape, but the percentage of VSS 1 clumps would decrease under all alternatives. VSS 2 clumps would decline with this alternative by 2% over the no action alternative, which is converse to the 3% increase seen with Alternative C (see Jacob Ryan Management Indicator Species Report in the PR). While this is a measurable change, it would not result in a widespread change to turkey populations or overall habitat. The project treats 4.1% of turkey habitat available at the Forest level. A 2% change to 4.1% of the bird's forest-wide habitat would be negligible, thus a negligible effect to populations at the forest level.

The change expected to mature ponderosa pine used by wild turkey would be similarly discountable. Trees 18" dbh and over would increase by 2% with this alternative over the no action alternative, and 1% less than Alternative C. Again, a 1% or 2% change to 4.1% of the bird's habitat would not yield a measurable change in population, habitat quality or quantity. Vegetation thinning and low intensity prescribed burning should benefit turkeys by providing increased herbaceous forage and ground cover.

Potential direct effects to this species under Alternative B and C include short-term disturbance and displacement of birds during thinning and prescribed burning activities. However, disturbance would be limited due to goshawk management guidelines limiting noise producing activities in the nesting season for both goshawk and turkey.

### **Alternative C**

Under Alternative C the estimated trees per acre increases slightly over the 20 year planning period (Table 3.9). The biggest habitat change under this alternative is a 3% increase in the mature component of ponderosa pine habitat compared to the no action alternative. Otherwise, the effects expected from this alternative on wild turkey are expected to be similar to Alternative B, and are described above. This alternative would not result in a change in turkey populations, habitat quality or quantity measurable at the Forest level. Both alternatives would close roads after use, resulting in further protection from future noise disturbance during the breeding season. For wild turkey, there is essentially little difference between the action alternatives. There would be no appreciable change to the population or habitat available at the forest level.

### **Hairy Woodpecker**

The information available suggests that hairy woodpeckers are stable to increasing at the regional and Statewide scales. Given the KNF snag policy and the increasing number of acres burned and the increasing severity of forest fires in the Southwest, we predict that hairy woodpeckers populations on the KNF are stable to increasing. It is assumed that overall habitat trends brought about by the shift in Forest objectives and harvest techniques initiated in 1992 have been positive for each of the MIS associated with the ponderosa pine cover type with the possible exception of elk (Forest MIS Report, 2003).

The hairy woodpecker is an MIS of late-seral ponderosa pine habitat. Habitat attributes identified to evaluate potential effects to this species include snags >6" dbh per acre, trees per acre and SDI for ponderosa pine >18" dbh. Existing trees per acre for >18" dbh ponderosa pine within the Jacob Ryan project area is estimated at 19.6. Estimated existing SDI is 82.72 (Table 3.9). Conditions for trees 18" dbh and larger have been reported under wild turkey and northern goshawk above. The effects to that segment of the ecosystem are the same for this MIS, therefore, that discussion will not be repeated. This discussion will focus on snags only.

The project area comprises 17.1% of the district's ponderosa pine habitat, and action alternatives propose to alter conditions on 11.4%. The project area comprises 6.2% of the Forest and proposes to alter 4.1% of the total ponderosa pine habitat at that level. Snags 6" dbh and over are currently estimated at 2.15 per acre. Of these, 2.1 per acre are 14" dbh and over, 18" dbh and over are estimated

### **Alternative A – No Action**

There are an estimated 2.15 snags per acre greater than 6" dbh currently. Under Alternative A, there would be a slight decrease in such snags over the 20-year planning period. The LMP and goshawk management recommendations specify that at least 2 snags >18" dbh per acre be maintained within goshawk PFAs and FAs. If this alternative is implemented, no opportunity would exist to increase the number of snags in the project area and they would decline below recommended levels.

In 1910, Lang and Stewart reported 0.16 large snags per acre on the District (Forest MIS Report, 2003). The project area contains 2.15 with a projected decline to 1.8 in 20 years with no action. While this would be lower than recommended levels under MRNG, snags would still be vastly more prevalent than historical conditions. Thus, hairy woodpeckers would have more resources to use than historically available. This is higher than the 0.6 per acre average for the Forest using Forest Inventory Assessment data, and within range for stand exam data for the 1.4 average for the Forest or 1.6 for the District. The trend for hairy woodpecker populations and snag habitat would not change at the Forest or District level as a result of implementing this alternative.

### **Alternative B – Proposed Action**

Large snag numbers would be slightly less than recommended by MRNG, and would decline similarly to the no action and C alternatives. If MRNG numbers cannot be achieved, then snag recruitment will be implemented. Current Forest Service management practices recognize the value of snags, and with the exception of hazard trees, snags are not selected for removal during vegetation management activities. Proposed hazard tree removal along Highway 89 will have negligible affect on snags per acre within the project area, or use by the hairy woodpecker. Snags along the highway would probably not be as attractive for use by the species, lessening the effect of removal.

Since the effects are so similar between alternatives, the Forest and District trend changes are expected to be similar. District levels would remain higher than Forest and historic levels. Hairy woodpecker numbers would remain stable at the Forest level because snag densities and other components of the ecosystem used by the species would not change appreciably from this project.

### **Alternative C**

Under Alternative C, there would be a slight decrease in snags per acre over the 20-year planning period compared to the existing conditions. Since the effects are so similar between alternatives, the Forest and District trend changes for snag habitat are expected to be similar. District levels would remain higher than Forest and historic levels. Hairy woodpecker numbers would remain stable at the Forest level because snag densities and other components of the ecosystem used by the species would not change appreciably from this project.

### **Pygmy Nuthatch**

The overall trend for the KNF is assumed to be reflective of the State-wide trend and that pygmy nuthatches populations are stable. It is assumed that overall habitat trends brought about by the shift in Forest objectives and harvest techniques initiated in 1992 have been positive for each of the MIS associated with the ponderosa pine cover type with the possible exception of elk (Forest MIS Report, 2003).

The pygmy nuthatch is an MIS of late-seral ponderosa pine habitat. Attributes identified to evaluate potential effects to this species includes trees per acre and SDI for ponderosa pine >18" dbh. Existing trees per acre for >18" dbh ponderosa pine within the Jacob Ryan project area is estimated at 19.6. Estimated existing SDI is 82.72 (Table 3.9). Dependent upon large, older conifer trees, the pygmy nuthatch prefers open mature ponderosa pine forest. Effects to this species and mature ponderosa pine habitat components are described under northern goshawk and wild turkey (and to some degree under Kaibab squirrel). Those discussions will not be repeated here. The effects and trends described under each alternative for northern goshawk, and wild turkey (and Kaibab squirrel) would be the same for this species.

## **Juniper Titmouse**

The assumed trend for KNF is the same as the overall State trend, and that plain titmouse populations are stable on the Forest. Except for actions aimed at restoring grasslands and savannah, the low levels of active management of pinyon-juniper woodland have allowed stands to increase in area, density, and has allowed seral succession to continue. The results have presumably increased the amount of habitat, created more snags through competition, and to date, management has only converted a small percentage of the woodland cover type to early successional stages. Drought and beetle activity are dramatically increasing pinyon snag availability across pinyon-juniper woodlands. The resulting pulse of pinyon snags will be at the cost of future pinyon and pinyon snag availability. Overall, there has probably been an increasing trend in juniper titmouse habitat quantity and quality since the signing of the KNF Forest Plan (Forest MIS Report, 2003).

The juniper titmouse is an MIS of late-seral pinyon-juniper woodland habitat. Attributes identified to evaluate potential effects to this species includes pinyon trees >16" drc per acre, juniper trees >16" drc per acre, and pinyon-juniper snags >6" dbh. Stand exam data was not available for pinyon-juniper woodland within the Jacob-Ryan project area. Of the almost 3,000 acres of pinyon-juniper woodland within the project area, 1,144 acres are proposed for vegetative treatment. The objective of these treatments is to reduce tree densities through selective thinning of younger age class trees. Thinning ratio will include 75% juniper and 25% pinyon. Estimated reduction of basal area is approximately 20%. The purpose of these treatments is to enhance wildlife habitat through browse release and understory herbaceous cover. Large pinyon and juniper trees are not proposed for removal. Studies indicate that this species prefers relatively open mature pinyon-juniper woodland habitat and benefits from the creation of small clearings (Latta et al. 1999). There are no direct, indirect, or cumulative effects expected to this species under any of the Alternatives.

### **Alternative A – No Action**

Current conditions in the pinyon-juniper portion of this project are becoming insufficient for juniper titmouse use (loss of openness and clearings). This trend would continue under this alternative. Because of the crowded tree conditions, the likelihood that existing trees would continue to grow to sizes preferred by this species without management is slim. Within the project area, this species will see a slow erosion of preferred conditions through time.

Pinyon-juniper in the project area makes up 6.4% of the Forest acreage. A slow decrease in the quality of this habitat type over time would probably not be recognizable at the Forest level. The quantity of habitat would remain steady. Species population levels would decline slowly as well, and probably would not be detectable at the Forest level, either. Individuals of the species would shift use to other, more suitable areas nearby.

### **Alternative B – Proposed Action**

Selective thinning focused on removing more juniper than pinyon would benefit the species and the habitat quality over time. Trees would experience reduced competition for nutrients, moisture and sunlight compared to the existing condition. Improved competition would result in healthier trees able to withstand insect and disease outbreaks, and able to provide more seeds and foliage for wildlife use. Ground level plants would benefit from reduced competition as well, leading to an increase in the amount, quality and diversity of species available to wildlife.

Treatment would affect 2.5% of the total acreage across the Forest, a very small amount probably undetectable at the Forest level. However, the treatment would be important to individuals of the species residing in the area. Changes to populations, habitat quality and habitat quantity at the Forest level would not be appreciable.

### **Alternative C**

This alternative implements the same treatments at the same intensity as Alternative B. Therefore, the effects are expected to be the same as those described for Alternative B.

### **Migratory Bird Species**

There are over 200 species of birds that occur or potentially occur on the North Kaibab Ranger District as residents, migrants, or occasional visitors. Seventy-five percent of these are considered neo-tropical migrants and over 50% are considered breeding season residents. On January 10, 2001, President Clinton signed Executive Order 13186 directing Federal agencies to minimize negative impacts to migratory birds, and to carry out certain actions to further the implementation of the Migratory Bird Treaty Act. A Memorandum of Understanding (MOU) between the Forest Service and the U.S. Fish and Wildlife Service was established that directs the agencies to:

“Ensure that environmental analyses of Federal actions required by the NEPA or other established environmental review processes evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern.”

Current direction from the Forest Service Southwestern Region Office is to address migratory birds by analyzing potential effects to: (1) Priority bird species identified in the *Arizona Partners in Flight Bird Conservation Plan* (Latta et al. 1999); (2) Important Bird Areas (IBAs) identified through the Audubon Society IBA program (3) known important or unique avian overwintering areas.

### **Priority Species of Concern**

The Arizona Partners in Flight (APIF) Priority Species of Concern concept (Latta et. al 1999) is utilized because it is not possible to quantify and analyze the current condition and effects of management on all of the many different species of migratory birds that use habitat within a Forest for breeding, migrating, or overwintering. APIF selected priority species for each habitat type in Arizona to represent a suite of associated species, discussed habitat and population objectives for each species, and identified management issues and recommendations.

In 2002 a *Draft Migratory Bird Species Analysis for Coniferous Forests on the Kaibab National Forest* (see report in the PR) was produced that outlines the status of APIF Priority Species of Concern associated with habitat types of the Kaibab National Forest. The report summarizes the conservation objectives and recommendations provided by the *Arizona Partners in Flight Bird Conservation Plan* (Latta et al. 1999).

The Jacob Ryan analysis area contains suitable habitat for Priority Species of Concern identified by APIF for ponderosa pine and pinyon-juniper habitat. Priority species of Concern for ponderosa pine include the northern goshawk, olive-sided flycatcher, Cordilleran flycatcher, and purple martin. Priority Species identified for pinyon-juniper are gray flycatcher, pinyon jay, gray vireo, black-throated gray warbler, and juniper titmouse.

The following management recommendations are provided by APIF for ponderosa pine habitat:

- Manage for snag recruitment trees, create snags, and promote longevity of existing snags.
- Promote larger and older live trees.
- Use fire as a management tool to create desired forest conditions and reduce fuel loads.
- Utilize *Management Recommendations for the Northern Goshawk in the Southwestern United States* (Reynolds et al. 1992) when conducting siviculture treatments.

The following management recommendations are provided by APIF for pinyon-juniper habitat:

- Promote larger and older (>75 years) cone producing trees, especially pinyon.
- Restrict commercial and personal fuelwood collection of large, older trees.
- Promote understory and shrub cover through creation of small openings by mechanical vegetation treatment and/or burning.
- Burn slash piles to eliminate winter hibernaculums of the *Ips* beetle.

### **Priority Species of Concern for Ponderosa Pine**

The following criterion was used to assess effects of proposed management alternatives on the suite of APIF migratory bird Priority Species of Concern for ponderosa: acres of ponderosa pine habitat treated per the *Management Recommendations for the Northern Goshawk in the Southwestern United States* (Reynolds et al. 1992). (See Appendix 4.)

#### **Alternative A**

Under the No Action alternative, no treatment would occur in ponderosa pine habitat. There would be no direct effects to the suite of APIF migratory bird Priority Species of Concern for ponderosa pine under the No Action alternative. The indirect effect of the No Action alternative to these species is reduced habitat suitability over time due to unsustainable forest conditions. Continued increases in tree density will result in reduced herbaceous species diversity, which translates to reduced foraging opportunities. Further, the high risk of stand-replacing wildfire within the analysis area translates to a high risk of habitat loss. Unsustainable forest conditions are recognized in ponderosa pine habitat across the Kaibab Plateau. Therefore, the cumulative effect of the No Action alternative to the Priority Species of Concern for ponderosa pine is an overall reduction in habitat quality and a risk of habitat loss.

#### **Alternative B**

Under Alternative B, approximately 21,730 acres of ponderosa pine habitat would be treated per the *Management Recommendations for the Northern Goshawk in the Southwestern United States* (Reynolds et al. 1992).

Direct effects to the suite of APIF migratory bird Priority Species of Concern for ponderosa pine under Alternative B are short-term disturbances to nest sites during vegetation treatments and prescribed burning activities. These effects are expected to be limited in area and duration. Indirect effects are long-term benefits to migratory bird Priority Species of Concern through improved forest health and sustainability. This translates to overall improvements in habitat quality and reduced risk of habitat loss from stand-replacing wildfire. Possible positive cumulative effects from Alternative B and other present and foreseeable management activities are improved ponderosa pine habitat quality for the suite of APIF migratory bird Priority Species of Concern for ponderosa pine on the Kaibab Plateau. No adverse cumulative effects to the Priority Species are expected from Alternative B because disturbance from planned activities in other project areas and proposed activities will be minimized by the spatial and temporal separation of such activities.

#### **Alternative C**

Under Alternative C, approximately 21,429 acres of ponderosa pine habitat would be treated per the *Management Recommendations for the Northern Goshawk in the Southwestern United States* (Reynolds et al. 1992).

Under Alternative C, direct effects to the suite of APIF migratory bird Priority Species of Concern for ponderosa pine are expected to be analogous to those discussed for Alternative B. While the area treated is similar in size to that under Alternative B, forest conditions assumed to be created through implementation of Alternative C are not sustainable from a crown fire standpoint (modeled fire behavior indicates that the risk of stand-replacing wildfire is not reduced). Therefore, long-term benefits to

migratory bird Priority Species of Concern will not be recognized under Alternative C. Rather, indirect effects of this alternative are expected to be adverse because of the continued risk of habitat loss from stand-replacing wildfire. Further, the majority of ponderosa pine habitat on the Kaibab Plateau exists in an unsustainable condition and the cumulative effect of Alternative C with these conditions is likely to be adverse to the APIF Priority Species of Concern for ponderosa pine.

### **Priority Species of Concern for Pinyon-juniper**

The following criterion was used to assess effects of proposed management alternatives on the suite of APIF migratory bird Priority Species of Concern for pinyon-juniper: acres of pinyon-juniper habitat enhanced. (See Appendix 4.)

### **Alternative A**

Under the No Action alternative, no pinyon-juniper enhancement would occur. There would be no direct effects to the suite of APIF migratory bird Priority Species of Concern for pinyon-juniper under the No Action alternative. Indirect effects from the No Action alternative include reduced forage potential and habitat suitability over time, from increasing tree densities and conversion into monotypic habitat with low plant diversity. Because this habitat trend is recognized in pinyon-juniper habitat across the Kaibab Plateau, the cumulative effect of the No Action alternative to the Priority Species of Concern for pinyon-juniper is an overall reduction in habitat quality.

### **Effects Common to Alternatives B and C**

Under Alternatives B and C, approximately 1,143 acres of pinyon-juniper enhancement would occur. Direct effects to the suite of APIF migratory bird Priority Species of Concern for pinyon-juniper under these alternatives are short-term disturbance to nest sites during vegetation treatment and prescribed burning activities. These effects are expected to be limited in area and duration. Indirect effects from Alternatives B and C are benefits from improved habitat quality. Benefits are expected to be long-term. Possible positive cumulative effects from these alternatives and other present and foreseeable management activities are improved pinyon-juniper habitat quality for the Priority Species on the Kaibab Plateau. No adverse cumulative effects to the suite of APIF migratory bird Priority Species of Concern for pinyon-juniper are expected from either Alternative B or C because disturbance from planned prescribed burning activities in other project areas and prescribed burning activities proposed under the alternatives will be minimized by spatial and temporal separation of such activities.

### **Important Bird Areas**

Important Bird Areas (IBAs) are geographical areas considered unique or important to bird populations. The National Audubon Society administers the IBA program in the United States and establishes IBAs on a state-by-state basis. Although 16 Important Bird Areas have been established in Arizona, none are designated or nominated within or adjacent to the Kaibab National Forest. Thus, there are no Important Bird Areas within the Jacob Ryan analysis area and no further discussion of IBAs will follow.

### **Important Overwintering Areas**

Important overwintering areas are defined as locations where large concentrations of birds gather for migration and/or overwintering. Primary overwintering areas generally consist of large wetlands or bodies of water where waterfowl, shorebirds, or raptors congregate in large numbers. Because wetland areas on the Kaibab Plateau are few and are of limited size, no known or potential important overwintering areas exist within the North Kaibab Ranger District. Small water sources such as the natural lakes, dirt tanks, and other developed waters on the NKR District may provide overwintering habitat on a very limited scale. However, significant concentrations of birds do not winter on the District; neither do unique species or a high diversity of species. No important overwintering habitat exists within the Jacob Ryan analysis area, and no further discussion of important overwintering areas will follow.

## **Fire, Fuels, and Air Quality**

### **Fire, Fuels, and Air Quality Affected Environment**

Fuel loads in the project area have been estimated by ocular reconnaissance using the photoseries for the Southwestern Region and range from 3 to 30 tons per acre. Loading is not evenly distributed across the project area. Past timber sale cutting units are generally in the 5 to 10 tons per acre range, plantations and the heavier-cut shelterwood and seed tree treatments are in the range of 3 to 7 tons per acre, old thinning units in which slash was lopped and scattered are about 10 to 15 tons per acre and untreated areas range from about 10 to 20 tons per acre. Areas that have been prescribed burned in the recent past (1990s) are generally about 5 to 10 tons per acre. For planning purposes, the estimated average for the project is 15 tons per acre.

The fire and fuel conditions that currently exist within the Jacob Ryan analysis area have occurred due to past management activities (or the lack thereof) (see the Fire and Fuels Report in the PR for a detailed description of the affected environment).

- The accumulation of forest fuels is partly due to a lack of natural fire and aggressive fire suppression;
- Logging and other vegetation manipulation practices such as lop and scatter slash treatments (without follow-up prescribed burning) contributed to fuel loading and over time the punky material has greatly increased the availability of receptive fuels, increased the number of potential ignitions, and increased resistance to control for fire suppression crews;
- The removal of fine fuels due to livestock grazing (probably only a minor consideration in the last 30 years) disallowed natural fire the opportunity to carry through discontinuous surface fuels;
- The combination of the above has effectively altered the historic fire regime from frequent fire return intervals of low to moderate severity to fires of moderate to high severity (tree mortality);
- Conservation strategies employed, generally single species oriented, have allowed the forest-at-large to become much more dense than it was even 50 years ago. The in-growth of saplings and poles, acts as ladder fuel and provides fire a pathway from surface fuel into a dense tree canopy layer. This sets the stage for stand-replacing wildfire, a generally rare condition in fire-adapted ecosystems, during the period prior to European settlement.

Air quality on the Kaibab Plateau and within the Planning Area is good to excellent, and the area has been designated a Class II Airshed. The Grand Canyon National Park is directly south of and adjacent to the North Kaibab Ranger District; the Park has been designated a Class I Airshed. Air quality within the Planning Area is primarily affected by conditions and situations outside of the area, such as coal-burning power plants and industrial and vehicle emissions in large metropolitan areas west and southwest of the area. Emissions from these sources cause periodic degradation of the airshed primarily during long periods of regional high pressure weather patterns or heavy regional winds from the south and southwest which add dust to the atmosphere. Other air degradation occurs on a temporary basis when fires occur in the Planning Area or the region.

### **Fire, Fuels, and Air Quality Environmental Effects**

The *Forest Vegetation Growth Simulator with the Fire and Fuels Effects* extension was used to model predictions of fire type and other parameters to provide a basis on which to describe effects and compare alternatives. For the No Action alternative, existing conditions were input and modeled into the future, with no treatments input. Alternatives B and C were grown from the same existing conditions as No Action with treatment parameters input appropriate for the alternative, beginning and completed in 2004. At year 2006 (after treatment and slash disposal for the action alternatives), the same wildfire scenario was input for all alternatives. See the Vegetation Resources section above for a discussion of snags and down logs.

### **Alternative A**

Implementation of the No Action Alternative would not contribute to the attainment of the Desired Condition nor of any of the resource objectives for the proposed project.

Table 3.10 shows the modeled wildfire results by predicted fire type in tabular form (acres). See the Alternative A map below for the locations of the predicted fire type (surface, passive or active crown fire) for sites with existing data.

Table 3.10. Summary of Acres for Fire Type, No Action Alternative by Cover Type.

Fire Type	ACRES						
	P. pine	P-J	Oak	Other	TRE	TRJ	
Active	37	297	0	0	0	0	
Passive	10,733	624	0	213	0	46	
Surface	15,431	208	0	61	26	0	
Total	26,201	1,129	0	274	26	46	
Grand Total	27,676						

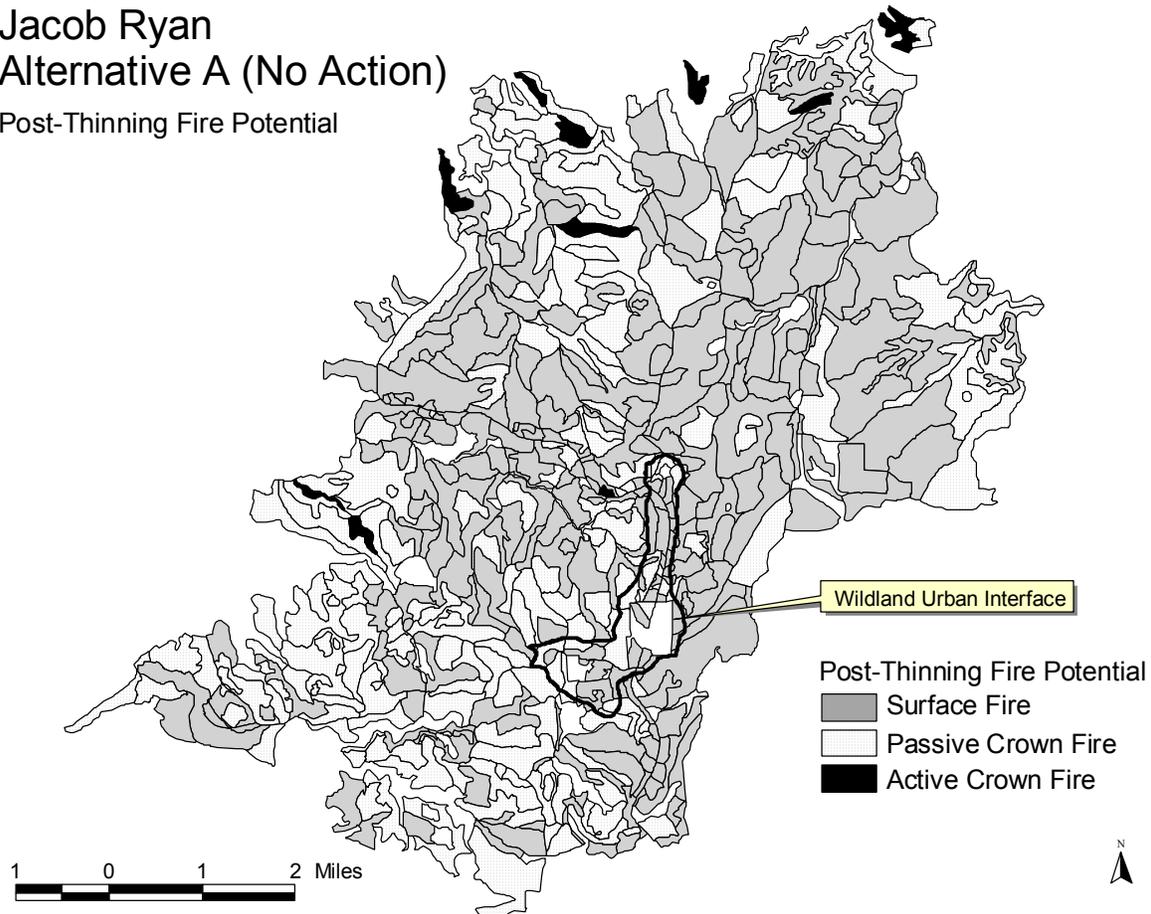
Not included are acres of non-forest ownership (private land, 27 acres), water (21 acres), grassland (196 acres) and timber cover types which were not modeled (PJ 1848 acres; PP 5941 acres). Note Alternatives B and C have 30 acres less than Alternative A in the “not-modeled” ponderosa pine category.

The No Action alternative would leave approximately 334 acres at risk for loss in an active crown fire; an additional 11,616 acres in passive crown fire. Three hundred and forty four of the 11,619 passive crown fire acres are in the WUI (see passive crown – WUI analysis in the PR).

Fuel loads are generally higher than desired and would continue to accumulate. Tree density especially, in the seedling and sapling size class would continue to increase. Access to, and construction of fire-control line would continue to become more difficult and time consuming (resistance to control would increase) in the event of a wildfire. Opportunities to conduct fire-use for resource benefits would continue to diminish or be foregone, further removing fire from playing its ecological role. The continuing buildup of surface fuels creates ladders (vertical fuel continuity). This together with high tree density could lead to active crown fire and result in a typical catastrophic (stand replacing) wildfire instead of the more natural low-intensity surface fire, which only occasionally damaged overstory trees. This response (fire behavior) is outside the range of natural variation for Fire Regime 1 and would or could result in a conversion to a different fire regime altogether.

## Jacob Ryan Alternative A (No Action)

Post-Thinning Fire Potential



JMB 8/25/2004

Four factors acting together result in catastrophic wildfire. Of the 4 factors (weather, an abundance of fuel, low fuel moisture content, and terrain), only fuel load can be directly influenced by human decisions (Graham and McCaffery, 2003). Should a wildfire occur, the risk is greater under the No Action alternative that the fire would consume large areas of vegetation, degrade or destroy habitat, damage soil, lead to severe erosion, and reduce air quality.

The No Action Alternative could conceivably contribute to increasing risk to public and fire fighter safety and to property damage if a crown fire developed due to the fuel load and continuity when it would not have if otherwise treated.

Smoke (in tons of particulate produced) generated by a catastrophic wildfire is several orders of magnitude greater than that occurring as the result of low-intensity ground fires, impairing air quality and depending on the prevailing wind direction, could pose a health risk to the public in the immediate term. Several SASEM (Simple Approach Smoke Estimation Model, ver. 4.1) runs were conducted to determine if standards for PM-2.5  $\mu\text{m}$  and PM-10  $\mu\text{m}$  particulate size classes would be exceeded by the proposed action. The model runs, located in the PR, predict that standards would not be exceeded at the chosen receptor site, Jacob Lake, Arizona.

In areas adjacent to the Jacob Ryan project area, natural fire would possibly have to be suppressed instead of used for resource benefit due to unacceptable risk to public and fire fighter safety, and of damage to the resource—all because of fuel conditions in the Jacob Ryan vicinity. Here, continuing to restrict fire's role

would cause wildland fires to potentially become more severe (greater mortality) and more costly to suppress on an area larger than just Jacob Ryan. The subsequent conversion from fire resistant species to fire-intolerant species will make these areas even less resilient to fire.

Cumulative Effects: There would be little to no perceivable cumulative effects due to implementation of these current projects: Jacob Lake Inn Expansion project; Hidden Fire Salvage; Dry Park Vegetation Management. This is due to locations too distant or project size too small in scale to make a difference. Jack Jolly Fuels Reduction in watershed 1501000310 does provide a small reduction in the risk to the WUI due to the project location but the impact is small due to its limited size.

Future projects such as Cancoop Fuels Reduction; Billy West Vegetation Management; Telephone Hill Vegetation Management combined, will provide a large reduction in risk to the WUI, due to their proximate locations and the relatively large areas which could be treated. Reducing live and dead fuels in these project areas would assist in reducing the risk a crown fire could make a sustained run at Jacob Lake. East Rim Vegetation Management, Houserock Valley Browse Release and West Side Habitat Improvement projects would likely have no perceivable cumulative effects due their distant, geographical locations, topographic positions or vegetation types.

Overall the Jacob-Ryan Vegetation Management project has the largest and most adverse contribution to the three effected watersheds. The No Action alternative provides no reduction of risk catastrophic fire to the Jacob Lake WUI and would continue accumulate fuels deepening the effect. Cumulative effects, then are overall, adverse.

**Alternative B**

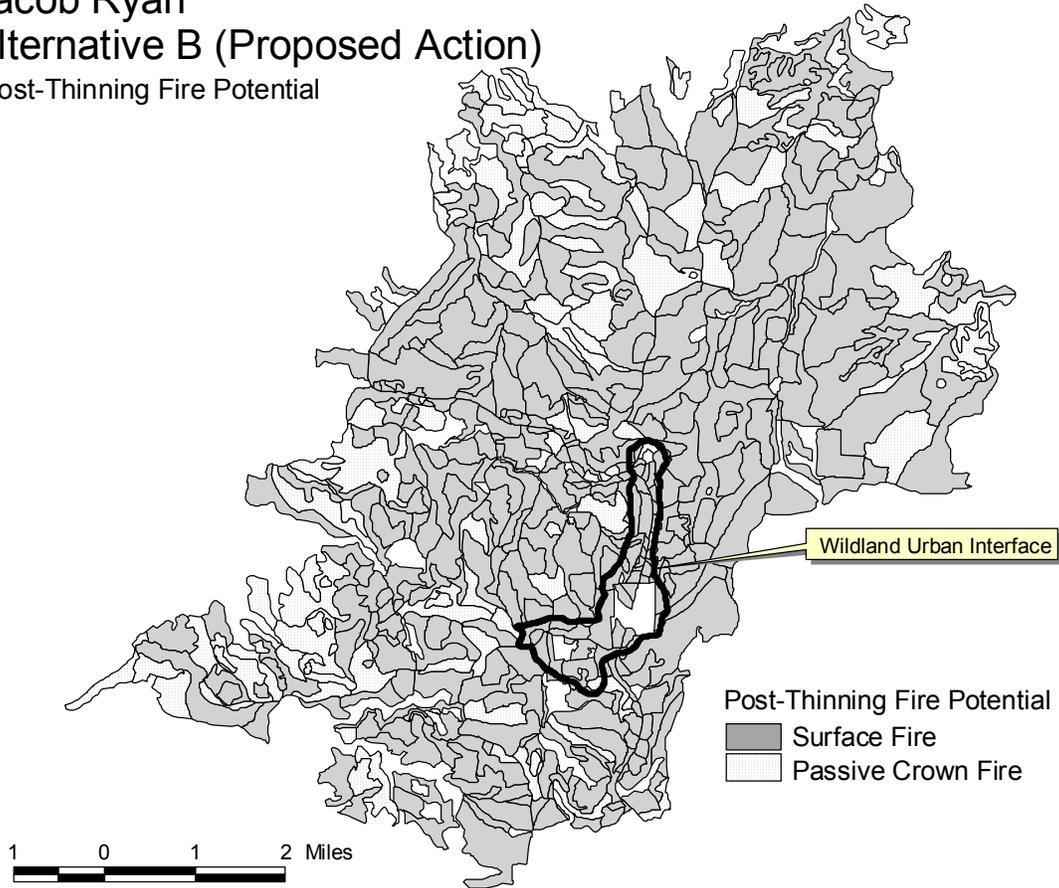
Alternative B includes prescribed burning on 24,141 harvested and 9,149 non-harvested acres, after harvest, thinning and sanitation treatments; maintenance on 56 miles (2,140 acres) of existing fuelbreaks. Table 3.11 and the Alternative B map (below) indicate the number of acres by fire type and cover type for the model run.

Table 3.11. Summary of Acres for Fire Type for Alternative B, by Cover Type.

Fire Type		ACRES					
		P. pine	P-J	Oak	Other	TRE	TRJ
Active		0	0	0	0	0	0
Passive		5,370	963	101	98	0	46
Surface		20,863	167	92	176	26	0
Total		26,233	1,130	193	274	26	46
Grand Total	27,902						

All sites modeled as at-risk of loss by active crown fire in the No Action alternative would be converted potentially to surface fire type or at the most passive crown fire, by the treatments proposed in Alternative B. The largest effect (beneficial) is in the change in acres of passive crown fire. Approximately 6,867 modeled acres changed from passive fire type under No Action to surface fire type under Alternative B. There are 33 acres of passive crown fire stands in the WUI after treatment (see passive crown – WUI analysis in the PR).

Jacob Ryan  
 Alternative B (Proposed Action)  
 Post-Thinning Fire Potential



JMB 8/25/2004

The amount of acreage at-risk of torching of single trees and groups is a very important factor in evaluating overall risk or potential effectiveness of proposed treatments. Due to unpredictable aspects of fire behavior and of fire weather factors, a slight increase in mid-flame wind speed could have a drastic effect on fire intensity and rate of spread, and could easily result in changing fire type from passive to active (stand-replacing) crown fire. The ponderosa pine vegetation type is resilient enough to withstand torching of singles and small groups, pockets which create intense fire, but large areas of blowout is outside the normal range of variation. The model predicts the treatments proposed under Alternative B would be effective in reducing the loss due to wildfire and improving conditions for the safety of fire fighters and the public.

A short-term effect would be an immediate reduction in tree density, especially in the younger size classes. These are the trees that pose the most risk to the rest of the stand. The ranking of VSS 2s for risk of a wildfire becoming an active crown fire under the No Action Alternative, changes from High to Moderate in FAAUs, PFAs and the project area. Surface fuels would be reduced to an acceptable level and condition of fuelbreaks would afford fire fighters improved opportunity to stop a running surface fire (See Map 8 in the Fire and Fuels Report – PR).

Short-term adverse impacts would occur to air quality during burning operations, but should meet ADEQ standards and guides; some visual resources would be impaired for 1 to 5 years after fuels reduction treatments. Short-term and long-term risk to fire fighter and public safety would be reduced. Risk of

damage to facilities would be reduced and the risk of adverse effect to the environment due to catastrophic wildfire would be reduced. Wildlife habitat would somewhat enhanced and sustained.

Cumulative Effects: Current salvage logging in the Hidden Fire area and subsequent slash treatments would reduce fuels in the project area in the short-term, reducing the overall hazardous situation slightly. The Jacob Lake Inn Expansion project may also reduce the risk of damage to facilities through WUI defensible-space treatments; reducing indirectly the risk to fire fighter and public safety and potential damage to facilities. However due their limited size, little to no perceivable cumulative effects are likely to occur in the watershed they occupy. Dry Park Vegetation Management and Jack Jolly Fuels Reduction projects both provide beneficial effects to watershed 150100310 in reducing fuels and the potential for catastrophic wildfire. Jack Jolly provides a small beneficial effect to reducing the risk of crown fire, which could impact the Jacob Lake WUI.

Future projects such as Jacob-Ryan (Alternative B), Cancoop Fuels Reduction, Billy West and Telephone Hill would make small to large, beneficial contributions to reducing live and dead fuels in their affected watersheds and would reduce the risk a crown fire could make a sustained run at Jacob Lake WUI. East Rim, Houserock Valley and West Side Habitat projects contribute no perceivable effects toward fuels reduction in the timber due to their geographical location, their relative small size or the vegetation type to be treated.

Overall the cumulative effects for the three watersheds affected, is likely to be overwhelmingly beneficial due the amount (area) and level of fuels reduction proposed as demonstrated by the very large shift in acres predicted to experience surface fire vs. crown fire in Alternative B.

### Alternative C

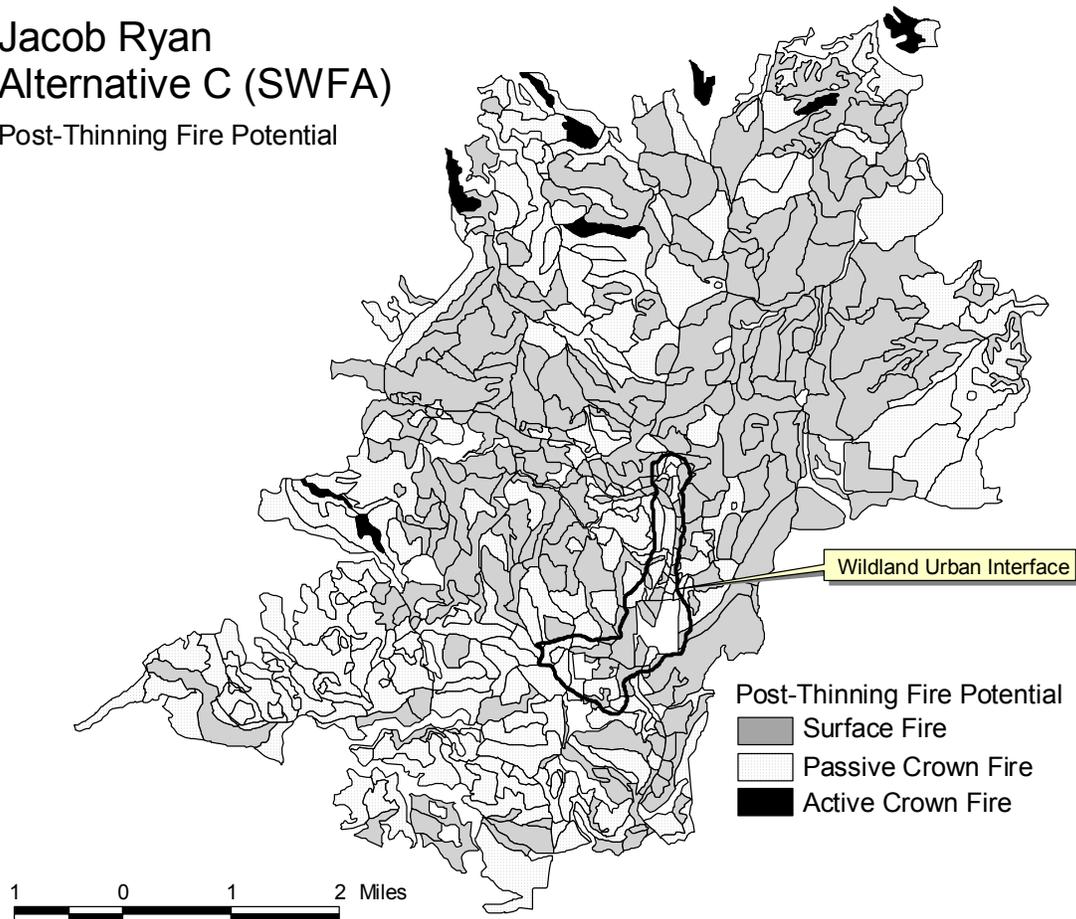
Alternative C is very similar in regard to fuel treatments and really only differs from Alternative B by the reduced amount of acreage harvested and by the reduction in larger trees taken due to the imposed diameter cap (Table 3.12 and Alternative C map below).

Table 3.12. Summary of Acres for Fire Type for Alternative C, by Cover Type.

Fire Type		ACRES					
		P. pine	P-J	Oak	Other	TRE	TRJ
Active		28	297	42	0	0	0
Passive		12,247	624	69	274	0	46
Surface		13,958	208	82	0	26	0
Total		26,233	1,129	193	274	26	46
Grand Total	27,901						

According to the model results, Alternative C’s post-treatment active crown fire sites would change very little from the No Action alternative. This is similar to findings reported by Fulé et al. 2001. Fulé found that thinning at levels less than full restoration did not raise the crown height enough or reduce crown bulk density enough to convert an active crown fire to a ground fire. The change from acres predicted as passive crown fire under No Action to surface fire under Alternative C is much less than under Alternative B. Proposed treatments under Alternative C convert only about 1,700 acres from passive to surface fire type, 5168 acres less than Alternative B. There are 432 acres of passive crown fire stands in the WUI after treatment (see passive crown – WUI analysis in the PR).

Jacob Ryan  
 Alternative C (SWFA)  
 Post-Thinning Fire Potential



JMB 8/25/2004

Furthermore, vegetation treatments under alternative C would open up the stands to more wind, but the 12-inch dbh cap would not reduce crown bulk density enough to reduce passive crown fire as effectively as Alternative B (which is closer to Fulé’s “full restoration” than Alternative C). This is problematic because the area of high passive crown fire under Alternative C is southwest of Jacob Lake. Prevailing winds on the NKRD are out of the southwest. This could cause a crown fire to burn up to and over Jacob Lake and the associated administrative and private sites.

Cumulative Effects: The cumulative effects for the three watersheds affected are the same as for Alternative B, except to a lesser degree.

## Soil and Watershed

### Soils and Watershed Affected Environment

Weathered Kaibab Limestone carbonate parent materials dominate soils within the Planning Area. The Terrestrial Ecosystem Survey (TES), completed in 1991, identifies 24 soil mapping units within the Planning Area and provides additional information on soil properties and conditions as related to potential uses, erosion, reforestation, and revegetation potential. The information for the TES units (acres, % slope, dominant vegetative component, erosion potential, rehabilitation potential, and management implications) is found in the TES report (Forest Service 1991).

Review of the TES data has indicated that the soils are relatively shallow, rarely exceeding 40 inches in depth. The soils are well drained on the tops of ridges but less well drained in valley bottoms. The loamy soils are prone to sheet and rill erosion when disturbed and have a low water-holding capacity. Clayey soils have better water-holding capacity, but they are subject to compaction, rutting and puddling when wet. Disturbances, which bring clay to the surface, can lower infiltration rates and soil productivity and, subsequently, the success of rehabilitation efforts.

In general, the ponderosa pine areas are probably close to the desired watershed condition (not too different from the historic condition), but the piñon-juniper woodlands appear to differ considerably from the historic condition. In those woodlands, there appears to be periodic soil movement due to overland flow.

Overall, the watershed condition is fair. Most of the unsatisfactory areas are in the piñon-juniper woodland and sagebrush-grassland types, and a large portion of the unsatisfactory conditions arise primarily because they are situated on relatively steep slopes where erosion is understandably more likely. Satisfactory condition is defined as current erosion rates not exceeding tolerance levels (the maximum rate of soil loss that can occur while sustaining inherent site productivity). Steep slopes in arid locations often preclude the possibility of being brought into a satisfactory condition; that is, erosion in such places is inevitable and can thus be seen as natural.

Although sediment flow into live waters is not a concern on the Kaibab Plateau, in order to maintain and improve watershed condition, Best Management Practices as prescribed by the Arizona Department of Environmental Quality are applied to activities such as road building and timber harvesting. Grazing has been the most ubiquitous impact to the herbaceous understories. The heavy and unmanaged grazing that occurred in the early years of this century have been replaced with controlled stocking and use levels, coupled with grazing management systems. At the present time, recreation activities do not appear to be causing unacceptable watershed impacts, but increasing recreational activity, such as off-highway vehicle use and unregulated dispersed camping, could affect watershed conditions in the future.

### Soil and Watershed Environmental Effects

We used soil map units from *Terrestrial Ecosystem Survey of the Kaibab National Forest* (TES) (see TES in PR) to determine current, expected, and tolerance soil loss estimates (see Soil and Watershed Analysis Rational in the PR for analysis assumptions). Because the Alternatives B and C are so similar the effects are presented together. Table 3.13 summarized the current, expected, and tolerance soil loss from the treatment areas. Table 3.13 was derived from the Soil and Watershed Analysis Rational in the PR).

Table 3.13. Summary of total Current, Expected, and Tolerance Soil Loss from Alternatives B and C in the Jacob Ryan Treatment Areas (Alternative A – No Action is represented by “Current Soil Loss”)

<i>Treatment Type</i>	<i>Current Soil Loss</i>	<i>Total Expected Soil Loss</i>	<i>Tolerance</i>
<b>Alternative B</b>			
<i>Tons/Year</i>	30,151	63,444	69,703
<b>Alternative C</b>			
<i>Tons/Year</i>	30,006	63,167	69,070

The overall total expected soil loss is less than tolerance levels in all instances (Table 3.13). Therefore, there will be no increase in soil loss or loss of soil productivity on the cutting and burning units in the Jacob Ryan Area under either Alternatives B or C. However, for some individual TES soil units the modeled expected soil loss exceeds the tolerance soil loss (See the watershed analysis and rationale in the PR). Therefore the mitigation measures in Chapter 2 will be applied to reduce the soil loss impact to negligible levels.

Furthermore, past (Kane Ranch EA) and foreseeable future (West Side Habitat Improvement, Jack Jolly Fuels Reduction, Houserock Valley PJ, and Cancoop) projects will continue to improve watershed condition in cumulative effects analysis area. For example, the Kane EA reduced the number of cattle head months by 30 % on the Central Summer allotment within the project area. This reduction shortened the use season from approximately 5.5 months to approximately 3.5 months; thus, resulting in increased ground cover and lower soil erosion rates in the cumulative effects analysis area.

Future vegetation management projects (Telephone Hill and Billy West) will utilize the same mitigation measures presented below; so, there will not be a negative cumulative impact from these future projects. The benefit of fuels reduction and forest thinning –i.e., reduced threat of catastrophic wildfire - actually presents a net positive cumulative effect on watershed and soils in the cumulative effects analysis area. For example, if the forests are thinned, the potential for a crown fire killing all of the ground cover are reduced and the potential for post fire erosion is also reduced considerably.

## **Visual and Recreation Resources**

### **Visual and Recreation Affected Environment**

This section covers two elements within the social realm: visual or aesthetic resources, and recreation resources (see the Visual and Recreation report in the PR for a detailed discussion of the affected environment). The two are related, as high quality scenery is often very important for high quality recreation activities. One source (Ribe, 1989) found that almost all recreators wanted scenic beauty as part of their outdoor recreation pursuits.

Scenic beauty and availability of recreation opportunities are also critical to the tourism industry. Much of the local economy and local businesses depend on tourism. Scenic beauty of the Kaibab Plateau is also important to the growing Fredonia-Kanab area resident's quality of life, as well as the sense of place of long time residents.

### **Visual**

The Visual Quality Objectives (VQO) for the area include the following: The primary road corridors, Highways 67 and 89A are mapped as Retention foreground and middleground. Other retention areas include the Arizona Trail corridor, and parts of FR 257, 248 (northern portion), and 225. Partial Retention is called for on Highway 89A approximately 4 miles north and 6.5 miles east of Jacob Lake. There are also Partial Retention road corridors on FR 248 (south and central portions), 461, 462, 205. The remaining area does not have specific VQO assigned in the Kaibab Forest Plan, and were given a general Modification status.

The Kaibab National Forest is in the process of converting to the Scenery Management System (SMS) from Visual Quality Management (VQO). Scenic integrity is a measure of the degree to which a landscape is visually perceived to be complete per SMS. For this project, the scenic integrity of the Jacob Ryan project area is moderate to low depending upon the viewer's location. Moderate (approximately equal to Partial Retention) refers to a landscape character that appears slightly altered. Noticeable

deviations are visually subordinate to the landscape character being viewed. This would be the case primarily along the highways, as well as a few of the major forest roads that are shown on the North Kaibab Ranger District visitor map. These generally fit into moderate because little vegetation manipulation has occurred, not because these are natural appearing stands of trees. Low (approximately equal to Modification) refers to landscapes where valued landscape character appears moderately altered. Deviations begin to dominate the valued landscape. Many of the past vegetation treatments are examples of Low Scenic Integrity. These have resulted in stark contrasts between adjacent areas, stands of trees that are even aged where this would not normally be the growth habit of ponderosa pine, overstocking, and un-natural appearing areas where resource activities dominate the landscape.

Specific analysis of the Highway 89A and Highway 67 road corridors was completed in addition to the overall assessment of scenic integrity (see Assessment of the Quality of the Scenic Driving Experience – Jacob Ryan Project Area, in the PR). Highway 89A has been designated as an Arizona Scenic Road, and Highway 67 is National Scenic Byway. Maintenance of high quality scenery along both of these corridors is critical. A numerical rating was given to both road corridors, based on six criteria. The roads both had scores of 24.5 out of 35 potential points. These would be very average ratings for prominent highways.

Aspen stands are highly valued in the Southwest, as are most native deciduous trees. The popularity of such stands is particularly evident during the fall leaf-viewing season. Aspen stands are relatively short-lived, in order to have them as a component of the ponderosa pine forest, vegetation management will be needed, or stand replacing fires, doing nothing will eventually result in their disappearance as an important source of visual contrast.

## Recreation

The project area is assigned ROS categories of "Roaded Natural Appearing", "Semi-primitive", and "Semi-primitive Non-motorized", per the Forest Plan. Roaded Natural Appearing is a subclass of Roaded Natural, and occurs where there is moderate evidence of human modification, and natural characteristics remain dominant. An example might be where there are many high standard forest roads in the area, but there is a sense of remoteness because of the distance from major travel ways. Semi-primitive (motorized) is characterized by a largely undisturbed natural environment, with little evidence of human development. Vegetation alterations in these areas would be small in size and number and widely dispersed and not evident. Semi-primitive Non-motorized areas would be similar to the motorized areas, but access and travel is non-motorized on trails, some primitive roads or cross-country.

A number of recreation developments are present in the Jacob Ryan planning area. At Jacob Lake and the immediate vicinity are:

- Jacob Lake Inn – a long-term special use permitted resort.
- CampeRVillage – a privately operated RV park.
- Kaibab Plateau Visitor Information Center – a Forest Service operated information center for the plateau and adjoining Grand Canyon National Park North Rim.
- Jacob Lake Campground – a large, concessionaire operated Forest Service campground.
- Jacob Lake Picnic Area and Group Area – a concessionaire operated Forest Service day use area, and reservation group campground.
- Allen's Equestrian – a special use permitted stable with trail rides on National Forest lands.
- Arizona Trailhead – a Forest Service trailhead along the Arizona Trail (a trail that spans Arizona from north to south).
- Jacob Lake Ranger Station – an historic Forest Service ranger station site that has been restored for interpretive programs.

In addition to the recreation facilities, there are other developed areas including the Forest Service Jacob Lake Administrative Site, a communications site, Jacob Lake Fire Lookout Tower, and the ADOT maintenance yard north of Jacob Lake.

The Jacob Ryan area receives use from dispersed camping, hunting, hiking, horseback riding, off-highway vehicles, forest product gathering, and other activities. Although these activities are generally less concentrated in their impacts or numbers of people in one area, the expectation for a quality recreation experience is still high. Often dispersed users are more sensitive to vegetation alterations than users who are mainly viewing scenery from their vehicles.

## **Visual and Recreation Environmental Effects**

### **Alternative A**

There would be slow changes in the landscape as time passes, changes in the scenery would result from natural disturbances rather than planned activities. The forest would continue to have tree densities many times greater than historic conditions. The lack of visual diversity would continue, and the monotony and tunnel-like experience driving along the major highways would remain the same. The landscape integrity would continue to be broken up, with abrupt changes due to past management practices, many acres of even-aged stands of trees, few meadows or openings, and few areas of different plant species such as aspen, Gambel oak, shrubby species and forbs. In some instances, the meadows and aspen stands would disappear as the ponderosa pine forest overtakes them. The potential for large-scale natural disturbances such as wildfire and insect infestation would remain high and increase over time. Hazard trees would be removed as needed along the roadside, but the Timber Influence Zone would continue to be maintained. While these are natural occurrences, stand replacing fires and the resulting erosion processes or large scale tree mortality would generally be considered visually unappealing and possibly catastrophic to visitors and nearby permittees and businesses. The landscape would recover over time, and the visual quality would improve as well, but this timeline could be over several human generations.

The current recreation opportunities and the quality of the experiences would remain the same unless a large-scale event (wildfire or tree mortality) occurs. If such an event occurs, the recreation opportunities would change drastically, and most likely in a negative direction for the foreseeable future. There is also a good chance that the facility investments at Jacob Lake would be burned as well. Vehicle travel would be restricted only in areas designated in the Forest Plan or future management actions such as any proposals resulting from the Five Forest Off-Highway Vehicle Environmental Impact Statement.

### **Alternative B**

The Jacob Ryan vegetation management project, with the mitigation measures proposed, would result in improved scenic quality over time. The ponderosa pine forest would appear more open; stands would have more groups of trees with spaces between them. Overall tree density would be reduced, and would move toward pre-settlement conditions. Grass, forb and shrub growth would increase due to the creation of openings. Meadow enhancements would stop the encroachment of pines, and create needed visual diversity in the forested lands. Oak clumps and aspen stands would be opened up and competing trees thinned or removed, resulting in more vigorous growth and possibly an increase in the quantity of these species. If aspen stands are a valued component of the desired condition, further management activities would be required to maintain their presence. Old growth trees would be visible and would appear as groups instead of even-aged areas of large trees. The Travel Influence Zone would be largely removed, resulting in less abrupt changes between stands. Treated areas would be less vulnerable to crown fires, and more likely to withstand wildfire and insect infestations in the future.

Short-term impacts of thinning and slash treatment would be apparent during the vegetation treatments. These would lower visual quality. Thinning activities would include tree cutting, tree yarding (gathering into landings), tree removal via log trucks, slash treatments, and burning of slash and broadcast burning. In areas scheduled for broadcast burning, there would be noticeable charred areas, scorched tree canopies and bark. These visual results may be considered unpleasant to forest users. Timing in vegetation removal projects is always a concern. In areas along the highways with a retention visual quality objective, slash treatments should be completed as soon as possible. In partial retention VQO, generally slash should be treated as soon as possible, or in a maximum of one year after vegetation removal is completed. In areas of modification VQO, the area should appear visually compatible as soon as possible, or within one to two years after treatment is completed. It is acknowledged that weather and other unforeseen conditions can alter the vegetation and slash treatment schedules. This being said, the guidelines stated above must be adhered to as closely as possible in order to meet the visual quality objectives.

The fact that many public viewers generally consider the existing condition desirable should not be seen as an endorsement of the present condition, rather an indication of people being comfortable with what they are familiar with. Incremental change is generally more acceptable than drastic changes. Initial reactions to trees being harvested, ground disturbed, and freshly burned landscapes will often be negative. Over time as these changes diminish and areas "green up" in the spring, the reactions begin to be more positive. Overall the scenic effects of the proposal will result in temporary lowering of the visual quality, with increases over the existing condition within ten years. It is anticipated the proposed activities will also bring the scenic integrity to a higher level, where the valued landscape character appears only slightly altered. Noticeable deviations will be lessened, and progress will be made toward the desired condition. The landscape integrity will also be improved, as there would be less drastic changes in tree cover, meadows and smaller openings reappear in the landscape, and trees of all sizes and ages would be present.

There would be a short-term decrease in recreation opportunities because of the vegetation management activities. Some hunters might be displaced, dispersed campers might not be able to use their favorite camping spot, hikers may be restricted to established trails, or may be asked to stay out of areas where trees are being felled, or equipment being used. There may also be restrictions for users if broadcast burning is taking place. Off-highway vehicle users would still be able to use existing open roads, but some roads may be closed in the Jacob Ryan area. Cross-country vehicle travel would be restricted only in areas designated in the Forest Plan or future management actions such as the Five Forest Off-Highway Vehicle Environmental Impact Statement. Special Use permittees, such as Allen's Equestrian would be assured of access to areas for trail rides.

### **Alternative C**

Vegetation management under Alternative C, with the mitigation measures proposed, would result in somewhat improved scenic quality over time. The ponderosa pine forest would appear more open, stands would have more groups of trees in some areas, but others would continue to look like even-aged stands if there is a dominance of trees over 12 inches diameter breast height (DBH). Overall tree density would be reduced, and there would be some movement toward pre-settlement conditions. Grass, forb and shrub growth would increase due to the creation of openings, but not as much as in Alternative B. Meadow enhancements would stop the encroachment of pines, and create needed visual diversity in the forested lands. Oak clumps and aspen stands would be opened up and competing trees thinned or removed, resulting in more vigorous growth and possibly an increase in the quantity of these species. Old growth areas with trees over 12 inches DBH would not be treated, thus no spacing would be introduced around the trees and they would remain visually less stimulating than in Alternative B. Treated areas would be somewhat less vulnerable to crown fires, and somewhat more likely to withstand wildfire and insect infestations in the future. Hazard trees along the highway would continue to be a problem, creating icy conditions in densely shaded areas, and the potential for trees falling into the highway. There is also the

concern that by not managing the roadside area, the Timber Influence Zone will be partially maintained, causing the abrupt changes in vegetation treatments to continue.

Vegetation treatments and slash treatments would have similar effects as delineated in Alternative B. It is anticipated there would be more trees with charred areas, scorched tree canopies and bark, as fewer stems will be removed, and fires will generally burn hotter with more fuels. These visual results may be more noticeable and considered unpleasant to forest users. This alternative would need to meet the same general timeframe as stated in Alternative B.

Overall the scenic effects of the proposal will result in temporary lowering of the visual quality. It is anticipated the proposed activities will bring the scenic integrity to a higher level, where the valued landscape character appears only slightly altered over time. Noticeable deviations will be lessened somewhat, although there will still be abrupt changes in numbers of trees in areas where previous vegetation removal projects have occurred. Hazard trees along the highway will not be removed, potentially increasing the distractions of drivers and lowering the visual quality of the driving experience. Progress will be made toward the desired condition although at a slower pace than in Alternative B.

There would be a short-term decrease in recreation opportunities because of the vegetation management activities. Some hunters might be displaced, dispersed campers might not be able to use their favorite camping spot, hikers may be restricted to established trails, or may be asked to stay out of areas where trees are being felled, or equipment being used. There may also be restrictions for users if broadcast burning is taking place. Off-highway vehicle users would still be able to use existing open roads, but some roads may be closed in the Jacob Ryan area. Cross-country vehicle travel would be restricted only in areas designated in the Forest Plan or future management actions such as the Five Forest Off-Highway Vehicle Environmental Impact Statement. Special Use permittees, such as Allen's Equestrian would be assured of access to areas for trail rides.

### **Cumulative Effects**

Timber management, fuels reduction projects, recreation developments, and historic forest management activities in the Jacob Ryan area have resulted in changes to the "natural appearing" landscape and to both scenic integrity and landscape integrity. The greatest factors have probably been fire suppression and logging practices that changes the natural age structure and distribution in the ponderosa pine forest. The development of highways 89A and 67 has increased the human impacts in the area along with the concentration of services at Jacob Lake. The recreation developments have also resulted in the urban interface situation that makes the vegetation treatments in Jacob Ryan critical to reduce fire hazard. Current management activities close by include Jacob Ryan Watershed Improvement and Hidden Fire Salvage. Both projects will result in short-term changes in the scenic integrity, but it is expected the overall effect will be positive. Future management activities proposed for this area include: Telephone Hill and Billy-West vegetation management; Jacob Lake Campground reconstruction; range improvement projects; improvements and expansion at Jacob Lake Inn; and, improvements at Allen's Equestrian permit area.

Evidence of management activity will be high during vegetation management activities, and to a lesser extend during reconstruction at recreation developments. The timing of the end of Jacob Ryan vegetation and fuels treatments may coincide with the beginning of treatments on Telephone Hill or other vegetation management project. The visual quality experienced along the Highway 67 corridor would be lowered over a longer period of time if this occurs, in the worst case, 10 to 15 years, depending upon the timing and areas being treated. The long-term effect of these projects, if they have a similar desired condition, will be to improve both scenic and landscape integrity.

## **Roads and Access**

### **Roads and Access Affected Environment**

On January 12, 2001, the Forest Service adopted a final policy governing the national forest transportation system (36 CFR § 212). Responsible officials are to incorporate an interdisciplinary, science-based analysis, termed a 'roads analysis' into project level planning efforts in order to analyze road system opportunities, needs, and priorities that support land and resource management objectives.

This interdisciplinary analysis resulted in draft recommendations for roads in the Jacob Ryan analysis area. This analysis meets the requirements of the six steps outlined in *Roads Analysis: Informing Decisions About Managing the National Forest Transportation System* (USDA 1999) and meets the requirements set forth under FSM 7712.1 (see RAP in the PR).

During scoping, several members of the public commented that road closures would be a beneficial activity to undertake. No negative comments regarding road closures have been received. However the District made the effort to contact Arizona Department of Game and Fish and the Kane County Resource Committee to seek additional comments about road closure (see RAP notes in the PR).

The Roads Analysis process proposes changes to the Jacob Ryan area road system based on balancing the need to provide access within current budget capabilities, with the need to minimize adverse effects.

The current road system in the project area has approximately 6.0 miles of road per square mile (see road information analysis in the PR). These roads are in various stages of drivability; some are not maintained or are only suitable for high clearance vehicles. Past Off Highway Vehicle use has created some short user roads in the area. As road maintenance budgets decrease, these short user roads and some of the high clearance roads will become even less drivable. These roads also increase the chance of harassment for wildlife species. The current road system is too large to adequately maintain across the District.

### **Roads and Access Environmental Effects**

#### **Alternative A**

The no-action alternative, maintains the current road system. No roads would be closed. Direct, indirect and cumulative effects from possible continued sediment contribution, possible noxious weed encroachment, and harassment to wildlife species (Canfield et al. 1999) would continue to occur (see the Road Closures Section in the BA/BE in PR). However, access would not be limited to forest visitors under this alternative. Hunters, people driving for pleasure, and other visitors to the forest would continue to be able to use all roads within the area. As budgets continue to decline, fewer roads within the area would be maintained at current standards. This may contribute to decreased positive driving experiences as the roads become difficult to navigate.

#### **Alternatives B and C**

Alternatives B and C propose closing approximately 110 miles of road within the project area boundary (see proposed action). Closing 110 miles of road would reduce the road density from 6 miles of road/square mile to 3 miles of road/square mile (Figure 4). Direct, indirect, and cumulative effects to the aquatic and terrestrial ecosystem would diminish as these roads are closed. Wildlife species would experience less harassment (see RAP meeting notes 6/24/03 in the PR) and there would be a reduced possibility for noxious weed encroachment. Closing these roads would enable the Forest Service to better meet their ability to maintain the remaining road system.

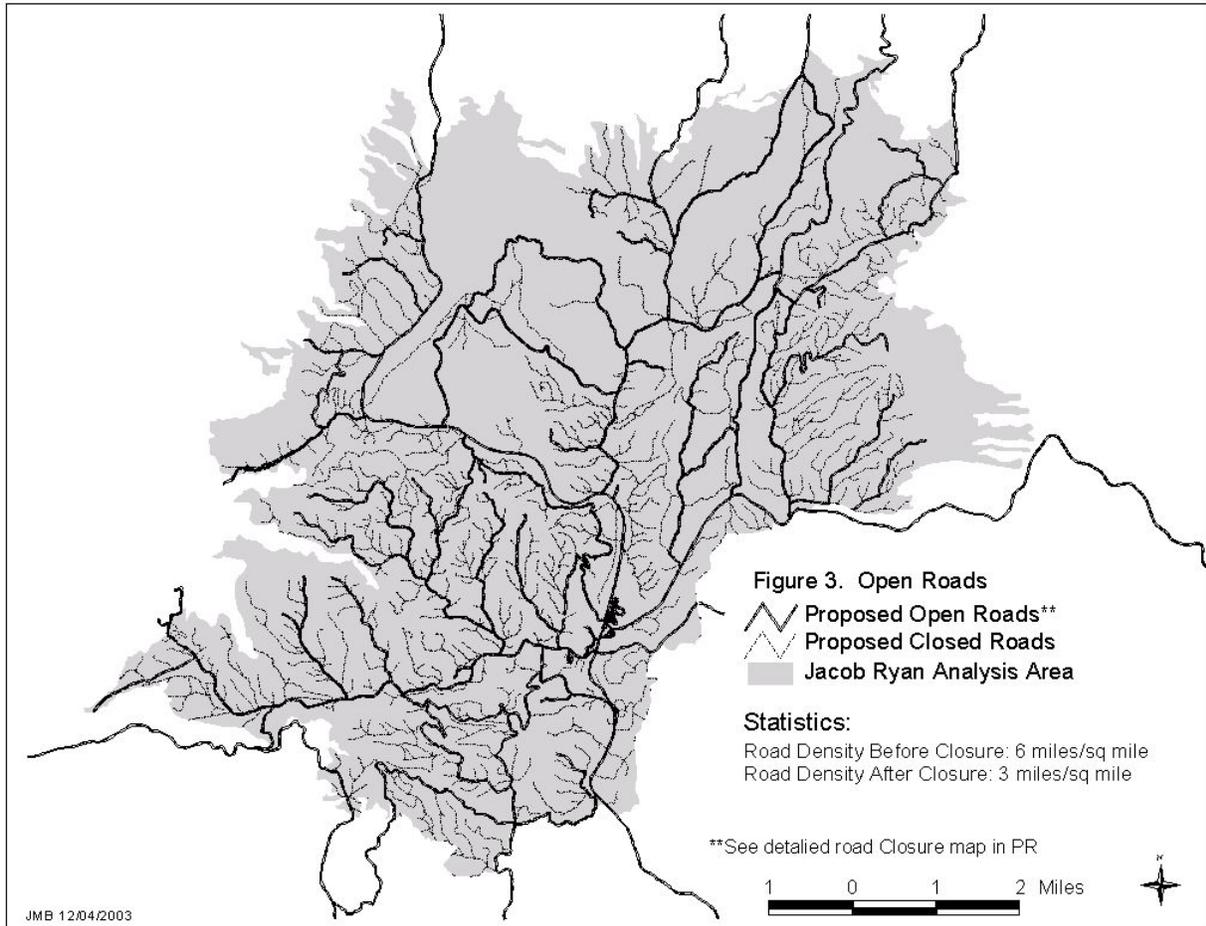
Access to forest visitors would be diminished in the immediate project area, but many miles of roads still exist for those who desire access. These alternatives would have the most impact to people who desire full access to the National Forest.

For fire suppression efforts, the effect of closing these roads would be in a slightly delayed response to initial attack efforts, should a wildfire occur. Delays in fire response times to the areas currently accessible from these spur roads can be expected. Resources would take a longer time to arrive at the incident.

Resources sent to the incident would likely change from an engine crew that may currently have direct access, to a hand crew that would walk in, smoke jumpers or rappellers (aerial delivery); there may be increased need for retardant to slow the fire spread until ground forces can arrive.

Fire size can be expected to increase as a result of a delayed response. Estimated fire size would be dependent on location of start, type of fuel model supporting the ignition, and weather conditions at the time of ignition. The suppression cost would increase as a result of type of resources used and an increase in overall fire size.

There would likely be an increase in the number of fires that escape initial attack efforts. This would be most noticeable when there are multiple starts on district and access is limited. However, due to the access that would remain within the planning area, these effects are expected to be minor.



## Economics

The Forest Service measures economic efficiency in terms of the Present Net Value (PNV) and the Benefit/Cost (B/C) ratio. The PNV and B/C ratio of the various alternatives, using a 4% interest rate, discounted to 2003 are displayed in Table 3.14. The B/C ratio is strictly a comparison of the revenues received per dollar of cost. A ratio greater than 1 indicates that revenue is higher than costs; a ratio less than 1 indicates costs higher than revenues. A positive PNV indicates an amount by which revenues exceed costs; a negative PNV indicates how much costs exceed revenues (See Quick Silver analysis and Silviculture report in the PR).

Table 3.14. Calculated Benefit/Cost (B/C) Ratio Results and the Present Net Value (PNV).

Revenues and Costs	Alternative A	Alternative B	Alternative C
Revenues: Present Value \$	0	\$1,362,120	\$241,240
Costs: Present Value \$	\$214,290	\$1,300,648	\$1,058,971
Present Net Value \$	-\$214,290	\$61,472	-\$817,731
Benefit/Cost Ratio	0	1.05	0.23

Alternative B would remove enough material (approximately 12 to 19 MMBF of trees in the 9 to 18 inch range and 48,000 - 53,000 Tons 4-8.9”) that the vegetation management project would pay for itself while enhancing wildlife habitat. Alternative C’s 12 inch diameter cap would preclude this sale from paying for itself. In a study by Larson and Mirth (2001), a 16 tree cutting cap resulted in implementation costs increases of 5-19.4 %. The cap limited the operator’s ability to function profitably because there was not a market for smaller material (pulp mill, fiber board plant etc.). Thus, in this study, the 16 inch cap had a negative effect on the economics of forest thinning. There is no market for smaller material in the northern Arizona, southern Utah region that could make a sale with a 12 in diameter cap (Alternative C) profitable.

Alternative B supports the Memorandum of Understanding (MOU 04-MU-11046000-060) between the USDA Forest Service, Southwestern and Intermountain Regions, and the State of Utah by building “the capacity to accomplish restoration projects” and encouraging “local employment in order to benefit the management of the National Forests and communities of the Central Colorado Plateau and Great Basin.” Alternative C does not support to the Memorandum of Understanding as well as Alternative B because Alternative C’s diameter cap makes the project unprofitable.

## **Cultural Resources**

All treatment areas within the Jacob Ryan Planning Area have been systematically surveyed for cultural resources (see Inventory standards and Accounting form in the PR). The sites that were found and any site located during the proposed activities will be protected by standard protection measures outlined in the heritage resource assessment. Activities associated with the Jacob Ryan Vegetation management project will have no adverse effects on historic properties and will be in compliance with Section 106 of the National Historic Preservation Act, as amended if the management recommendations contained within the heritage resource assessment are followed.

See Jacob Ryan Planning Area Inventory Standards and Accounting form in the PR for State Historic Preservation Office concurrence. Consultation with local American Indian tribes was conducted to identify any areas of cultural sensitivity within the Planning Area. No specific areas were identified.

## 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:

### ID TEAM MEMBERS:

**Jonathan Beck** - North Kaibab Ranger District, Environmental Coordinator  
**Tim Howard** - North Kaibab Ranger District, District Silviculturist  
**Jeff Wells** - North Kaibab Ranger District, District Biologist  
**Melissa Siders** – North Kaibab Ranger District, District Biologist  
**Roger Hoverman** - North Kaibab Ranger District, Fuels Specialist  
**Charlotte Minor** – Kaibab National Forest, Landscape Architect  
**Kyra Thomas** - North Kaibab Ranger District, District Biologist

### OLD GROWTH COLLABORATION GROUP

#### *Non-Forest Service Employees:*

**Liz Taylor and Jon Souder** (NAU Forestry professors)  
**Steve Sennie** (NAU student)  
**John Schmidt** (Utah Forest Products)  
**Bill Austin** (US F&WS)  
**Rick Miller** (AZ G&F)  
**Sharon Galbreath** (Sierra Club)  
**Brian Segee** (Center for Biological Diversity)  
**Chris Newell** (Grand Canyon Trust)  
**Martos Hoffman** (SW Forest Alliance)

#### *Forest Service employees:*

**Bruce Higgins** (Forest Planner)  
**Scott Nannenga** (Stewardship Branch Leader)  
**Dan Garcia/Melissa Siders** (Wildlife Biologists)  
**Dave Steffensen** (Silviculturist)  
**Roger Hoverman** (Fuels Specialist)  
**Jill Leonard** (District Ranger)

### **FEDERAL, STATE, AND LOCAL AGENCIES:**

Arizona Department of Game and Fish

### **TRIBES:**

The Kaibab Band of Paiute Indians  
Hopi Tribe

## Literature Cited

Arizona Game and Fish Dept. 1994. Special Status Plants of the North Kaibab Ranger District and Vicinity Kaibab National Forest. Arizona Game and Fish Dept., Heritage Data Management System. Phoenix, AZ.

Canfield, J. E. Lyon, J., Hillis, J. M., and Michael J. Thompson. 1999. Ungulates Effects of Recreation on Rocky Mountain Wildlife A Review for Montana. Montana Chapter of the Wildlife Society.

Fulé, Peter, Z., C. MCHugh, T. A. Heinlein, and W. Wallace Covington. 2001. Potential fire behavior is reduced following forest restoration treatments. USDA Forest Service Proceedings. RMRS-P-22.

Graham, RT and S. McCaffery. 2003 Influence of Forest Structure on Wildfire Behavior and the Severity of Its Effects. USDA Forest Service. (in peer review) Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.

Harrington, M.G., and Hawksworth, F.G. 1990. *Interactions of fire and dwarf mistletoe on mortality of southwestern ponderosa pine*. Dwarf Mistletoes: Biology, Pathology and Systematics, Agriculture handbook 709, March 1996.

Howard, Tim. 2003. Silviculture Report for Jacob-Ryan Vegetation Management Project. USDA Forest Service, North Kaibab Ranger District. Final Report, Dated November 9, 2003.

Joy, Suzanne M. 2002. Northern Goshawk Habitat on the North Kaibab Ranger District in Arizona, Factors Affecting Nest Locations and Territory Quality. Dissertation for Graduate Degree in Ecology. Colorado State University, Fort Collins. Fall 2002. 223pp.

Larson, Debra and Richard Mirth. 2001. Projected economic impacts of a 16-inch tree cutting cap for ponderosa pine forests within the greater Flagstaff urban-wildlands. USDA Forest Service Proceedings RMRS –P-22.

Latta, M. J., C.J. Beardmore, T.E. Corman. 1999. Arizona Partners in Flight Bird Conservation Plan. Technical Report 142. Nongame Endangered Wildlife Program, Arizona Game and Fish Dept., Phoenix, AZ.

Phillips, B.G., and G. Holsten. 1996. Paradine Plains Cactus Conservation Assessment and Strategy on the North Kaibab Ranger District, Kaibab National Forest and Arizona Strip District, Bureau of Land Management. Oct. 3, 1996.

Reynolds, Richard T., R. T. Graham, M.H. Reiser, R.L. Bassett, P.L. Kennedy, D.A. Boyce, Jr., G. Goodwin, R. Smith and E.L. Fisher. 1992. Management Recommendations for the Northern Goshawk in the Southwestern United States. USDA Forest Service, Rocky Mountain Research Station. General Technical Report RM-217.

Ribe, Robert G. 1989. Scenic Beauty Perceptions Along the ROS. USDA Forest Service Cooperative Research Project 23-89-80.

Roth, L.F. 1996. *Foliar habit of ponderosa pine as a heritable basis for the resistance to dwarf mistletoe*. Dwarf Mistletoes: Biology, Pathology and Systematics, Agriculture handbook 709, March 1996.

Sesnie, Steven E. 2001. *Environmental Histories: A Foundation for Adaptive Forest Management on the Kaibab Plateau in Northern Arizona*. Master of Science in Forestry Thesis, Northern Arizona University.

USDA Forest Service. 2003. *Implementation and Interpretation of Management Recommendations for the Northern Goshawk*, (KNFI&I). Menasco, Keith A. and Higgins, Bruce. Kaibab National Forest, Southwestern Region.

USDA Forest Service. 1997. *Landscape Assessment for Jacob Ryan Ecosystem Management Area*. CEEM Project. WhiteTrifaro, Linda, et al. Kaibab National Forest, Southwestern Region.

USDA Forest Service. 1996. *Record of Decision for Amendments of Forest Plans, Arizona and New Mexico*. Kaibab National Forest, Southwestern Region.

USDA Forest Service. 1991. *Terrestrial Ecosystem Survey of the Kaibab National Forest*. Kaibab National Forest, Southwestern Region.

# Appendix I: Possible Management Options and VSS Response

2003 Inventory Conditions

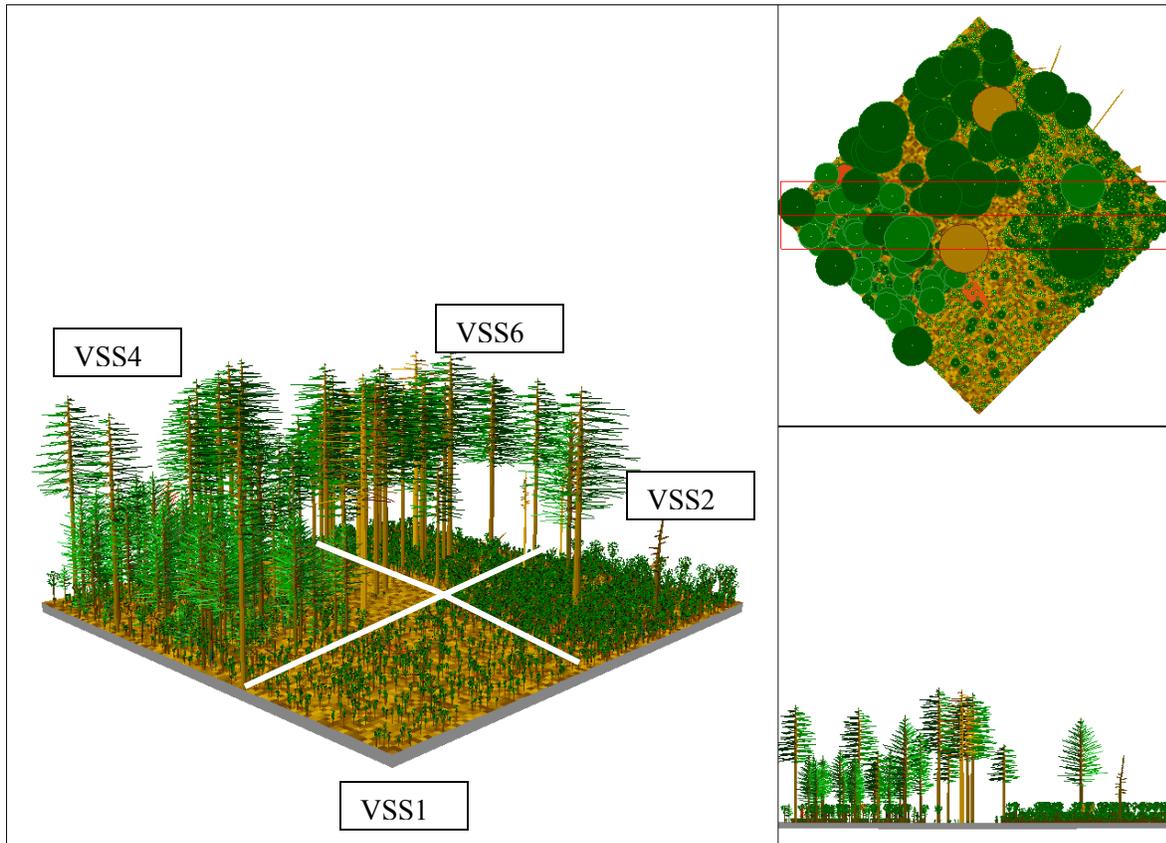


Figure 1.1. 2003 Inventory Conditions

Figure 1.1 depicts an existing landscape with VSS 2 on the right side, VSS 4 on the left side, and VSS 6 in the middle prior to vegetation treatments. Please note the individual large diameter tree in the VSS 2 stand. VSS refers to the Vegetation Structural Stage that dominates the stand; therefore, this individual tree is not a “VSS 6 tree”. It is merely a large diameter tree in a VSS 2 stand.

2005 After Vegetation Treatment

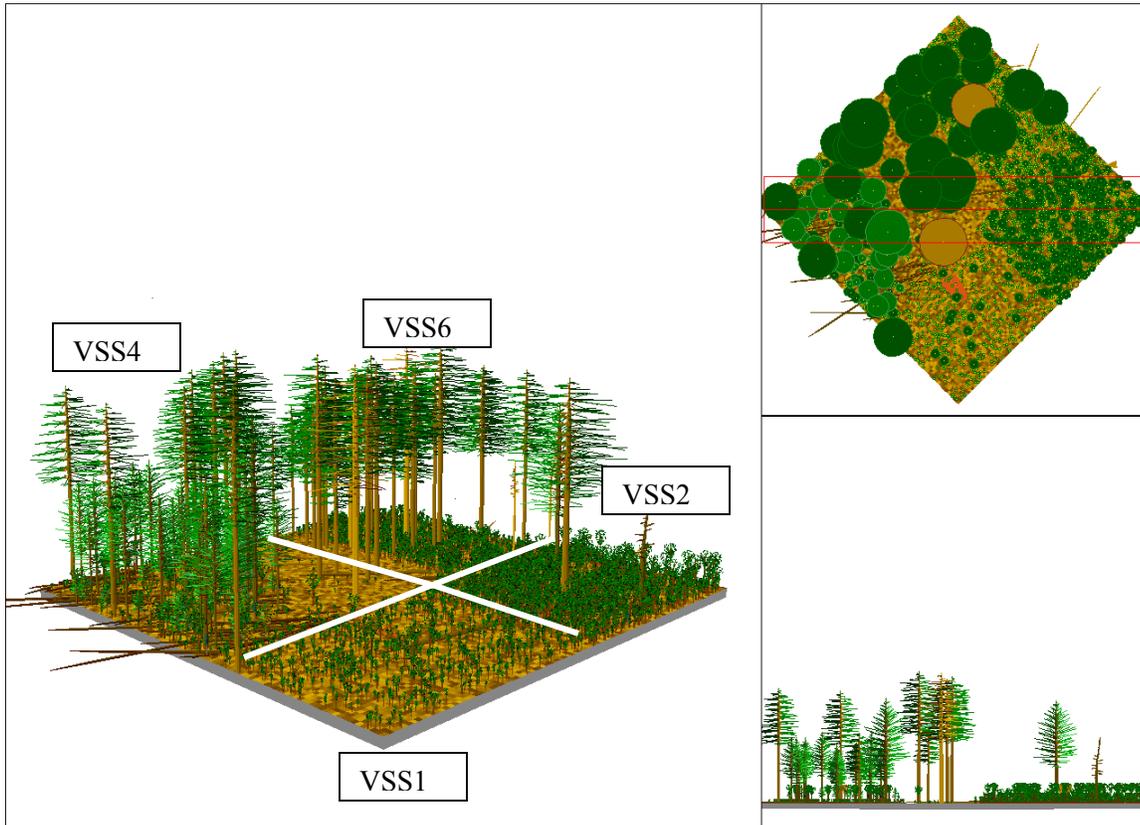


Figure 1.2. 2005 Conditions After Vegetation Treatment

Figure 1.2 displays the VSS after vegetation treatments have occurred. The removal of trees less than 24" dbh using a thinning-from-below prescription in the VSS 6 group did not change the VSS. It enhanced the group by removing the competition. On the left side of the diagram thinning trees between 12" dbh and 17.9" dbh in the VSS 4 did not change the VSS of the group after treatment. Note the single large tree (24" dbh) that overtopped the VSS 2 was not removed.

## Appendix II: 500 and 803 Stands

Location and site for stands requiring plan amendment to restore to meadow condition.

Location	Site	Timber component 500	Timber component 803	Total Acres
003054	0018		2.04	2.0
	0020		4.26	4.3
	0023	1.09		1.1
	0163	0.82		0.8
003055	0001		1.09	1.1
	0004	20.92		20.9
	0006	12.84		12.8
	0008	0.50		0.5
	0011	0.57		0.6
	0012	4.73		4.7
	0101	3.05		3.0
	0113	0.61		0.6
	0114	8.44		8.4
	0149	0.16		0.2
	0152	1.81		1.8
003146	0002	5.89		5.9
	0003	5.72		5.7
	0130	0.61		0.6
003150	0002	1.19		1.2
	0003	0.90		0.9
003151	0008	2.08		2.1
	0011	0.50		0.5
	0158	11.55		11.6
	0170	0.30		0.3
	0173	30.35		30.3
	0174	12.73		12.7
	0176	3.75		3.8
003155	0011	0.08		0.1
	0013	1.56		1.6
	0016	12.42		12.4
	0019	2.60		2.6
	0021	5.43		5.4
	0024		8.90	8.9
	0033	0.58		0.6
003186	0010	13.84		13.8
	0122	0.03		0.0
003188	0017	0.01		0.0
	0019	3.08		3.1
	0120	0.02		0.0
Total Acres		170.7	16.3	<b>187.0</b>

## Appendix III: GLOSSARY

**Acre** - A unit measurement of land area containing 43,560 sq. ft., approximately 209 feet by 209 feet.

**Audit Unit** - An area of land whose boundaries match stand boundaries and is an approximation of a particular goshawk foraging area or post-fledging area.

**Basal Area** – The cross-sectional area of a tree's bole at 4.5 feet above the ground, and expressed as a ratio of bole area to land area (for example: sq. ft./acre). The basal area of stands is the cross-sectional area of all trees in the stand divided by the number of acres in the stand.

**Commercial Thinning** - A thinning operation in which all or part of the felled trees are removed for useful products.

**Cover Type** - The dominant tree species that occurs in a stand.

**Dwarf Mistletoe** - A parasitic plant that grows on conifer trees and uses water and nutrients from the trees.

**Foraging Area** - An area of roughly 5400 acres used by the northern goshawk for foraging.

**Fuelbreak** - Land that is maintained at a low level of vegetation, both live and dead, to impede the spread of a wildfire.

**Fuel Loading** - The amount of combustible material present in a given area, usually expressed in tons per acre.

**Group Selection** - Removal of small groups of trees from an uneven-aged forest.

**Heritage Resource** - The remains of sites, structures, or objects used by humans in the past (more than 40 years ago); either historic or prehistoric.

**Jackpot Burn** – Burning slash that is in natural concentrations (jackpots). The slash has not been piled but has usually been lopped.

**Lopping** – Treating slash so that it will lie closer to the ground and thus decay more rapidly. Usually done with chainsaws and cut so that the slash is within 2 feet of the ground.

**Machine Piling Slash** – Slash that is piled with a bulldozer. Piles are generally no larger than 25 feet in diameter and 10 feet in height.

**MASS Model** – Old growth model developed by the Old Growth Collaborative Group that classifies old growth based on identifiable characteristics.

**MMBF** - One million board feet of timber.

**Nest Area** - An area roughly 30 acres in size which may include more than one nest. A goshawk pair occupies the nest from early March to late September.

**Precommercial Thinning** - The practice of removing some trees of less than merchantable size (<9 inches in diameter) from a stand so that the remaining trees will grow faster.

**Prescribed Fire** - Fires that are ignited by resource managers to meet management objectives and allowed to burn only under certain conditions.

**Pile Burning** - The burning of activity generated slash or existing fuels that have been piled by hand or by machine.

**Post-fledging Family Area (PFA)** – An area of roughly 420 acres where young goshawks learn to hunt; within that area the desired tree density is greater than in the foraging area which surrounds the post fledging-family area.

**Sanitation/Salvage** - Removal of dead, damaged, or infected trees primarily to prevent the spread of insects or diseases and to promote forest health.

**Sensitive Species** - A plant or animal identified by the Forest Service for which the population viability is a concern.

**Slash** - The residue left on the ground after logging, including logs, uprooted stumps, branches, twigs, leaves and bark.

**Snag** - A standing dead tree.

**Stand** - A spatially continuous group of trees and associated vegetation having similar structures and growing under similar soil and climatic conditions.

**Stand-replacing fire** - A severe fire which burns through the forest canopy (crown fire) and kills all or nearly all of the trees over a large area, setting the area back to an earlier successional stage.

**Succession** - The change in species composition as a forest stand ages--from bare soil to grass to shade intolerant tree species such as aspen or ponderosa pine to shade tolerant species such as white fir, subalpine fir or Engelmann spruce.

**Vegetation Structural Stage (VSS):** A Generalized description of forest growth and aging stages based on the majority of the trees in the specific diameter distribution of the stand. Six growth stages are identified (see Table 3.1 below). For example, if the majority of the stems in a stand (based on basal area) were in the 12-18 inch diameter class the stand would be classified as a VSS 4.

Table 3.1. Tree diameter range and description for the Vegetation Structural Stages (VSS).

VSS	DBH Range in Inches	Description
1	0-1	grass-forb-shrub (opening)
2	1-5	seedling/sapling
3	5-12	young forest
4	12-18	mid-age forest
5	18-24	mature forest
6	24+	old forest

## Appendix IV: Summary Comparison of Alternatives

Matrix 1. Summary Comparison of Alternatives for the Jacob-Ryan Analysis Area.

MATRIX			Alternative A			Action Alternative B			Action Alternative C		
Issue	Indicator	Desired Outcome	Existing Condition <sup>1</sup>	Short-term <sup>3</sup>	Long-term <sup>4</sup>	Immediate <sup>2</sup>	Short-term	Long-term	Immediate	Short-term	Long-term
<i>Threatened, Endangered, and Proposed Species &amp; Species Managed Under a Conservation Agreement</i>											
<i>Kaibab plains cactus (Conservation Agreement)</i>	# Individuals impacted	None	None	None	None	None	None	None	None	None	None
	# Acres suitable habitat impacted	None	None	None	None	None	None	None	None	None	None
<i>Forest Service Southwestern Region Sensitive Species</i>											
Northern goshawk	Post-Fledgling Family Area (PFA)										
	<i>Ponderosa Pine Habitat:</i>										
	# PFAs treated per MRNG <sup>5</sup>	Increase in number	0	0	0	29	29	29	29	29	29
	TPA large ponderosa pine snags (≥18" dbh <sup>6</sup> & ≥ 30' tall)	2 per acre	0.94	0.90	0.86	0.92	0.85	0.77	0.93	0.89	0.84
	VSS <sup>7</sup> distribution:										
	% VSS1	10%	10.5	2.5	1.5	3.3	1.9	1.0	5.0	3.0	1.6
	% VSS2	10%	8.2	17.5	20.1	12.4	16.9	20.2	10.1	15.8	20.0
	% VSS3	20%	24.9	23.6	23.4	23.0	21.9	21.9	13.6	13.2	14.6
	% VSS4	20%	19.5	18.7	18.5	19.5	18.7	18.0	23.1	21.2	19.0
	% VSS5	20%	20.6	18.5	17.6	22.7	21.4	19.6	23.8	22.8	21.4
	% VSS6	20%	16.2	19.2	18.9	19.1	19.2	19.3	24.4	24.0	23.4

MATRIX			Alternative A			Action Alternative B			Action Alternative C			
Issue	Indicator	Desired Outcome	Existing Condition <sup>1</sup>	Short-term <sup>3</sup>	Long-term <sup>4</sup>	Immediate <sup>2</sup>	Short-term	Long-term	Immediate	Short-term	Long-term	
<i>Northern goshawk</i>	% Canopy closure <sup>8</sup> : VSS5	Min. 50%	15.36	17.16	18.08	13.89	14.63	15.43	16.41	17.31	18.30	
	VSS6	Min. 50%	10.83	13.52	15.14	11.93	13.41	15.47	12.43	13.86	15.86	
	Foraging Area Audit Unit (FAAU)											
	<u><i>Ponderosa Pine Habitat:</i></u>											
	TPA large ponderosa pine snags (≥18" dbh <sup>6</sup> & ≥ 30' tall)	2 per acre	1.7	1.51	1.35	1.60	1.42	1.19	1.62	1.49	1.34	
	VSS <sup>7</sup> distribution:											
	% VSS1	10%	17.1	4.2	2.4	3.0	1.6	0.9	5.1	2.8	1.6	
	% VSS2	10%	7.7	15.2	19.8	12.7	17.8	21.2	12.4	18.1	22.0	
	% VSS3	20%	22.8	20.6	19.7	17.4	16.8	18.1	9.0	12.5	17.1	
	% VSS4	20%	18.4	18.4	18.2	15.9	15.8	15.3	22.0	19.1	15.6	
	% VSS5	20%	20.5	18.6	17.8	17.1	16.0	15.0	23.0	21.0	19.3	
	% VSS6	20%	13.7	23.0	22.1	34.0	32.0	29.5	28.5	26.5	24.4	
% Canopy closure <sup>8</sup> : VSS4	Min. 40%	14.47	16.73	18.25	10.06	11.21	12.65	15.01	14.95	14.44		
VSS5	Min. 40%	14.05	15.42	16.63	10.40	11.03	12.23	14.71	15.59	17.07		
VSS6	Min. 40%	12.07	14.07	15.72	12.99	14.38	16.19	12.95	14.44	16.40		

MATRIX			Alternative A			Action Alternative B			Action Alternative C		
Issue	Indicator	Desired Outcome	Existing Condition <sup>1</sup>	Short-term <sup>3</sup>	Long-term <sup>4</sup>	Immediate <sup>2</sup>	Short-term	Long-term	Immediate	Short-term	Long-term
<i>Sharp-shinned hawk</i>	# of known nest sites impacted	None	0	0	0	0	0	0	0	0	0
Flammulated owl	TPA large ponderosa pine snags ( $\geq 18''$ dbh <sup>6</sup> )	Maintain or increase number	1.7	1.51	1.35	1.60	1.42	1.19	1.62	1.49	1.34
<u>Mammals</u>											
<i>Kaibab squirrel</i>	TPA mature ponderosa pine trees ( $\geq 18''$ dbh <sup>6</sup> )	Maintain or increase number	19.64	21.26	22.62	16.04	16.94	18.36	20.39	21.53	23.21
	% Canopy closure <sup>8</sup> VSS4 pine	Min. 40%	14.47	16.73	18.25	10.06	11.21	12.65	15.01	14.95	14.44
	% Canopy closure <sup>8</sup> VSS5 pine	Min. 40%	14.05	15.42	16.63	10.40	11.03	12.23	14.71	15.59	17.07
<i>Spotted bat</i> <i>Allen's lappet-browed bat</i> <i>Townsend's big-eared bat</i> <i>Occult bat</i>	# Acres meadow habitat enhanced	Increase in acreage	0	0	0	263	263	263	263	263	263
	TPA ponderosa pine snags ( $\geq 14''$ dbh <sup>6</sup> & $\geq 15'$ tall)	Maintain or increase number	2.15	1.97	1.80	2.03	1.75	1.41	2.08	1.92	1.76
<i>Management Indicator Species (MIS)</i>											
<u>Early-seral aspen species</u>											
Mule deer	# Acres aspen habitat enhanced	Increase in acreage	0	0	0	3,345	3,345	3,345	3,345	3,345	3,345
<u>Late-seral aspen species</u>											

MATRIX			Alternative A			Action Alternative B			Action Alternative C		
Issue	Indicator	Desired Outcome	Existing Condition <sup>1</sup>	Short-term <sup>3</sup>	Long-term <sup>4</sup>	Immediate <sup>2</sup>	Short-term	Long-term	Immediate	Short-term	Long-term
<i>Red-naped (yellow-bellied) sapsucker</i>	# Acres aspen habitat enhanced	Increase in acreage	0	0	0	3,345	3,345	3,345	3,345	3,345	3,345
Early-seral ponderosa pine species	See FS Sensitive Species	See FS Sensitive Species									
<i>Tassel-eared (Kaibab) squirrel</i>											
Mid-to late-seral ponderosa pine species	See FS Sensitive Species	See FS Sensitive Species									
<i>Tassel-eared (Kaibab) squirrel</i>											
Late-seral ponderosa pine species	See FS Sensitive Species	See FS Sensitive Species									
<i>Northern goshawk</i>											
<i>Hairy woodpecker</i>	TPA ponderosa pine snags ( $\geq 14''$ dbh <sup>6</sup> & $\geq 25'$ tall)	Maintain or increase number	2.08	1.94	1.78	1.98	1.72	1.40	2.03	1.89	1.74
	TPA mature ponderosa pine trees ( $\geq 18''$ dbh <sup>6</sup> )	Maintain or increase number	19.64	21.26	22.62	16.04	16.94	18.36	20.39	21.53	23.21

MATRIX			Alternative A			Action Alternative B			Action Alternative C		
Issue	Indicator	Desired Outcome	Existing Condition <sup>1</sup>	Short-term <sup>3</sup>	Long-term <sup>4</sup>	Immediate <sup>2</sup>	Short-term	Long-term	Immediate	Short-term	Long-term
Late-seral ponderosa pine species											
Pygmy nuthatch	TPA of mature ponderosa pine trees ( $\geq 18''$ dbh <sup>6</sup> )	Maintain or increase number	19.64	21.26	22.62	16.04	16.94	18.36	20.39	21.53	23.21
	# large ponderosa pine snags ( $\geq 18''$ dbh <sup>6</sup> ) per acre	Maintain or increase number	1.7	1.51	1.35	1.60	1.42	1.19	1.62	1.49	1.34
Turkey	# of mature ponderosa pine trees ( $\geq 18''$ dbh <sup>6</sup> ) per acre	Maintain or increase number	19.64	21.26	22.62	16.04	16.94	18.36	20.39	21.53	23.21
	SDI for large ponderosa pine ( $\geq 18''$ dbh <sup>6</sup> ) per acre	Maintain or increase number	82.72	89.69	92.31	71.73	75.91	82.05	86.01	90.92	97.95
<u>Snag species</u>											
<i>Hairy woodpecker</i>	See Late-seral ponderosa pine species MIS	See Late-seral ponderosa pine species MIS									
Pygmy nuthatch	See late-seral ponderosa pine MIS	See late-seral ponderosa pine MIS									
<i>Red-naped (yellow-bellied) sapsucker</i>	See late-seral aspen MIS	See late-seral aspen MIS									

MATRIX			Alternative A			Action Alternative B			Action Alternative C		
Issue	Indicator	Desired Outcome	Existing Condition <sup>1</sup>	Short-term <sup>3</sup>	Long-term <sup>4</sup>	Immediate <sup>2</sup>	Short-term	Long-term	Immediate	Short-term	Long-term
<i>Juniper (plain) titmouse</i>	See pinyon-juniper MIS	See pinyon-juniper MIS									
<u>Pinyon-juniper species</u>	# acres PJ enhanced	Increase in acreage	0	0	0	1,143	1,143	1,143	1,143	1,143	1,143
<i>Juniper (plain) titmouse</i> <i>Mule deer</i>											
<i>Migratory Birds (Arizona Partners in Flight Priority Species of Concern)</i>											
<u>Ponderosa pine species</u>	# acres of ponderosa pine treated per MRNG <sup>5</sup>	Increase in acreage	0	0	0	21,730	21,730	21,730	21,429	21,429	21,429
<i>Goshawk</i> <i>Olive-sided flycatcher</i> <i>Purple martin</i> <i>Hermit thrush (substituted for Cordilleran flycatcher)</i>											
<u>Pinyon-juniper species</u>	# acres PJ habitat enhanced	Increase in acreage	0	0	0	1,143	1,143	1,143	1,143	1,143	1,143
<i>Black-throated gray warbler</i> <i>Gray flycatcher</i> <i>Gray vireo</i> <i>Juniper titmouse</i> <i>Pinyon jay</i>											

MATRIX			Alternative A			Action Alternative B			Action Alternative C		
Issue	Indicator	Desired Outcome	Existing Condition <sup>1</sup>	Short-term <sup>3</sup>	Long-term <sup>4</sup>	Immediate <sup>2</sup>	Short-term	Long-term	Immediate	Short-term	Long-term
<p><sup>1</sup>Existing condition = 2002, <sup>2</sup>Implementation = 2007, <sup>3</sup>Short-term = 2014, <sup>4</sup>Long-term = 2024</p> <p><sup>5</sup>Reynolds et al. 1992. Management recommendations for the northern goshawk in the southwestern United States. GTR-RM-217.</p> <p><sup>6</sup>Diameter at breast height (dbh)</p> <p><sup>7</sup>Vegetation structural stage (VSS), a forest description based on the tree diameter distribution within a stand: VSS1 = &lt;1" dbh, VSS2 = 1-4.9" dbh, VSS3 = 5-11.9" dbh, VSS4 = 12-17.9" dbh, VSS5 = 18-23.9" dbh, VSS6 = &gt;24" dbh</p> <p><sup>8</sup>Percent canopy closure is measured within vegetation structural stage (VSS, see <sup>7</sup> above) <u>groups</u> rather than across the entire area of interest</p>											

# Appendix V: NKRD Listed Species

LISTED ANIMAL AND PLANT SPECIES NORTH KAIBAB RANGER DISTRICT		Federal Listing <sup>1</sup>	State Listing <sup>2</sup>	Regional Forester's List <sup>3</sup>	Documented on NKRD	Suitable Habitat on NKRD	Documented in Project Area*	Designated Habitat in Project Area <sup>4</sup>	Suitable Habitat in Project Area*
<b>BIRDS</b>									
Bald Eagle*	<i>Haliaeetus leucocephalus</i>	T	WC		Yes	Yes	No	No	No
Mexican Spotted Owl	<i>Strix occidentalis lucida</i>	T	WC		No	Yes	No	No	No
Southwestern Willow Flycatcher	<i>Empidonax trailii extimus</i>	E	WC		No	Yes	No	-	No
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	C			No	No	No	-	No
California Condor*	<i>Gymnogyps californianus</i>	E			Yes	Yes	Yes	No	No
Northern Goshawk	<i>Accipiter gentilis</i>		WC	S	Yes	Yes	Yes	Yes	Yes
American Peregrine Falcon*	<i>Falco peregrinus anatum</i>		WC	S	Yes	Yes	No	-	No
Sharp-shinned Hawk	<i>Accipiter striatus</i>			S	Yes	Yes	Yes	-	Yes
Swainson's Hawk	<i>Buteo swainsoni</i>			S	Yes	Yes	No	-	No
Flammulated Owl	<i>Otus flammeolus</i>			S	Yes	Yes	Yes	-	Yes
<b>MAMMALS</b>									
Kaibab Squirrel	<i>Sciurus aberti kaibabensis</i>			S	Yes	Yes	Yes	Yes	Yes
Spotted Bat	<i>Euderma maculatum</i>		WC	S	Yes	Yes	No	-	Yes
Townsend's Big-eared Bat	<i>Corynorhinus townsendii townsendii</i>			S	Yes	Yes	Yes	-	Yes
Western Mastiff Bat	<i>Eumops perotis</i>			S	Yes	Yes	No	-	No
Allen's Lappet-browed Bat	<i>Idionycteris phyllotis</i>			S	Yes	Yes	No	-	Yes
Western (Desert) Red Bat	<i>Lasiurus blossevillii</i>		WC	S	No	Yes	No	-	No
Occult Bat	<i>Myotis occultus</i>			cS	Yes	Yes	No	-	Yes
<b>REPTILES and AMPHIBIANS</b>									
Northern Leopard Frog	<i>Rana pipiens</i>		WC	S	Yes	Yes	No	-	No
<b>FISH</b>									
Apache Trout	<i>Oncorhynchus apache</i>	T	WC	S	Yes	Yes	No	-	No
<b>INVERTEBRATES</b>									
Kanab Amber Snail	<i>Oxyloma haydeni kanabensis</i>	E		S	No	Yes	No	-	No
<b>PLANTS</b>									
Brady Pincushion Cactus	<i>Pediocactus bradyi</i>	E	HS		No	Yes	No	-	No
Siler Pincushion Cactus	<i>Pediocactus sileri</i>	T	HS		No	Yes	No	-	No
Jone's Cycladenia	<i>Cycladenia humilis</i> var. <i>jonesii</i>	T			No	Yes	No	-	No
Mt. Dellenbaugh Sandwort	<i>Arenaria aberrans</i>			S	Yes	Yes	No	-	No
Coppermine Milkvetch	<i>Astragalus ampullarius</i>			S	No	Yes	No	-	No
Marble Canyon Milkvetch	<i>Astragalus cremnophylax</i> var. <i>hevronii</i>			S	No	Yes	No	-	No
Cliff Milkvetch	<i>Astragalus cremnophylax</i> var. <i>myriorrhaphis</i>		SR	S	Yes	Yes	No	-	No
Rusby Milkvetch	<i>Astragalus rusbyi</i>			S	No	Yes	No	-	No
Kaibab Paintbrush	<i>Castilleja kaibabensis</i>			S	Yes	Yes	No	-	No
Arizona Bugbane	<i>Cimicifuga arizonica</i>	CA	HS	S	No	Yes	No	-	No
Morton Wild Buckwheat	<i>Eriogonum mortonianum</i>			S	No	Yes	No	-	No
Atwood Wild Buckwheat	<i>Eriogonum thompsonae</i> var. <i>atwoodii</i>			S	No	Yes	No	-	No
Kaibab Bladderpod	<i>Lesquerella kaibabensis</i>			S	Yes	Yes	No	-	No
Kaibab Plains Cactus	<i>Pediocactus paradinei</i>	CA	HS	S	Yes	Yes	Yes	Yes	Yes
Fickeisen Pincushion Cactus	<i>Pediocactus peeblesianus</i> var. <i>fickeiseniae</i>	C	HS	S	Yes	Yes	No	-	No
Mt. Trumbull Beardtongue	<i>Penstemon distans</i>			S	No	Yes	No	-	No
Grand Canyon Rose	<i>Rosa stellata</i> ssp. <i>Abyssa</i>		SR	S	No	Yes	No	-	No

<sup>1</sup> T-Threatened, E-Endangered, C-Candidate, CA-Conservation Agreement  
<sup>2</sup> WC-Wildlife of Special Concern, HS-Highly Safeguarded, SR-Salvage (collection) Restricted  
<sup>3</sup> S-Forest Service Sensitive Species, cS-Candidate Sensitive Species  
<sup>4</sup> Mexican Spotted Owl (PA-Protected Area, R-Restricted Area), Northern Goshawk (PFA), Kaibab Plains Cactus (CU-Conservation Unit), Kaibab Squirrel (NL-Natural Landmark)  
\* Bald Eagle, California Condor, Peregrine Falcon (Nesting, Roosting or Key Foraging Area)

