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Department of
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Forest
Service

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Environmental Assessment

Pack Rat Salvage

**Mogollon Rim Ranger District, Coconino National Forest
Coconino County, Arizona**

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CHAPTER 1: INTRODUCTION

In August of 2003, lightning struck the Mogollon Rim igniting the Pack Rat fire, which burned 3,094 acres. Dead trees line several miles of the Rim Road (Forest Road 300) and are common in dispersed recreation areas, posing a concern for the safety of individuals in the area. The previous drought and dense forest conditions add to the stress imposed on trees in the burn area, increasing the susceptibility of trees to further damage and mortality. Given the tremendous amount of recreational use on the Mogollon Rim, the District Ranger of the Mogollon Rim Ranger District deemed it necessary to actively manage the area.

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. The document is organized into five parts:

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

Documents included in the Pack Rat Salvage project record are identified by a document number and are referenced in this assessment by 'PR #'.

Forest Plan Consistency

This action responds to the goals and objectives outlined in the Coconino National Forest Land and Resource Management Plan (Forest Plan), as amended, and helps move the project area towards desired conditions described in that plan (Coconino National Forest Plan 1987).

Forest-wide Standards and Guidelines are used in directing management activities for the project area, as well as Management Area Standards and Guidelines. A Management Area (MA) is defined as “an area that has common direction throughout and that differs from neighboring areas” (Coconino National Forest Plan 1987). The Pack Rat Salvage project area lies within two designated Management Areas, Management Area 3 (MA 3) and Management Area 19 (MA 19) (See Appendix A). The Forest Plan defines MA 3 as ponderosa pine and mixed coniferous forest on slopes less than 40 percent and MA 19 as the Mogollon Rim (Coconino National Forest Plan 1987). Management emphasis for MA 3 and MA 19, as outlined in the Forest Plan, focus on dispersed and developed recreation, visual quality, wildlife habitat including travel corridors, off-road driving restrictions, fuel treatment, protection of the General Crook Trail, Integrated Stand Management (ISM) and watershed condition (Coconino National Forest Plan 1987).

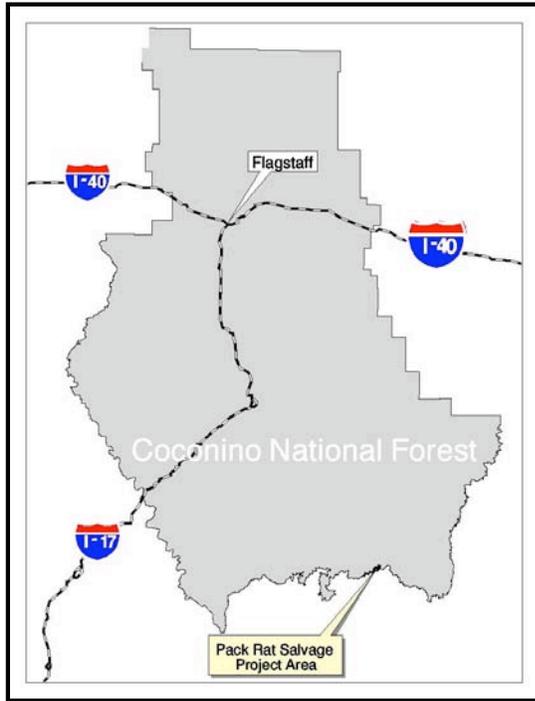
Background

On the evening of August 15, 2002 lightning struck the escarpment of the Mogollon Rim on the Mogollon Rim Ranger District, Coconino National Forest igniting the Pack Rat fire. Steep, rocky and inaccessible terrain made the fire difficult to suppress. The fire spread by burning material rolling downhill, establishing itself in drainages with thick vegetation, then running back up to the top of the Mogollon Rim. The Pack Rat fire burned approximately 1,074 acres of mixed conifer on the Mogollon Rim Ranger District, Coconino National Forest. The fire continued to burn for several weeks until it was contained on September 2, 2002 burning a total of 3,094 acres (1,074 acres on the Coconino National Forest and 2,020 acres on the Tonto National Forest).

A Burned Area Emergency Rehabilitation (BAER) plan (PR #3) was implemented immediately following the Pack Rat fire to address the potential impacts to private lands below the Mogollon Rim caused by the fire. Treatments to minimize potential impacts focused on the moderate and high intensity burn areas located on the face and edge of the Mogollon Rim. The treatments implemented in the fall of 2002 included seeding a total of 364 acres (65 acres on the Coconino National Forest and 299 on the Tonto National Forest), 65 acres of log erosion barriers and 10 straw bale check dams.

In the past 15 years there have been two other large fires on the Mogollon Rim, the Dude and Bray fires. The aftermath of these fires left the Mogollon Rim in a similar condition as the Pack Rat fire. The experience managing the Dude and Bray burn areas suggests that there will be a large number of dead trees falling in the next ten years, creating a potential hazard to travelers on the Rim Road (Forest Road 300) and recreationists in the area.

Project Location



The Pack Rat Salvage project area is located approximately 70 miles southeast of Flagstaff, Arizona in T12N, R10E, Sections 2, 3, 5, 9, 10, 11, 16 and 17 of the Gila and Salt River Meridian. The project area is roughly 550 acres in size and excludes the nearby Mexican spotted owl Protected Activity Center and the Mogollon Rim Botanical Area. Refer to Figures 1 and 2.

Figure 1. Vicinity Map for the Pack Rat Salvage Project.

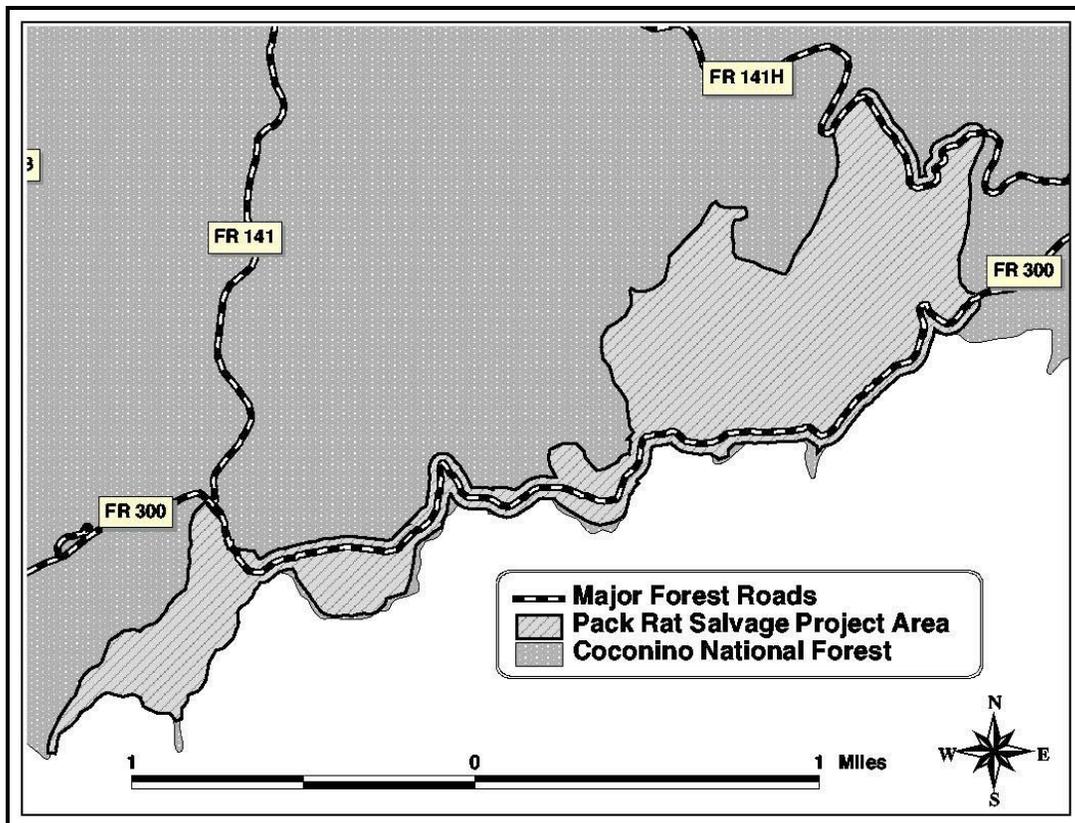


Figure 2. Project Area Location for the Pack Rat Salvage.

Purpose & Need for Action

Forests in the southwest are severely stressed from drought and unhealthy forest conditions. The Pack Rat fire amplified this stress leaving hundreds of acres of forest vulnerable to further injury. Due to previous stress from drought, fire and existing bark beetle activity, future conifer mortality is expected within the next 3 years in the project area. District staff reviewed the burn area and identified the following conditions.

- There is a need to remove hazard trees adjacent to travel corridors and highly used dispersed recreation areas
- There is a need to stabilize soils in the high intensity burn areas thus minimizing erosion and promoting recovery of soil productivity
- There is a need to decrease long-term heavy fuel loads to reduce intensity of future surface fires
- There is a need to minimize the spread of bark beetle activity from fire-killed and damaged trees into nearby live trees

The Mogollon Rim is a valuable scenic byway and draws large numbers of recreationists for camping and other activities. Areas on the Mogollon Rim that have burned in the past are now vista points and highly used dispersed recreation areas. Hazard trees adjacent to travel corridors, such as roads and trails, and dispersed recreation sites pose an immediate threat to the public and Agency employees. To alleviate this immediate threat there is a need to remove these hazard trees.

Due to the topographical nature of the Mogollon Rim, there is potential for increased sedimentation into the East Verde and Upper Clear Creek watersheds. Therefore, there is a need to stabilize soils in the high intensity burn areas thus minimizing erosion and promoting recovery of soil productivity.

Over time, most of the dead trees in the project area will fall. Dead trees less than 12 inches in diameter at breast height (DBH) will deteriorate and fall within 1-10 years. Dead trees larger than 12 inches DBH are expected to deteriorate and fall within the next 10-15 years. The eventual buildup of large diameter fuels will result in an increased potential for high intensity surface fires. There is a need to decrease these long-term heavy fuel loads and the risk they pose to resources.

Bark beetle activity has been observed on the Mogollon Rim around the communities of Pine and Strawberry and is spreading north into the project area. Currently, there are confirmed patches of beetle activity in and adjacent to the burn. Knowing that bark beetles are opportunists and populations can quickly grow, there is a need to minimize the spread of bark beetle activity from fire-killed and damaged trees into nearby live trees.

Existing Condition

Approximately 1,074 acres burned in the Pack Rat fire on the Coconino National Forest, which includes the 550 acre project area. Roughly 150 acres of the project area burned intensely, killing an estimated 60 percent of the trees. The remaining 400 acres in the project area burned at a low to moderate intensity, causing additional stress on already weakened trees.

- Dead trees will soon be falling onto Forest Road 300 and into dispersed recreation areas causing a safety concern for the public.
- There is minimal woody material on the ground in the short term to stabilize soils, intensifying potential for erosion and increased sedimentation into the East Verde and Upper Clear Creek watersheds.
- Large diameter dead trees (12 inches DBH and over) are expected to fall, increasing long-term heavy fuel loads.
- Confirmed patches of bark beetle mortality in and adjacent to the project area.

Desired Condition

- Dead trees are removed along Forest Road 300 and from dispersed recreation areas making the forest a safer place for the visiting public.
- Soils are protected and stabilized through the placement of small diameter woody material (3 to 12 inches in diameter) speeding the recovery of soil productivity and decreasing soil loss.
- Long-term heavy fuel loads are decreased by large diameter dead tree removal (12 inches DBH and over).
- The spread of bark beetle mortality is reduced in and adjacent to the project area.

Objectives and Unit of Measure

- Minimize threat to public safety along Forest Road 300 and other high use areas
 - Miles of hazard tree removal along roads
- Stabilize soils in high intensity burn areas, minimizing erosion and promoting recovery of soil productivity
 - Duration of time until 10-15 tons per acre of coarse woody debris (CWD) greater than 3 inches in diameter is achieved
- Decrease long-term heavy fuel loads to reduce intensity of future surface fires
 - Tons per acre of residual heavy fuel (greater than 12 inches in diameter)
- Minimize the spread of bark beetle activity from fire-killed and damaged trees into nearby live trees
 - Number of acres treated

Proposed Action

To best meet the purpose and need, the Mogollon Rim Ranger District is proposing to:

- Salvage dead trees 12 inches diameter at breast height (DBH) and greater on approximately 550 acres. A dead tree is considered to have no green needles.
- Fell hazard trees less than 12 inches in diameter along a 130-foot corridor adjacent to Forest Roads 300, 320, 141H and 501 where safety is a concern.
- Lop and scatter coarse woody debris (CWD) greater than 3 inches in diameter created by felling activities on all treated acres in high intensity burn areas.
- Open Forest Roads 9360L and 9266 for use during salvage activities and close after use (1.7 miles).
- Keep 1.0 mile of Forest Road 659 open and close 0.2 miles at alternate entrance to protect the General Crook Trail.
- Keep 0.1 miles of Forest Road 9266A open and close last 0.2 miles to restrict access to the Mexican spotted owl Protected Activity Center and the Mogollon Rim Botanical Area.
- Keep 0.1 miles of Forest Road 300J open and close last 0.1 miles to restrict access to the Mexican spotted owl Protected Activity Center and the Mogollon Rim Botanical Area.
- Construct 0.4 miles of temporary road for salvage activities and obliterate after use.

The following is clarification of slash treatment guidelines in low and/or moderate burn intensity areas:

- Where total fuel loads (activity slash plus existing slash) are greater than 15 tons per acre, mechanically pile slash and burn.
- Where total fuel loads (activity slash plus existing slash) are at or less than 15 tons per acre, lop and scatter slash to a 2-foot height.

Implementation is expected to begin in September of 2003, after the Mexican spotted owl breeding season has ended and may carry into the spring of 2004.

Decision Framework

The District Ranger of the Mogollon Rim Ranger District, Coconino National Forest is the deciding official for this project. The deciding official can choose the No Action Alternative or the Action Alternative and include any mitigation measures necessary.

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

- Select the No Action Alternative *or*
- Select the action Alternative

Public Involvement

The proposal was provided to the public and other agencies in a scoping letter requesting comment from January 22, 2003 to February 22, 2003. The scoping letter was sent to approximately 170 individuals on the project mailing list, which is available at the Mogollon Rim Ranger District in the Pack Rat Salvage project record (PR #10). Comments generated through scoping are also available in the project record in summary form and as original responses (PR #12 and #23).

Seven responses to the scoping letter were received from the following organizations, tribes and agencies:

- Zuni Heritage/Historic Preservation Office
- USDA Natural Resources Conservation Services
- Hopi Tribe, Hopi Cultural Preservation Office
- Navajo Nation
- Crooked H Ranch
- US Fish and Wildlife Service
- Arizona Game and Fish Department

Responses to comments received from the above parties are documented in the Pack Rat Salvage project record (PR #13 and #23). In addition, a meeting with US Fish and Wildlife Service was held to clarify and discuss concerns expressed through scoping. A summary of this meeting is available in the project record, including topics discussed and recommendations from US Fish and Wildlife Service regarding this proposal (PR #17).

Issues

Significant issues are defined as those directly or indirectly caused by implementing the proposed action. Significant issues are those that result in additional alternatives. Non-significant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council for Environmental Quality (CEQ) NEPA regulations require this delineation in Sec. 1501.7, "...identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)...". A list of non-significant issues and reasons regarding their categorization as non-significant may be found at the Mogollon Rim Ranger District in the Pack Rat Salvage project record (PR #13).

No significant issues were raised during scoping that would generate additional alternatives.

Applicable Laws And Executive Orders _____

Shown below is a partial list of federal laws and executive orders pertaining to project-specific planning and environmental analysis on federal lands. While most pertain to all federal lands, some of the laws are specific to Arizona. Disclosures and findings required by these laws and orders are contained in Chapter 3 of this analysis.

Multiple-Use Sustained-Yield Act of 1960
National Historic Preservation Act of 1966 (as amended)
Wild and Scenic Rivers Act of 1968, amended 1986
National Environmental Policy Act (NEPA) of 1969 (as amended)
Clean Air Act of 1970 (as amended)
Endangered Species Act (ESA) of 1973 (as amended)
Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974 (as amended)
National Forest Management Act (NFMA) of 1976 (as amended)
Clean Water Act of 1977 (as amended)
American Indian Religious Freedom Act of 1978
Archeological Resource Protection Act of 1980
Executive Order 11593 (cultural resources)
Executive Order 12898 (environmental justice)
Executive Order 12962 (aquatic systems and recreational fisheries)
Executive Order 13186 Jan. 11, 2001 (Migratory Bird Treaty Act)

Permits, Licenses, And Certificates _____

To implement the proposed project as addressed in this EA, an Air Quality Burn Permit will be obtained from the State of Arizona, Department of Environmental Quality for pile burning.

Applicable Legal And Regulatory Requirements And Coordination

Legal Requirements

No further NEPA analysis is needed. Further environmental reports are necessary, including a Biological Assessment and Evaluation and Cultural Resource Clearance. These documents must be completed before any decision is made.

Coordination Requirements

Stipulations for coordination of implementation activities will be specified in the Biological Assessment and Evaluation, Cultural Resource Clearance and Best Management Practices for soil and water conservation.

Project Record Availability _____

Additional documentation, including more detailed analyses of project area resources, may be found in the project record (PR) located at the Mogollon Rim Ranger District office. These records are available for public review pursuant to the Freedom of Information Act (5 U.S.C. 552). Copies of the EA are available at the Mogollon Rim Ranger District and on the Internet at the following addresses:

Mogollon Rim Ranger District
HC 31 Box 300
Happy Jack, AZ 86024
(928) 477-2255

<http://www.fs.fed.us/r3/coconino>

For information contact Sara Alberts at the above address or by email at salberts@fs.fed.us.

CHAPTER 2: COMPARISON OF ALTERNATIVES, INCLUDING THE PROPOSED ACTION

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

Alternatives

Alternative 1: No Action

The No Action alternative is required by the National Environmental Policy Act (NEPA) and provides a baseline with which to compare any proposed activities. Under the No Action alternative, none of the actions described in the proposed action will occur, including salvage activities, hazard tree removal and further soil stabilization (Figure 3). All forest roads currently open to public use will remain open. Rehabilitation activities will be limited to those which have already been completed by a Burn Area Emergency Rehabilitation (BAER) Team.

Alternative 2: The Proposed Action

- Salvage dead trees 12 inches diameter at breast height (DBH) and greater on approximately 550 acres. A dead tree is considered to have no green needles.
- Fell hazard trees less than 12 inches in diameter along a 130-foot corridor adjacent to Forest Roads 300, 320, 141H and 501 where safety is a concern.
- Lop and scatter coarse woody debris (CWD) greater than 3 inches in diameter created by felling activities on all treated acres in high intensity burn areas.
- Open Forest Roads 9360L and 9266 for use during salvage activities and close after use (1.7 miles).
- Keep 1.0 mile of Forest Road 659 open and close 0.2 miles at alternate entrance to protect the General Crook Trail.
- Keep 0.1 miles of Forest Road 9266A open and close last 0.2 miles to restrict access to the Mexican spotted owl Protected Activity Center and the Mogollon Rim Botanical Area.
- Keep 0.1 miles of Forest Road 300J open and close last 0.1 miles to restrict access to the Mexican spotted owl Protected Activity Center and the Mogollon Rim Botanical Area.
- Construct 0.4 miles of temporary road for salvage activities and obliterate after use.

The following is clarification of slash treatment guidelines in low and/or moderate burn intensity areas:

- Where total fuel loads (activity slash plus existing slash) are greater than 15 tons per acre, mechanically pile slash and burn.
- Where total fuel loads (activity slash plus existing slash) are at or less than 15 tons per acre, lop and scatter slash to a 2-foot height.

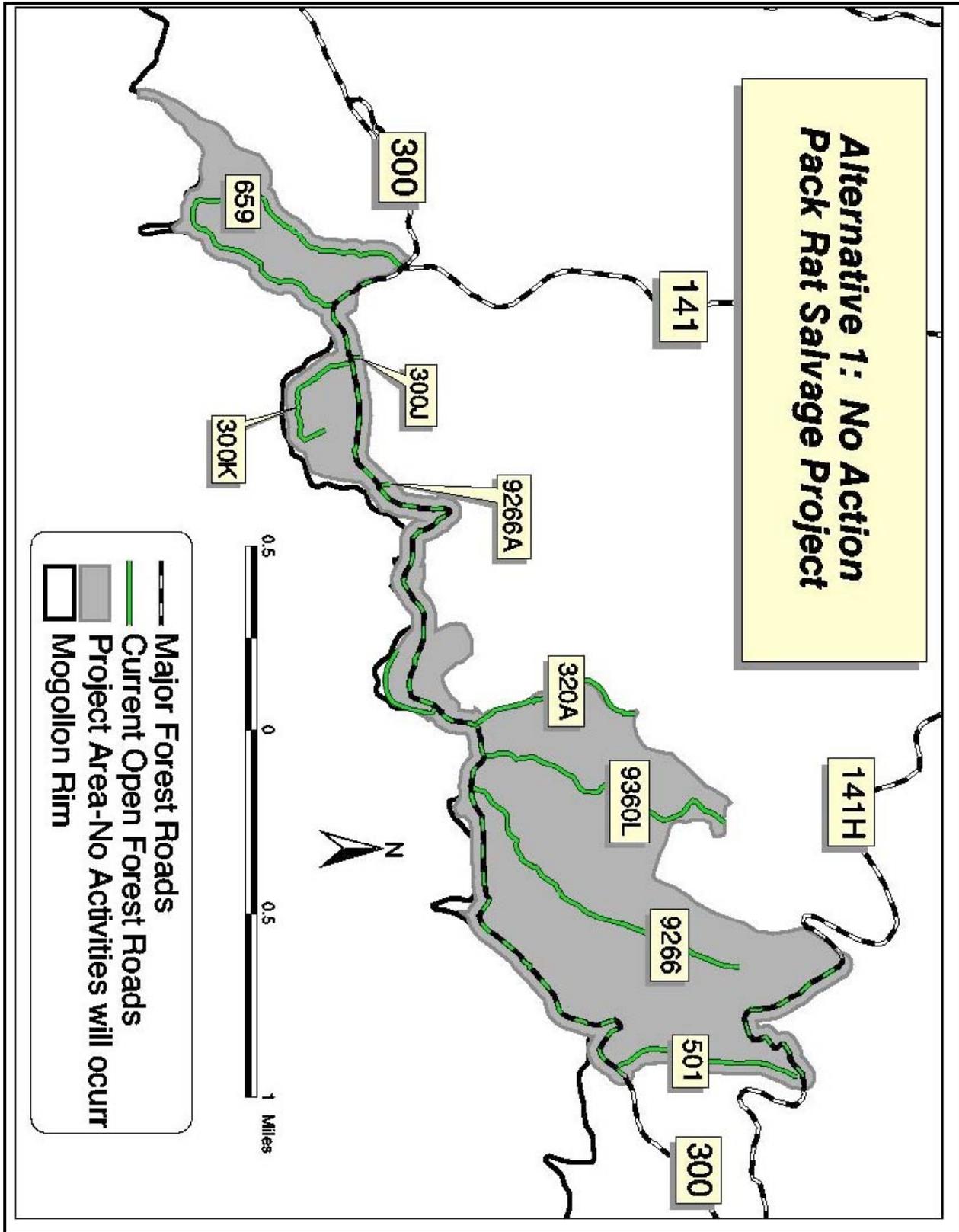


Figure 3. Map of Alternative 1 (No Action) for the Pack Rat Salvage Project.

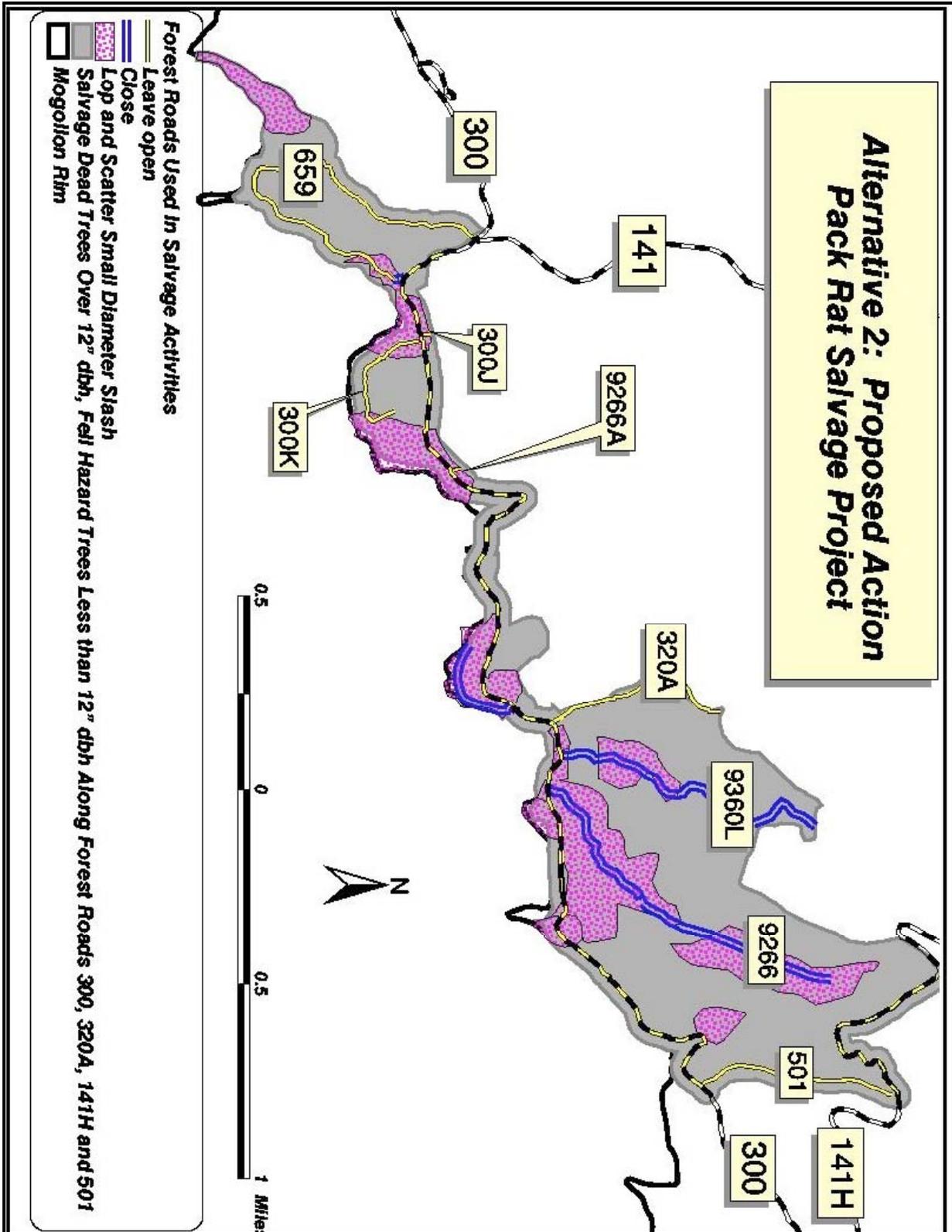


Figure 4. Map of Alternative 2 (Proposed Action) for the Pack Rat Salvage Project.

The proposed action (Figure 4) applies to the entire project area, however it is not likely that all 550 acres will be treated. A range between 200 and 500 acres is a more accurate representation of the area most likely to be treated. Due to natural processes in burn areas, tree mortality will increase over time. The proposed activities would follow the natural pattern of mortality in the project area, resulting in a mosaic treatment pattern.

Comparison of Alternatives _____

This section provides a summary of each alternative based on Objectives and Units of Measure, as described in Chapter 1. Information in the table is focused on activities contributing to objective accomplishment, which can be distinguished quantitatively or qualitatively among alternatives. For a detailed description of figures displayed in Table 1, please reference the Soil, and Fire and Fuels sections in Chapter 3, or Specialist Reports for these resources (PR# 20 and #26).

Table 1. Objective Accomplishment by Alternative for the Pack Rat Salvage Project.

Objective	Alternative 1: No Action	Alternative 2: Proposed Action
Minimize threat to public safety along Forest Road 300 and other high use areas	0 miles of hazard tree removal along roads	6.2 miles of hazard tree removal along roads
Stabilize soils in high intensity burn areas, minimizing erosion and promoting recovery of soil productivity	3-8 years to 10-15 tons per acre	1 year to 10-15 tons per acre
Decrease long-term heavy fuel loads to reduce intensity of future surface fires	6.2 – 13.4 tons per acre of fuel > 12” diameter*	2.7 – 6.2 tons per acre of fuel > 12” diameter*
Minimize the spread of bark beetle activity from fire-killed and damaged trees into nearby live trees	0 acres treated	200 to 500 acres treated**

* Fuel loading is based on a 20 year time period.

**Number of acres treated is an estimated range, knowing that it is not likely that all 550 acres of the project area will be treated.

Mitigation Measures Common to All Alternatives _____

Mitigation measures were developed to reduce, avoid and/or compensate for the potential impacts the proposed activities may cause. The mitigation measures are applied to the action alternative and are displayed in Appendix B.

In addition to specific mitigation measures prescribed for the action alternative, all management activities implemented are required to follow Forest Plan Standards and Guidelines, Best Management Practices (BMP's) and any other Forest Service Policies, such as Timber Sale Contract provisions.

Monitoring

Table 2. Required Monitoring for Alternative 2 (Proposed Action) of the Pack Rat Salvage Project.

Who	Monitoring	When
District Range Conservationist or appointed individual(s)	Perform range inspections to ensure range readiness standards are met, cattle are using the pasture during the designated period, sensitive areas are not being adversely impacted and to inspect range improvements.	While livestock are in the project area
District Range Conservationist or appointed individual(s)	Utilization monitoring in key areas to determine if utilization standards have been met.	At the end of the growing season
District Range Conservationist or appointed individual(s)	Monitoring of overall pasture use to indicate cattle movement in grazing rotation	During growing season
District Archaeologist	Project administrators must notify the District Archaeologist so that the General Crook Trail (AR-03-04-01-240) can be marked for avoidance in the field, and so that a project monitoring schedule can be set up.	Prior to project implementation
District Archaeologist or a certified Cultural Resource Specialist	Monitor the project weekly and report the results of such monitoring in writing to the District or Forest Archaeologist.	During implementation
District Wildlife Crew	A complete survey for Mexican spotted owls, which includes surveying the entire project area, as well as a ½ mile buffer around the analysis area. Survey techniques would follow the 2003 U.S. Fish and Wildlife Service Mexican spotted owl protocol. Areas on the Tonto National Forest that may be affected by project activities would also be surveyed.	Prior to project implementation
District Wildlife Crew	The Mexican spotted owl Immigrant PAC (#040414) will be monitored following the 2003 U.S. Fish and Wildlife Service Mexican spotted owl protocol.	Prior to project implementation and one year following project activity

Table 3. Project Specific Monitoring for Alternative 2 (Proposed Action) of the Pack Rat Salvage Project.

Who	Monitoring	When
District Silviculturist	<p>A) Monitor the project and surrounding areas for beetle activity</p> <p>B) Request report of annual aerial surveys from Entomology and Pathology personnel</p>	<p>A) During implementation</p> <p>B) During/after implementation</p>
District Fire Ecologist and/or Fuels Specialist	Monitoring of fuel loading resulting from salvage activities in low and moderate intensity burn areas should occur in order to accurately identify areas with greater than 15 tons/acre of total fuel loading on average.	During implementation if contractor is doing piling; Immediately after implementation if Forest Service is doing piling
District Wildlife Crew	Annual surveys and treatment of all Category 'A' & 'B' invasive plant species should be completed.	For at least three years until the seedbank is depleted or an alternative weed management plan is established.

CHAPTER 3: AFFECTED ENVIRONMENT AND 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 Chapter 2.

Analyses of resources are based on 550 acres of which the project area is comprised. However, it is not likely that all 550 acres will be treated under the Proposed Action. A range between 200 and 500 acres is a more accurate representation of the area most likely to be treated. Due to natural processes in burn areas, tree mortality will increase over the next several years. The proposed activities would result in a mosaic treatment pattern, following the natural pattern of mortality in the project area.

Past, Present and Reasonably Foreseeable Future Activities _____

Depending on the resource, activities considered in analysis may vary. Tables 4 and 5 display a general list of past, present and reasonably foreseeable future activities within the project area. Analysis is based on the past 10 years unless specified otherwise.

Table 4. List of Past and Present Actions in the Pack Rat Salvage Project Area.

Project Name	Type of Activities
Hackberry-Pivot Rock and Buck Springs range allotments	Cattle grazing
Hunting/Fishing	Under permits issued by Arizona Game and Fish
Fuelwood gathering	Gathering of dead and down fuelwood by public under permits issued by USFS
Annual Road Maintenance	Road blading and maintenance on FR 300 and 141H roads.
Dispersed recreation	Camping, driving for pleasure, scenic view from the Mogollon Rim (especially at High View Point), hiking, etc.
BAER activities	Burned area emergency rehabilitation efforts after the Pack Rat fire. Included 65 acres of seeding, 65 acres of log erosion barriers and 10 channel structures (completed in 2002).
Pack Rat fire (and other small wildfires)	Fire suppression activities

Table 5. List of Reasonably Foreseeable Future Actions Expected in the Pack Rat Salvage Project Area.

Project Name	Type of Activities
Hackberry-Pivot Rock and Buck Springs range allotments and NEPA analyses	On-going cattle grazing and NEPA analysis for re-issuance of term-grazing permit
Hunting/Fishing	Under permits issued by Arizona Game and Fish
Fuelwood gathering	Gathering of dead and down fuelwood by public under permits issued by USFS
Annual Road Maintenance	Road blading and maintenance on FR 300 and 141H roads.
Dispersed recreation	Camping, driving for pleasure, scenic view from the Mogollon Rim (especially at High View Point), hiking, etc.
Cross-Country Travel by Off-Highway Vehicles -- Proposed Forest Plan Amendment For Apache-Sitgreaves, Coconino, Kaibab, Prescott, and Tonto National Forests	Limit off-road driving
Noxious Weeds (Four Forest EIS)	Treatments to limit the spread and control of noxious weeds
Small wildfires (lightning fires)	Fire suppression activities

Soil

Affected Environment

Soils have been negatively affected by the Pack Rat fire in areas where the fire burned with a high intensity. These effects include damage to soil physical properties, soil microflora, and soil chemical processes (Wells et al. 1979). The soils in the project area are described by the Terrestrial Ecosystem Survey (TES) for the Coconino National Forest (Miller 1995). The fire burned on a variety of soil types and landforms, varying from meadows (TES Units 53), elevated plains (TES Unit 650), and hills/scarp slopes of plains (TES Unit 651). The project area includes elevated planes with slopes of 0-15% (TES Map Units 650) and hills/scarp slopes of plains on slopes of 15-40% (TES Unit 651). Erosion Hazard for TES Units 53 and 650 are rated as slight, with the erosion hazard for TES Unit 651 as severe. Refer to Table 6.

Table 6. Burn Intensity by TES Unit for the Pack Rat Salvage Project Area.

TES Soil Group	Description or Plant Association	Acres	Slope	Erosion Hazard	Fire Intensity
53	Meadow	23	0-5	Slight	None to Low-23 acres
650	Mixed Conifer	178	0-15	Slight	Low-111 acres Low-Moderate-2 acres Moderate-High-23 acres High-42 acres
651	Mixed Conifer	349	15-40	Severe	Low-266 acres Low-Moderate-1 acres Moderate-High-22 acres High-60 acres
Total		550			

Erosion hazard, as defined by the TES, is based on the complete removal of vegetation and litter or 'bare ground'. A slight rating indicates that all vegetative ground cover could be removed from the site and the resulting soil loss will not exceed 'tolerance' soil loss rates. A moderate rate indicates that predicted rates of soil loss will result in a reduction of site productivity *if left unchecked*. Conditions in moderate erosion hazard sites are such that reasonable and economically feasible mitigation measures can be applied to reduce or eliminate soil loss. A severe rating indicates that predicted rates of soil loss have a high probability of reducing site productivity before mitigating measures can be applied.

A Burned Area Emergency Rehabilitation (BAER) plan was implemented on a portion of the Pack Rat fire within the project area in the East Verde River watershed to minimize impacts from the fire on private lands at risk below the Mogollon Rim. The treatments prescribed and implemented in the fall of 2002 included seeding of 65 acres, 10 straw bale check dams and log erosion barriers on 65 acres.

On sites with moderate and severe burn intensity, the fire removed coarse woody debris (CWD) (CWD is defined as down woody material 3 inches in diameter or greater). Graham et al. (1994) recommends 10 to 15 tons per acre of coarse woody debris to maintain long-term soil productivity on mixed conifer sites.

Environmental Consequences

Alternative 1: No Action

Direct and Indirect Effects

Direct effects to soil loadings of coarse woody debris will come through natural processes. Coarse woody debris is expected to increase over time as small diameter material begins rotting and falling. Personal observations from the Pot fire (burned 1996) and the Dude and Bray fires (burned 1990) have shown that small trees begin falling in the second year after the burn. Based on these observations, coarse woody debris requirements for the ponderosa pine and mixed conifer sites will be met within 3-8 years.

Direct effects of the no action alternative, with no salvage activities, will be no acres of ground disturbance from mechanized logging.

Indirect effects from the No Action Alternative will be a significant increase in coarse woody debris as trees rot and begin to fall on site. The heavy loading of coarse woody debris (50+ tons/acre) will create a fire hazard and potential for high-intensity surface fire. Experience from the Dude and Bray fires show that approximately 80%-90% of all trees will fall within a ten year timeframe. In 2000, the Mogollon fire burned in down woody material from the base of the Mogollon Rim on the Tonto National Forest to the top of the rim. The fire intensity on the top of the rim was moderated by material that was removed off-site from the Dude Fire Salvage.

Cumulative Effects

Cumulative effects for Alternative 1 of the Pack Rat Salvage Project to soils will include timber sales and thinning that can effect the distribution of coarse woody debris, primarily through fuel treatments. The geographic setting for cumulative effects analysis includes the Upper Clear Creek 5th code watershed (formerly known as East Clear Creek 5th code) and the East Verde River 5th code watershed. The timeframe for past actions is 10 years.

Upper Clear Creek

Alternative 1 will not have any additional impacts to coarse woody debris distribution within the Upper Clear Creek watershed; therefore, there will be no direct cumulative effect from this alternative. See Tables 7 and 8 below for a summary of activities that have been implemented or are planned for implementation.

Table 7. Past and present ground disturbing projects within the Upper Clear Creek Watershed.

Project Name	Forest	Year Completed	Acres
Barber T.S.	Coconino	1995	1,308
Buckhorn T.S	Coconino	1993	4,764
Gentry T.S	Apache-Sitgreaves	*	2,855
Gramma T.S	Apache-Sitgreaves	1994	7,869
Hart T.S	Apache-Sitgreaves	1992	2,153
Holder T.S	Coconino	1992	1,765
Hospital T.S	Coconino	1994	1,065
Immigrant T.S	Coconino	1992	1,896
Leonard T.S	Coconino	1994	2,354
Limestone T.S	Coconino	1996	1,342
Lockwood T.S	Coconino	1995	1,644
Merritt T.S	Coconino	1995	1,479
U-Bar T.S	Coconino	ongoing	1,889
Wiggins T.S	Apache-Sitgreaves	ongoing	2,550
Blue Ridge Urban Interface PCT	Coconino	ongoing	5,391
Immigrant Timber Sale Preparation	Coconino	1996	36
Pack Rat Dozer suppression lines	Coconino	2002	21
Grand Total			40,381

Table 8. Future And Foreseeable Timber Sale And Precommercial Thinning Projects Within The Upper Clear Creek Watershed.

Activity	Description	Status	Effects
Rim Christmas Tree Cutting	Provide fir Christmas trees for personal use designated along the Mogollon Rim.	Annual	200 acres of trees less than 10' tall cut. Not mechanized, no ground disturbance.
Victorine 10K Area Analysis	Evaluate alternative treatments to reduce live and dead fuels to protect urban interface areas and past investments in forest health.	NEPA in 2003	Approximately 6,000 acres of thinning proposed up to 12" DBH. Thinning on some of the same acres as Buckhorn and Limestone TS's. Is not expected to be mechanized, minimal ground disturbance.
East Clear Creek Watershed Health Improvement Project	Evaluate watershed conditions and impacts from recreation, roads, past watershed projects, with special consideration for Little Colorado spinedace habitat needs in the Upper Clear Creek watershed.	Implement fall 2002	Approximately 9,400 acres of thinning trees less than 12" DBH proposed. Thinning on some of the same acres as Limestone, Merritt, Leonard, Lockwood and Hospital TS's. Is not expected to be mechanized, minimal ground disturbance.
Clear Creek Timber Sale	Timber harvest and fuels treatments.	NEPA in 2005	Approximately 2,000 acres of thinning of primarily thin from below prescription. Thinning up to 18" DBH
Buck Springs Range Analysis and AMP	Precommercial thinning	NEPA in 2003	Approximately 200 acre of precommercial thinning to improve the ability to manage cattle. Is not expected to be mechanized, minimal ground disturbance.
Maple Draw Restoration Project	Maple restoration project	Implement in 2003	34 acres of thinning and 34 acres of prescribed burn. Is not expected to be mechanized, minimal ground disturbance.

East Verde River

Alternative 1 will not have any additional impacts to coarse woody debris distribution East Verde River watershed; therefore, there will be no direct cumulative effect from this alternative. See Tables 9 and 10 below for a summary of activities that have been implemented or are planned for implementation.

Table 9. Past and present Timber Sales and Thinning Projects within the East Verde River Watershed.

Project Type	Project Name	Acres	Year Completed
Timber Sale	Bear	207	1999
Timber Sale	Verde	481	2000
Timber Sale	Geronimo	278	2000
Timber Sale	Shadow	12	2000
Timber Sale	Sharp	80	1998
Precommercial Thinning	Verde – Units #1, 2 & 3	148	2000
Fuelbreak Construction	Geronimo	83	1999
Timber Sale	Chase	100	ongoing
Timber Sale	Control Road	100	ongoing
Timber Sale	APS Powerline	20	ongoing
Fire Rehabilitation	Pack Rat BAER	250	2002

Table 10. Future And Foreseeable Timber Sale And Precommercial Thinning Projects in the East Verde River Watershed.

Project Type	Project Name	Acres	Effects
Timber Sale/PCT	Whisper Embedded Commercial Timber Sale/Precommercial Thinning	291	Fuels reduction, some ground disturbance with timber sale
Precommercial Thinning	Verde	971	Minimal ground disturbance
Precommercial Thinning	Chase	100	Minimal ground disturbance

Alternative 2: Proposed Action

Direct and Indirect Effects

Alternative 2 is the salvage option. For the purposes of this analysis, it is assumed that every forested acre within the project area will be treated. The reality of the situation is that something less than the total acres will be treated.

Coarse woody debris deposition would occur on 200 to 500 acres within one year of the fire. The majority of coarse woody debris deposited would be in the form of tree limbs and tops from the limbing operation. Conventional logging falls trees by chainsaw, limbing and bucking logs where the tree falls. Mechanized harvesting uses either a shear or a feller-buncher to fall the tree. The tree is either limbed and bucked on-site or taken to a landing whole and delimbed at the landing. Coarse woody debris would be deposited within 1 year on 102 acres of high intensity burn, speeding the recovery of these sites over natural processes. Additionally, 45 acres of moderate to high intensity burn would have coarse woody debris added, thus speeding soil recovery and stabilization of these sites.

This conclusion is supported by data from monitoring 2 sites in the Pot fire (1996). Data was collected on four transects in 1996 to monitor rehab seeding effectiveness. In 1997, data was collected on two of four transects. The data showed that slash was present on three out of five plots in the transect that was salvaged. On the non-salvaged site, no new woody debris had fallen one year after the fire (USDA 1997). The data set is small, but it correlates with observations from the Dude, Bray, and other portions of the Pot fire.

Using conventional harvest methods, coarse woody debris would be deposited sooner than the predicted 3-8 years with no treatment. As a result of coarse woody debris deposition, site protection and mineral cycling will occur sooner than if not treated.

Salvaging approximately 550 acres will cause additional ground disturbance through tree felling, skidding (includes skidding and landing of logs), hauling logs off-site, and fuel treatments. It is estimated that 15-20% of treated acres (83 to 110 acres) would be disturbed due to skidding operations. This will delay recovery time of skid trails and landings to approximately 2-5 years, depending on mitigation measures applied. The delayed recovery may further increase water flow and movement of soil on-site and off-site, thus increasing potential for a nonpoint pollution (sedimentation) source from the Pack Rat fire (Froehlich 1981). Whole tree skidding of burned trees would increase the potential to gouge skid trails with case hardened limbs.

Slash treatment on high and moderate to high intensity sites is lop and scatter. Lopping and scattering by hand would not cause any additional ground disturbance. Lopping and scattering mechanically (crushing) would cause further ground disturbance, but would incorporate slash into the ground quicker than by hand lopping and scattering. This method would apply in the severely burned areas only because dead trees in these areas would be brittle enough to crush effectively. Therefore, there would be a potential increase of ground disturbance of approximately 65 acres (slopes less than 15%) from the crushing of slash.

Machine piling may occur on sites that exhibit low and low to moderate burn intensity if fuel loadings exceed 15 tons per acre of coarse woody debris. This could occur on a maximum of 379 acres of the project area, however, 266 of those acres are within map unit 651 that has a severe erosion hazard due to steep slopes (15-40% slopes). It is felt that a portion of this map unit up to 25% slope may be suitable for machine piling, therefore, machine piling may occur on approximately 250 acres of the low intensity and low to moderate intensity sites. Past experience with other timber sales shows that machine piling effects to soil are minimized by the use of brush rakes.

Machine piling of activity slash creates the most disturbance of any of the proposed activities. The amount of ground disturbed can be as much as 80% of a cutting area (200 acres), but is more commonly 40-60% (100-150 acres) of the cutting area. For this analysis, the area disturbed by machine piling could be up to 125 acres (50% of the harvested area on slopes above 25%). The amount of ground disturbance and corresponding sediments that are produced from machine piled areas can be limited through the use of rough piling (decreases the amount of area disturbed), not piling residual slash and the designation of filter strips along stream courses where no machine piling would be allowed.

The actual surface acres of machine piles is approximately 2-5% of the pile area or 3-7 acres. When burned, machine piles generate temperatures well over 1,000° F at 2 inches below the surface (Neary et al. 1999). This will in effect, sterilize the sites where the piles are located (biotic components of soils are damaged at 100-200 F, chemical properties are damaged at 400-600 F, and physical properties are damaged at 600-800 F) (Neary et al. 1999). Sediment production would be effected due to the sites becoming hydrophobic, in turn increasing the amount of water that will runoff the site. However, this effect is minimized due to the small area that piles actually occupy.

Harvesting in the high intensity burn sites on which BAER activities occurred (65 acres) will disturb and possibly damage log erosion structures that have been put in place. The increase in coarse woody debris from slash on these sites will improve the site protection more than the current log erosion structures, thus damage to log erosion structures will be mitigated through proposed slash (CWD) treatments. The hay bale check dams should not be affected because of mitigation measures that are prescribed to minimize impacts to stream courses.

Cumulative Effects

Cumulative Effects for Alternative 2 of the Pack Rat Salvage Project to soils will include timber sales and thinning, that can effect the distribution of coarse woody debris, primarily through fuel treatments. Site preparation for natural regeneration from the Immigrant Timber Sale (1996) and the dozer suppression lines from the Pack Rat Fire were not included in the cumulative effects analysis because it did not affect coarse woody debris distribution. The geographic setting for the cumulative effects analysis will include the 203,015 acre Upper Clear Creek 5th code watershed (formerly known as East Clear Creek 5th code) and the 212,017 acre East Verde 5th code watershed. The timeframe for past actions is 10 years.

Upper Clear Creek

The Upper Clear Creek 5th code watershed contains 203,016 acres. Table 7 displays the past and present timber sale and precommercial thinning projects in the Upper Clear Creek watershed. Table 8 displays the future and foreseeable timber sale and precommercial thinning projects in the Upper Clear Creek watershed.

In past projects, the majority of them were machine piled, therefore it is assumed 50% of the area received ground disturbance. Skidding and hauling of timber disturbed approximately 15-20% of the sale area, however machine piling was applied on the same acres. Therefore, the analysis will look at machine pile disturbance only. Past actions have disturbed approximately 20,160 acres (9.9% of the watershed). Each of the past projects were implemented with Best Management Practices and effects on sediment production and coarse woody debris accumulation have been mitigated. With this alternative, an additional 160 acres of ground disturbance would take place for a total of 20,320 acres (10% of the watershed) of ground disturbance.

The future and foreseeable projects are primarily precommercial thinning projects that propose lop and scatter slash treatments. These actions are usually non-mechanized and disturb less than 5% of the site, adding approximately 1,000 acres of ground disturbance. Approximately 220 acres of this disturbance are included in the project list above, thus leaving 780 acres of disturbance due to future and foreseeable projects. Table 11 displays a summary of the acres of ground disturbance within the Upper Clear Creek watershed.

Table 11. Summary of ground disturbing acres in Upper Clear Creek Watershed, past and present.

Alternative	Past acres disturbed	Future acres disturbed	Total acres disturbed this project	Total acres disturbed	% of watershed
1	20,160	780	0	20,940	10.3%
2	20,320	780	30-57	21,130- 21,157	10.4%

Overall, each alternative cumulatively disturbs approximately 10% of the Upper Clear Creek watershed (see Table 11). The past use of Best Management Practices has mitigated the impacts of coarse woody debris removal and bare soil from ground disturbance and it is believed that the effects from either Alternative will be minimal to soil resources within the watershed.

East Verde River

The East Verde River watershed contains 212,017 acres. Table 9 displays the past and present timber sale and precommercial thinning projects in the East Verde River watershed. Table 10 displays the future and foreseeable timber sale and precommercial thinning projects in the East Verde River watershed.

In past projects, the majority of them were machine piled, therefore it is assumed 50% of the area received ground disturbance. Skidding and hauling of timber disturbed approximately 15-20% of the sale area, however machine piling was applied on the same acres. Therefore, the analysis will look at machine pile disturbance only. Past actions have disturbed approximately 755 acres (0.3% of the watershed). Each of the past projects were implemented with Best Management Practices, and effects to sediment production and coarse woody debris accumulation have been mitigated. With this alternative, an additional 30 acres of ground disturbance would take place, for a total of 785 acres of ground disturbance (0.4% of the watershed).

The future and foreseeable projects are primarily precommercial thinning projects that propose lop and scatter fuel treatments. These actions are usually non-mechanized and disturb less than 5% of the site, adding approximately 62 acres of ground disturbance on these sites. The Whisper Embedded Commercial Timber sale will have a commercial timber sale component and is assumed to have machine piling on approximately 145 acres. Therefore, the future and foreseeable projects will affect an additional 207 acres. Table 12 displays a summary of acres of ground disturbance within the East Verde River watershed.

Table 12. Summary of ground disturbing acres in the East Verde River Watershed, past and present.

Alternative	Past acres disturbed	Future acres disturbed	Total acres disturbed this project	Total acres disturbed	% of watershed
1	755	207	0	962	.5%
2	785	207	30-57	1,022-1,049	.5%

Overall, Alternative 1 and Alternative 2 individually disturb approximately _ of 1% of the East Verde River watershed. The past use of Best Management Practices has mitigated the impacts to bare soil from ground disturbance and it is believed that the effects from either Alternative will be minimal to soil resources within the watershed.

Water

Affected Environment

The Pack Rat Salvage project area lies within two 5th code watersheds, Upper Clear Creek (203,015 acres) and the East Verde River (212,017 acres). Water quality of Upper Clear Creek meets the standards set by the State of Arizona (ADEQ 1998). There are approximately 1.3 miles of stream courses in the Upper Clear Creek watershed in the project area. Of these, 0.1 miles are riparian streams, and 1.2 miles are non-riparian streams. The riparian stream courses within the project area have been assessed prior to the fire using the Proper Functioning Condition assessment methodology (Prichard 1993), with .1 miles of stream being rated as at-risk. Rainfall after the fire put some ash into the stream courses. There are no water quality data for the specific reaches affected by the fire. Appendix C displays the water quality data for the Upper Clear Creek watershed.

Water Quality of the East Verde River is variable. The closest sample station to the project area is below the Mogollon Rim below Washington Park. In 1998, water quality was in full compliance at this sample point (ADEQ). There are approximately 0.3 miles of non-riparian streams within the East Verde watershed in the project area. Appendix C displays the water quality data for the nearest reach within the East Verde River watershed.

Environmental Consequences

Alternative 1: No Action

Direct and Indirect Effects

The direct effects to water quality from Alternative 1 will be dictated by the amount of soil loss that occurs. To date, there has been ash and some sediment moved into the stream courses within the project area. The area with the highest potential to move sediment is TES Unit 651, which has a severe erosion hazard. As stated above, a soil with a severe erosion hazard has the potential to move sediments above tolerable soil loss limits when ground cover is disturbed. Miller (1995) notes that the tolerable soil loss due to sheet and rill erosion in TES Unit 651 is 9.0 tons/hectare/year, with a potential soil loss as great as 59.5 tons/hectare/year.

With 60 acres (27.7 hectares) burned severely in this map unit, there is a potential for movement of 245 tons to 1,623 tons of sediment within the first year. Of this soil loss, not all will reach the drainages, however, we can expect some increase in sediments to stream courses within each watershed, thus having a short-term negative effect to turbidity within the associated stream reaches. Short-term on-site and off-site soil loss will continue as the site recovers, and will decrease over time (Cooper 1961, Rich 1962 and Ffolliet 1988). As the site begins to become revegetated, the amount of soil loss will decrease over time and begin to approach tolerable limits. It is expected to take at least 5 years for enough grass/forb recovery and coarse woody debris to fall to stabilize the site.

Cumulative Effects

Cumulative effects for Alternative 1 of the Pack Rat Salvage Project will include timber sales, thinning, site preparation for natural regeneration (36 acres in 1996) and dozer line construction from the Pack Rat Fire (21 acres from 2002) that may involve mechanized equipment that can

create ground disturbance. The geographic setting for the cumulative effects analysis will include the Upper Clear Creek 5th code watershed (formerly known as East Clear Creek 5th code) and the East Verde 5th code watershed. The timeframe for past actions is 10 years.

Upper Clear Creek

Table 13 summarizes the acres of disturbance for the Upper Clear Creek watershed. The Alternative 1 will not add any additional ground disturbing activities within the Upper Clear Creek watershed; therefore, there will be no direct cumulative effect from this alternative.

Table 13. Summary of ground disturbing acres in Upper Clear Creek Watershed, past and present.

Alternative	Past acres disturbed	Future acres disturbed	Acres Disturbed this project	Total acres disturbed	% of watershed
1	20,217	780	0	20,997	10.3%
2	20,377	780	53-80	21,210-21,237	10.5%

East Verde River

Table 12, in the Soil section, summarizes the acres of disturbance for the East Verde River watershed. Alternative 1 will not add any additional ground disturbing activities within the East Verde River watershed; therefore, there will be no direct cumulative effect from this alternative.

Alternative 2: Proposed Action

Direct and Indirect Effects

Salvage on approximately 200 to 500 acres of forested environment will produce abundant coarse woody debris to aid in stabilization of burn sites. This is most important on the 102 acres of high intensity burn, and in particular on the 60 acres of high intensity burn in TES map unit 651. The addition of coarse woody debris to this map unit will decrease the potential tons of soil lost closer to the tolerable soil loss amount and aid in site stabilization within the first year.

As stated above, increased ground disturbance from skidding and landing activities may impact 83 to 110 acres. Additional disturbance is expected from the hauling of logs on forest roads. The effect will apply to closed roads reopened for salvage activities (approximately 2 miles) and for new temporary roads (approximately 0.4 miles). The effects are increased acres of open road that are sources for on-site and possible off-site soil loss that would increase turbidity, thus negatively effecting water quality. Mitigation measures for applying slash to disturbed areas will minimize this impact.

An indirect effect of harvest activities is the use of heavy equipment as well as contractors camping on-site during harvest, potentially negatively affecting water quality. Effects to water quality are a result of hazardous materials spills and control of sanitation facilities. This is mitigated through BMP's (see Appendix B).

Roads can have a major impact on on-site soil loss and subsequent water quality through poor location, poor drainage, and season of use. The effect of roads that are located in drainages, have non-functioning drainage structures, and are used when wet is on-site soil movement, off-site soil movement to stream courses, and increased turbidity (negative effect on water quality). Salvaging approximately 550 acres will provide the opportunity for much needed road maintenance on

approximately 8 miles of road within the Pack Rat Salvage project area, and approximately another 22 miles of road outside of the project area. This will minimize soil movement associated with these roads because drainage structures will be maintained before and after log haul.

Cumulative Effects

Cumulative Effects for Alternative 2 of the Pack Rat Salvage Project will include timber sales and thinning that may involve mechanized equipment that have had or will create ground disturbance. The geographic setting for the cumulative effects analysis will include the Upper Clear Creek 5th code watershed (formerly known as East Clear Creek 5th code) and the East Verde 5th code watershed. The timeframe for past actions is 10 years.

Upper Clear Creek

The total project acres for cumulative effects for water include all of the soils acres of disturbance, as well as 36 acres of site preparation for natural regeneration (1996) and 21 acres of dozer line construction for the Pack Rat fire (2002). Overall, past and foreseeable actions cumulatively disturb approximately 10.5% of the Upper Clear Creek watershed (see Table 13), with Alternative 2 adding less than 1% of acres of disturbance. The past use of Best Management Practices has mitigated the impacts of bare soil from ground disturbance and it is believed that the effects from either Alternative will be minimal to water resources within the watershed. Water quality data (Appendix C) also supports this conclusion.

East Verde River

Acres of projects and relative ground disturbance used in the soils analysis also apply for cumulative effects to water. Overall, Alternative 2 disturbs approximately _ of 1% of the East Verde River watershed (see Table 12 above in the Soil section), with the actions proposed in Alternative 2 adding only 30-53 acres of expected ground disturbance. The past use of Best Management Practices has mitigated impacts to bare soil from ground disturbance and it is believed that the effects from either Alternative will be minimal to water resources within the watershed. Water quality data (Appendix C) also supports this conclusion.

Recreation and Scenery Management

Affected Environment

Recreation

The Mogollon Rim on the Coconino National Forest has historically offered dispersed recreation opportunities. Though mostly characterized as Roded Natural in the Recreation Opportunity Spectrum (ROS) (see Appendix D), the lack of developed recreation sites along the Mogollon Rim makes it closer to the Semi-Primitive Motorized classification. The Mogollon Rim is also designated as a Management Area (MA) in the Forest Plan as MA 19, which emphasizes recreation and visual quality.

The level of recreational use during the summer within MA 19 has grown dramatically and includes dispersed camping, hiking, horseback riding, bicycling, hunting and All Terrain Vehicle (ATV) or Off Highway Vehicle (OHV) use. The primary forest roads, including the Rim Road, all receive heavy use during summer months. A large number of side roads, originally constructed for timber harvest, are used for dispersed camping and recreational activities. Restrictions on

dispersed camping are the same as those across the Coconino National Forest. Heavily used “dispersed sites” occur within the project area and several camping parties were relocated during suppression of the Pack Rat fire. None of the high use dispersed campsites were destroyed in the fire. Immigrant Springs, and various locations along Forest Roads 320, 141H and 501 show signs of frequently used dispersed sites, most likely associated with family camping or hunting camps.

Access to some of the sites west of High View Point has increased due to fire suppression efforts that created trails now used as “jeep trails”. Open roads on each of the two points (Kehl Ridge and another, unnamed) west of High View point provide access to little used viewpoints off of the main route, away from the bustle of the Rim Road.

The main attraction is the view along the Rim Road. Driving for pleasure and viewing scenery are two high use activities. Overlooks close to the rim are heavily impacted due to dispersed recreation users creating pullouts to enjoy the view. Viewpoints were created with the 1990 fires (Dude and Bray), but interpretive or day use sites were never developed beyond the interpretive sign along the General Crook Trail near High View point.

High View Lookout (point) is the closest thing to a developed site within the project area, and the post fire view includes several acres of burned trees to the east of the viewpoint. Rehabilitation efforts are evident where waist high stumps were left to provide log erosion barriers. There is room for 6-8 vehicles to park and view the scenery from this point, and several rock fire rings indicate that dispersed camping occurs here.

Currently hazard trees in the vicinity of main Forest Roads, dispersed campsites and High View point threaten the health and safety of recreationists in the project area. While the probability of a tree falling the instant that a vehicle is passing under it is low, limited sight distance creates blind spots in the road where fallen trees can cause accidents. Large numbers of dead and damaged trees fall frequently along the roadway due to high winds associated with the Mogollon Rim.

Scenic Quality

The Mogollon Rim is a large fault cutting across central Arizona for some 200 miles in a southeast to northwest direction. “The Rim” is a rugged, spectacular escarpment that rises abruptly some 2,000 feet in places, providing a dramatically different landscape, vegetation type, and climate from the Sonoran Desert to the south. The coniferous forest of the Mogollon Rim contrasts sharply with the metropolis of Phoenix, less than 100 miles away. Since wildfires occur often, it is likely that the forest type and numerous openings currently observed have evolved historically and are within the natural range of variability.

This area is part of a highly scenic landscape. The sense of place developed around the Mogollon Rim dates back to memoirs of early travelers who described both the treacherous roads (accessed via General Crook’s Wagon Road in “Vanished Arizona” by US Army wife Martha Summerhey) and the amazing views from various (natural appearing) openings. The popular *Arizona Highways* magazine has, for over 75 years, featured at least one cover photo each year (and numerous internal articles) documenting the grandeur of the views, and the majesty of the Rim Road experience. Even popular writers of ‘pulp fiction’ like Zane Grey set dramatic adventures along the Mogollon Rim.

The dramatic relief of the rim itself contributes to the definable character of the landscape, and the importance of this landscape is part of the reason that the Mogollon Rim Management Area (MA 19) was created. The Rim meets the Scenery Management criteria of Distinctive; referring to extraordinary and special landscapes that are attractive and stand out from common landscapes.

High quality scenery, especially natural-appearing landscapes, enhances people's lives and benefits society. The benefits of high quality scenery are numerous, despite the fact that a dollar value is seldom assigned to it except in regard to real estate appraisals and areas with major tourism influences. The Visual Management System describes procedures implemented to create the criteria for the Visual Quality Objectives (VQO's) used in the Coconino Forest Plan. In 1995, *Landscape Aesthetics – A handbook for Scenery Management* was developed to supercede and replace VQO's with a system for evaluating the landscape in a larger sense and in an integrated manner (USDA 1995). The system is to be used in the context of ecosystem management to inventory and analyze scenery in a national forest, to assist in establishment of overall resource goals and objectives, to monitor the scenic resource, and to ensure high quality scenery for future generations. This summary will combine the two systems due to the small size of the area, using the defining landscape characteristics (from the Scenery Management System) to re-emphasize the special nature of the Mogollon Rim, while recommending mitigation measures identified in the Forest Plan to begin moving the area towards management objectives.

The Pack Rat fire created new visual impacts along the Rim directly between two previous fires (the Dude and Bray fires of 1990). The scenic integrity of the project area is currently in the low to moderate range. Over the next 10 to 20 years, nearby areas will burn again, keeping visual integrity in a state of flux. The abruptness and drama of a wildfire, while natural in the ecological context of the Mogollon Rim, will provide startling evidence of constant change across this distinctive landscape. Increases in human use and occupancy of the area will change over time as openings are created. Decades of timber harvest in areas adjacent to the Rim Road have created openings that are more modified, but still within management objectives for the ROS classification of Roded Natural.

Environmental Consequences

The geographic setting for analysis of Recreation and Scenic Quality is MA 19, the Mogollon Rim Management Area (Appendix A), and the timeframe for past activities is 15 years. The two main activities considered in this analysis, which are not listed in Tables 4 and 5, are the salvage projects associated with the Dude and Bray fires that occurred in 1991. The Pocket-Baker Timber Sale, completed in 2002, was also considered in this analysis. These projects were included in analysis due to the proximity of the Pack Rat Salvage project area and the impacts of project activities on Recreation and Scenic Quality.

Recreation

Alternative 1: No Action

Direct and Indirect Effects

No action means that the existing condition will not be changed and activities will continue as previously planned. Trees along the road corridors and near dispersed recreation activity sites would fall, perhaps causing injury or property damage. "Jack strawed" downed logs will create

access problems, blocking the Rim Road and other main roads in the burn area, possibly causing drivers to divert their path off road. This would cause direct problems perhaps to the vehicle or passengers as well as soil and other resource damage. Dispersed recreationists will have limited access in the area, and the roads would need constant clearing as trees fall randomly. Negligence, in a legal sense, from not removing identified hazard trees would be a very realistic outcome in a courtroom trial if this alternative is implemented.

Cumulative Effects

The direct and indirect effects of implementing this alternative have very real and tangible potential negative effects to the visiting public. The Mogollon Rim is subject to high winds and heavy snow loads. Trees naturally fall along the portions of the Rim Road after they are weakened by age, defects, insects and disease. Along the 4 miles of road where the Pack Rat fire burned intensely, the damaged trees are susceptible to falling from natural windthrow occurring along roads through MA 19. The cumulative effects include compounding maintenance costs, limited access to dispersed areas, and endangering the public visiting this portion of the Mogollon Rim. These effects would be the most apparent for the next 3 to 15 years.

Alternative 2: Proposed Action

Direct and Indirect Effects

Implementation of the proposed action with mitigations will help meet safety standards through removal of hazard trees. As mentioned in the Pack Rat Salvage Roads Analysis (PR # 15), closure of temporary roads and portions of other roads after they are used will reduce access to dispersed areas between Rim Road and the Rim itself, and in sensitive areas. This will meet some of the objectives of MA 19 to reduce off road vehicle use where it may be causing unacceptable levels of resource damage between the Rim Road and the Mogollon Rim. Road closures and restriction of off road travel may discourage users who have traditionally used the area and may have been causing resource damage. The road closures and scattered slash in harvest units will help to reduce off road vehicle travel in the area yet may displace those users. The experience provided would more closely resemble Semi-primitive motorized, rather than Roded Natural. Management constraints would be consistent with the lower end of the ROS (Appendix D) and not be intrusive: On-site regimentation and controls are noticeable, but harmonize with the natural environment. During operations, safety mitigations will noticeably change the experience, as strict safety measures would be enforced to provide reduced interaction and conflict (collisions) between logging equipment and recreation traffic.

Cumulative Effects

Implementing the mitigation measures with the action items will help provide the safety that recreationists have come to expect in this heavily used area. The past fires and logging areas/roads have provided almost unlimited access to this area. The direct and indirect effects above, in addition to ongoing operations, will help meet resource objectives outlined in MA 19 direction for recreation emphasis that integrates resource protection and improvement. Cumulatively, the removal of fire damaged trees in the road corridor of the neighboring Bray fire and in portions of the Dude fire (further east) has increased the safety of travelers along the Rim Road in MA 19. Road closures in the Pocket-Baker Timber Sale have reduced the density of open sub-standard or user-created roads, moving towards meeting MA 19 objectives for more primitive ROS experience.

Scenic Quality

Alternative 1: No Action

Direct and Indirect Effects

Implementation of this alternative would not improve the scenic integrity of this area. Although fire has played a natural ecological role in this landscape, suppression activities that need further rehabilitation are evident and would not be completed under this alternative. This portion of an important Management Area would continue to have low to moderate integrity from the highly altered landscape. This would not meet or move towards meeting the emphasis of MA 19 for a highly scenic landscape characteristic.

Cumulative Effects

The cumulative effects of no action are the same as the direct and indirect effects. The visual integrity of the landscape would move less quickly, if at all, from current low levels to a higher level of scenic integrity. Combined with other activities nearby in MA 19, (specifically the Pocket-Baker Timber sale slash treatment and blue-painted trees from the MC Timber Sale (which did not sell) near General Springs Cabin along the Rim Road) the impacts of this alternative do not meet standards for maintaining a high degree of scenic integrity in the landscape.

Alternative 2: Proposed Action

Direct and Indirect Effects

The mitigation measures included in the proposed action would help to rehabilitate the landscape character of the MA 19 highly scenic area. The area would begin to move toward a high degree of landscape character. Conscientious application of retention guidelines and mitigation measures in MA 3 areas along main roads and in MA 19 along the Rim Road would begin to provide increased scenic integrity.

Cumulative Effects

The direct and indirect effects of the proposed action may appear negative in the short term, however adjoining burned areas (Dude and Bray fires of 1990) in MA 19 are beginning to provide a higher level of scenic integrity. Cumulatively, past fires along the Rim from different time periods will show increasing levels of recovery towards a high level of scenic integrity. Cumulative effects of restricting access in the sensitive area between the Rim Road and the rim are that the area will begin to heal from rehabilitation activities and the proposed action, thus increasing scenic integrity. The area will become more natural appearing over time (fire is re-occurring in this landscape) and move back towards the high level of scenic integrity.

Fire and Fuels ---

Affected Environment

The Pack Rat fire burned on the Tonto and Coconino National Forests in the late summer of 2002 (August and September). Fire intensities in the Pack Rat Salvage project area varied from low/low-moderate intensity (403 acres) to high/moderate-high intensity (147 acres). The range of fire intensities resulted in a mosaic of effects to the fuel bed within the analysis area. Fire intensities are defined as the following for this analysis:

- 1) Low intensity: litter is scorched, but not altered for its entire depth with less than 40% of the canopy burned;
- 2) Moderate intensity: surface litter is charred but not ashed with 40-80% of the canopy burned and remaining charred twigs are greater than 1/2" in diameter;
- 3) High intensity: organic layer is completely burned, only ashes remain, charred plant stems remaining are greater than 1/2" in diameter. (Larson 1989, Wells et al. 1979)

The Pack Rat fire was established and spread on top of the Mogollon Rim primarily by long range spotting from below the Rim and burnout operations on top of the Rim. Fire intensities resulting from spotting varied from high to low intensity. The majority of high intensity burning was however, a direct result of crown fire runs and subsequent spotting originating below the Rim. The high intensity burn areas are located immediately adjacent to the edge of the Rim or are north of the Rim and northeast (down wind) of large chutes within the Rim. Many of these chutes experienced upslope fire runs resulting in crown fire and heavy long range spotting into the high intensity burn areas seen along the edge of the Rim and in the interior northeastern portion of the burn area (Figure 5). Most of the burnout operations resulted in low to moderate intensity burning because they were lit backing into the wind during burning conditions moderated by low night time temperature and high relative humidity as compared to the daytime burning period. Heavy crown scorching, particularly of Douglas-fir and white fir trees did occur in many areas with low to moderate burn intensities.

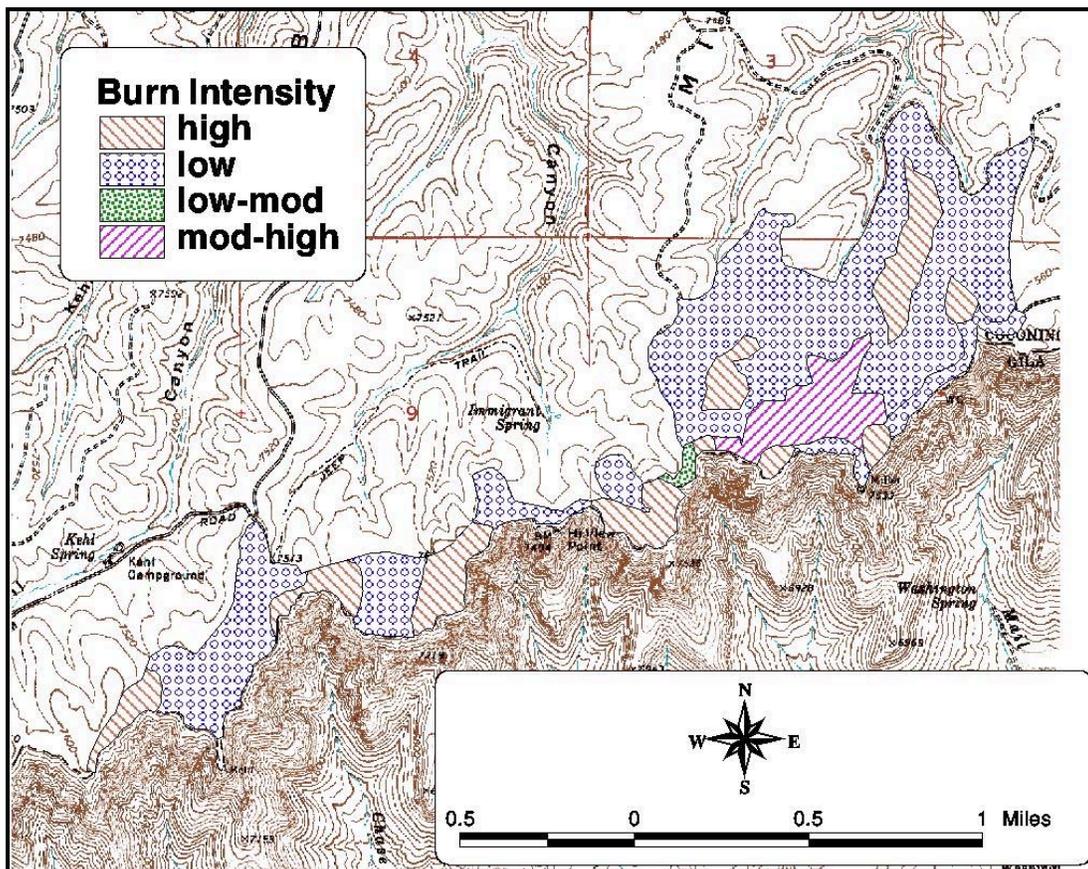


Figure 5. Burn Intensities in the Pack Rat Salvage Project Area.

Existing fuels were affected in the immediate term by the Pack Rat fire because of increased heterogeneity created in the fuel bed and through decreased surface fuel loading caused by the consumption of fuels that existed in the project area at the time of the burn. The fire will impact future fuel loading within the project area. Direct mortality within the high intensity burn areas and delayed mortality due to cumulative effects of drought, fire damage, and bark beetles will cause surface fuel loads to increase in the future. Tree fall will also result in a more homogenous fuel bed in the future.

Environmental Consequences

The geographic setting for analysis of Fire and Fuels is the Pack Rat Salvage project area. The timeframe for past actions is 10 years.

Modeling of Quantifiable Measures

The quantified effects discussed in this section were determined by simulating effects of the Pack Rat fire (high and low intensity) and the management activities that have an effect on fuel loading in the Proposed Action. The effects were modeled using the Fire and Fuels Extension to the Forest Vegetation Simulator (FFE-FVS). Fourteen of thirty-eight stands within the project area had inventory data that was used in the model. The inventories occurred between 1986 and 1988. Tree growth was simulated up to 2002 and the Pack Rat fire was simulated in 2002. Multiple fire intensities were simulated to assess trends in fuel loading within corresponding portions of the project area. Salvage, piling, and crushing were simulated in 2003 for the Proposed Action alternative. A wildfire was simulated under extreme conditions for all potential activities in 2022. This fire was simulated twenty years after the Pack Rat fire because nearly all trees killed by the Pack Rat fire were projected by FVS to have fallen by that time. Simulating a fire 2022 was done to assess potential fire effects of the maximum projected surface fuel loading.

Tree regeneration was excluded from the modeling because most species that will naturally regenerate in the project area will be browsed by ungulates (personal observation) and will not contribute significantly to fuel loading or fire intensity. It is important to note that the models used in this assessment are not capable of producing predictions of fire behavior or fuel loading. The models are capable of producing results that are useful for quantifiably projecting and evaluating trends in fuel loading and possible fire effects. Therefore, the quantified measures presented in the Fire and Fuels effects analysis are projections of potential fuel loading and fire effects. The projections were evaluated by comparing them to personal experience, professional judgment and peer-reviewed literature to determine plausibility. An electronic copy of files associated with the modeling of effects for this analysis are included in the project record as part of the Fire, Fuels and Air Quality Specialist Report (PR #28).

Alternative 1: No Action

Direct and Indirect Effects

Surface fuel loading in the analysis area will increase through time as needles, dead branches, and trees fall. Tree fall will begin primarily with trees less than 12 inches diameter at breast height (DBH) 2-4 years after the fire. Fall rates of dead trees will increase dramatically 5-10 years after death with as many as 70% of trees less than 12 inches DBH falling. Some large trees, greater than 12 inches DBH, will also fall within 10 years (Schmid et al. 1985, Everett et al. 1999). Observations of tree fall rates in high intensity burn areas of the adjacent Dude and Bray fires on

top of the Mogollon Rim by Forest Service personnel indicate that 80%-90% of all trees will fall within ten years after the fire. Rapid fall rates for the area are likely due to the combination of a relatively high proportion of small to medium diameter Douglas-fir and white fir in the local stands and the frequent occurrence of high velocity winds and heavy winter snows.

The direct effects of the No Action alternative are that no salvage activities will occur; therefore fuels resulting from the falling of dead trees will be allowed to accumulate. Retention of 10 – 15 tons/acre of coarse woody fuel loading (greater than 3 inches diameter) is suggested by Graham et al. (1994) for maintenance of long-term soil productivity in mixed conifer forest. The Pack Rat fire reduced the pre-existing surface fuel loading within the project area. However, post-burn surface fuel loading will likely exceed pre-burn levels due to the amount of mortality caused directly and indirectly by the fire (Harrington and Sackett 1990).

Total surface fuel loading for fuels greater than 3 inches in diameter ranges between an average of 20.5 tons per acre in low intensity burn areas to an average of 35.6 tons per acre in high intensity burn areas in 2022, twenty years after the Pack Rat fire. Tables 14 and 15 summarize the potential distribution of surface fuels greater than 3 inches in diameter for the No Action Alternative. The total fuel loading for fuels greater than 3 inches in diameter (sum of the means for respective categories in Tables 14 and 15) both exceed the suggested range of coarse woody debris retention suggested by Graham et al. (1994).

Table 14. Potential surface fuel loading of fuels greater than 12 inches in diameter for the No Action Alternative in tons per acre by dry weight within the Pack Rat burn area in 2022.

	Low Intensity	High Intensity
Mean	6.2	13.4
Minimum	2.3	3.7
Maximum	20.1	36.2

Table 15. Potential surface fuel loading of fuels between 3 and 12 inches diameter for the No Action Alternative in tons per acre by dry weight within the Pack Rat burn area in 2022.

	Low Intensity	High Intensity
Mean	14.3	22.2
Minimum	7.2	10.7
Maximum	39.7	39.8

Approximately 60% of potential surface fuels in high intensity burn areas are greater than 3 inches diameter because of consumption of foliage and twigs up to 0.25 inches diameter and partial consumption of twigs up to 1.0 inches in diameter. Heavy accumulations of 1000hr and greater fuels (3 to 9 inches diameter = 1000hr fuels, greater than 9 inches diameter = 10,000-hour fuels) are known to increase surface fire intensity and the duration of combustion. Fires occurring on sites with high 1000hr and greater surface fuel loading have been shown to increase the severity of

effects on all properties of soils due to the intensity and duration of combustion (Neary et al. 1999).

Severity of fire effects is highly dependent upon a variety of conditions that occur at the time of the burn such as (but not limited to) soil moisture, fuel moisture, fuel size, fuel arrangement and continuity, wind speed and direction, and type of combustion (Harrington and Sackett 1990). Future fires occurring within the project area from unplanned ignitions are likely to result in high intensity fire effects on soils and surrounding vegetation due to the predicted fuel loads resulting from tree fall. The severity of fire effects on other resources will increase as fuel loading increases and fuel moisture decreases. Common effects on soils from high intensity fire are decreased mineralization rates, nutrient loss through erosion, leaching or denitrification, decreases in micro and macrofauna, and altered microbial populations amongst other effects (Neary et al. 1999).

Over the short-term, fire spread will be limited in high intensity burn sites to spot or log-to-log ignitions because of insufficient accumulations of fine fuels in the interspaces of logs. This will result in relatively low rates of spread. Low rates of spread facilitate the achievement of fire suppression objectives. Rates of spread will increase over time in the high intensity burn sites as herbaceous fuels accumulate, creating a more continuous fuel bed. Fire spread in low and moderate intensity burn areas will not be limited in the short-term because needle cast from scorched and live trees as well as existing unburned fuels provide a continuous fine fuel bed in which fire can spread.

High fuel loading of large diameter fuels decreases fireline production rates because of the extra time and resources required to remove fuels, inhibiting the achievement of fire suppression objectives. High fuel loading also improves the ability of fire to spread by decreasing the spotting distance to available fuels and by increasing the probability of direct flame contact between fuels. Also, as fuel loading increases, severity of fire effects increase, particularly to soils underneath heavy fuel loads primarily due to high temperatures per unit of area and increasing resident time of those temperatures.

Horizontal continuity of fuels across the project area will become increasingly uniform over time as fallen trees and overstory and herbaceous litter accumulate on the forest floor. This continuity will allow future fires to carry across the project area. Fire intensities will vary proportionately with fuel loading. The average potential fuel loading exceeds 20 tons per acre of fuel greater than 3 inches in diameter on the entire project area. As a result, fire intensities may be high on the entire project area if burned with low fuel moistures. In addition, suppression objectives will become increasingly difficult to achieve as 1,000hr and greater fuels accumulate on the forest floor. This is due to associated increases in fireline intensity and flame lengths, which limit the effectiveness of direct fireline construction and contribute to extreme fire behavior such as spotting and torching.

The indirect effect of the No Action alternative is an increase in the potential for high intensity surface fire over time as forest floor fuels accumulate due to the falling of dead trees. Fires of this type result in long resident heating times and decreased effectiveness of fire suppression resources.

Cumulative Effects

Cumulative effects to fuels and fire for the proposed Pack Rat Salvage project considers activities that can effect the amount, arrangement, and distribution of course woody debris.

There are no past, present, or future activities that are expected to occur within the Pack Rat project area. Therefore, the No Action alternative is not expected to result in cumulative effects to other planned activities.

Alternative 2: Proposed Action

Direct and Indirect Effects

Salvage activities will produce slash in the first year after the fire. Therefore, the Proposed Action will result in higher fuel loading over the short-term than the No Action alternative. Salvage activities proposed in Alternative 2 are projected to decrease average fuel loading of fuels greater than 12 inches diameter over the long-term by 51% in low to moderate intensity burn areas and by 61% in high intensity burn areas. Total mean fuel loading for fuels greater than 3 inches in diameter in low/moderate intensity areas ranges from 11.5 tons per acre for the piling treatment to 13.1 tons per acre for the lop/scatter and crushing treatments. Total mean fuel loading for fuels greater than 3 inches in diameter in high intensity burn areas is projected to be 19.4 tons per acre. Tables 16 and 17 summarize the potential distribution of surface fuels greater than 12 inches diameter for the Proposed Action Alternative. The total mean fuel loading for fuels greater than 3 inches in diameter (sum of the means for respective categories in Tables 16 and 17) falls within the range of course woody debris retention suggested by Graham et al. (1994) with the exception of the high intensity lop and scatter category.

Table 16. Potential surface fuel loading of fuels greater than 12 inches in diameter for the Proposed Action Alternative in tons per acre within the Pack Rat burn area in 2022.

	Low Intensity			High Intensity Lop and Scatter
	Lop and Scatter	Pile	Crush	
Mean	3.0	2.7	3.0	5.3
Minimum	0.1	0.8	0.1	1.1
Maximum	10.1	9.1	10.1	13.6

Table 17. Potential surface fuel loading of fuels between 3 and 12 inches in diameter for the Proposed Action Alternative in tons per acre within the Pack Rat burn area in 2022.

	Low Intensity			High Intensity Lop and Scatter
	Lop and Scatter	Pile	Crush	
Mean	10.7	8.8	10.7	14.1
Minimum	4.9	3.9	4.9	6.5
Maximum	31.3	26.6	31.3	31.3

Reductions in fuel loading will reduce surface fire intensities across the project area by decreasing the soil surface area covered by large diameter fuels that can cause high intensity fire effects to soils if burned. Decreasing fuel loading will also facilitate the achievement of fire suppression objectives by increasing potential line construction rates and by reducing fireline intensities.

Hazard tree falling will result in higher short-term fuel loads than other activities along road corridors because of felling of some trees less than 12 inches in diameter. However, long-term fuel loads along road corridors will be reduced due to stem removal through salvage. Fuel loads along road corridors will not vary from the average fuel loading for salvage only areas over the long-term because of the accumulation of fuels less than 12 inches diameter from tree fall over time. Piling is not expected to occur along road corridors due to visual quality concerns.

Fuel loading will be horizontally and vertically heterogeneous across the project area. Heterogeneity will be achieved through salvage activities such as skidding, piling of slash and/or crushing of slash. Piling and crushing slash will contribute to vertical heterogeneity and decrease potential widespread fire intensity. Fire intensities will be high on locations where slash piles are burned. Slash crushing, the walking of mechanized equipment on broadcast slash to reduce vertical arrangement, is highly effective in reducing flame lengths and scorch heights (Jerman et al. in press) but may not reduce surface fire intensity if surface fuels are very dry when burned because of the increased propensity for smoldering combustion. In addition, crushing of fuels may disrupt the beneficial soil sustaining attributes of coarse woody debris (Graham et al. 1994). Skidding, piling, and crushing will contribute to horizontal heterogeneity by disrupting the horizontal continuity of the fuel bed across the project area limiting a fire's ability to spread with continuous high intensity burning across the project area.

Piling will reduce average loading of fuels greater than 3 inches in diameter in the low and moderate intensity burn areas by 2.1 tons/acre as compared to lopping and scattering or crushing slash. Some fine fuels less than 3 inches in diameter will also be consumed by piling and burning. Consumption of fine fuels will reduce fire hazard and total fuel loading. Heterogeneity of the fuel bed provides potential barriers to fire spread which allow suppression resources more options by which to achieve suppression objectives with minimal effort.

Cumulative Effects

Cumulative effects to fuels and fire for the proposed Pack Rat Salvage project considers activities that can effect the amount, arrangement, and distribution of coarse woody debris.

There are no past, present, or future activities that are expected to occur within the Pack Rat project area. Therefore, the Proposed Action alternative is not expected to have any cumulative effect to fuel loading or fire behavior on other planned activities.

Wildlife

Affected Environment

Wildlife species are integral components of the ecosystem that comprises the Pack Rat Salvage project area. The following describes the affected environment of wildlife, which includes big game, non-game, migratory birds, management indicator species, and endangered, threatened, and sensitive species. Also included is the affected environment for fish and sensitive plants, as well as important habitat components within the project area.

Habitat Components

Snags

Snags are an important component of habitat used by numerous species of wildlife. Many species of birds use snags for breeding, roosting, and foraging sites (Raphael and White 1984). Primarily fire, weather, insects, and disease create snags. Individual snags, however, decay and fall at different rates (snag longevity). Snag longevity is based primarily on species, diameter, height, cause of mortality, and exposure to wind (Raphael and Morrison 1987), and therefore, maintaining snags on the landscape is difficult. Overall, snags that are larger in diameter, shorter in height, less decayed, fir rather than pine, and that lack tops remain standing the longest (Morrison and Raphael 1993).

The Coconino National Forest has established a minimum requirement of two snags per acre (USDA 1987). As a result of the Pack Rat fire (which burned approximately 1,074 acres on the Mogollon Rim Ranger District), the project area currently has an over abundance of snags. The majority of the Pack Rat fire burned on the escarpment of the Mogollon Rim itself, and was located on the Tonto NF. The area of the fire on the Tonto NF is not within the analysis area, and no salvage logging is proposed there, due to steep and inaccessible terrain. Of the approximate 1,074 acres of the Pack Rat fire on the Mogollon Rim Ranger District, only 550 acres are being analyzed for this project. The remaining 524 acres is being left untreated. Furthermore, not all of the trees in the analysis area are dead, and therefore would not be considered eligible for harvest. Only dead trees (defined here as a tree with no green needles) would be harvested for this project. There would therefore be a mosaic of green trees, fire killed trees, beetle killed trees, and snags left intentionally for wildlife habitat, across the analysis area. Partially burned trees would not be salvaged, and would provide many snags in the future.

Cover

Animals utilize cover to modify extremes of weather, shelter their young, and avoid detection and or capture by predators. There is about 50 acres of thermal cover, found in a few drainages, on the project area.

Old-growth

Many of the threatened, endangered, and sensitive avian species of Region 3 have a strong association with old-growth conditions, which provide feeding and nesting habitat. There is no old-growth in the project area.

Big Game

The Pack Rat Salvage project area is an important area for wildlife. The area is summer range for game species such as elk, deer, turkey, and bear.

Elk: Elk populations dramatically increased in the mid 1980's through early 1990's. The state population in 1980 was estimated at approximately 10,000 adults after the hunting season, increasing to 30,000 adults post-hunt in 1989 and then stabilizing. Individual herd areas differed, however the elk population in the Pack Rat Salvage project area exhibited a similar pattern with increases until 1993.

Deer: There are two species of deer in the project area. Mule deer are the more common species and tend to frequent the higher elevations with ponderosa pine and mixed conifer in the summer, moving into the pinyon-juniper habitats in winter. White-tailed deer in Arizona eat high amounts of browse in late fall and winter and forbs in spring. Their diet selection appears to be driven by the availability of forbs. When forbs are low, the amount of shrubs consumed increases.

Turkey: Turkeys require different habitat types for different behavioral activities. Roosting habitat is located in tall, over-mature ponderosa pines with widely spaced spreading branches. For breeding, males prefer to display in small openings, edges of large openings or beneath forested habitats with open understory vegetation.

Bear: The project area provides very limited bear habitat. Drainages with dense mixed conifer shelter mothers with cubs during the spring and summer. Studies during the 1980's indicated that the number of breeding females on the Mogollon Rim was extremely low. The Pack Rat Fire destroyed the corridors that bears may have used in the project area.

Birds

The project area provides habitat for many birds, including neotropical migrant birds, resident species, raptors, and threatened and endangered species. Primary migratory birds include the northern goshawk, olive-sided flycatcher, cordilleran flycatcher, and purple martin.

Migratory Birds

The Arizona Partners in Flight (PIF) Bird Conservation Plan identifies priority species by habitat for the state of Arizona. Habitats that are found within the Pack Rat Salvage analysis area include mixed conifer and ponderosa pine. Table 18 lists the priority species for each of the habitats found in the Pack Rat Salvage analysis area.

Table 18. Arizona Partners In Flight designated priority species by habitat.

Habitat	Priority Species
Mixed Conifer	Northern goshawk Mexican spotted owl Olive-sided flycatcher
Pine and Pine-Oak	Northern goshawk Olive-sided flycatcher Cordilleran flycatcher Purple martin

Of the priority species listed by the Arizona Partners in Flight, the northern goshawk and Mexican spotted owl are addressed under threatened, endangered, and sensitive species.

Fish

There is no fish habitat located within the project area. Habitat for fish does occur downstream from the project area, with the closest perennial water approximately 1 mile downstream. The project area contains a very limited portion of the headwaters for the East Clear Creek watershed, and headwaters for the East Verde River. The Pack Rat Fire burned the project area, and the fire consumed much of the ground cover. The resulting bare soil would be easily eroded and could cause sedimentation into headwater drainages. These headwater drainages are ephemeral in nature and rely on snowmelt for run-off.

Non-game fish include natives such as Little Colorado sucker, roundtail chub and the Little Colorado spinedace. Aquatic systems are very limited in the southwest, and are impacted by activities such as livestock grazing, wildlife grazing, and recreation activities.

Sensitive Species

The following is a review of the sensitive species that could potentially be affected by the alternatives proposed for this project, and includes the peregrine falcon (*Falco peregrinus anatum*) and northern goshawk (*Accipiter gentilis*). Sensitive species not addressed below, and reasons for not considering them, are included in Appendix F.

Peregrine falcon: These falcons were often seen along the cliff faces found along the Mogollon Rim, prior to 1990. The cliffs provide suitable nesting substrates in some areas. Much of the Rim area and 28,000 acres of potential foraging habitat on the Tonto Forest below the Mogollon Rim, burned in the Dude fire of 1990. No eyries have been located in the burned areas, and falcons are infrequently seen flying through the project area. An eyrie was located in the East Clear Creek drainage in 1998, 3 _ miles north of the project area. A second eyrie was located within the same drainage in 2001, 2 _ miles north of the project area. A third eyrie is located along the rim 1 _ miles from the western boundary (adjacent to the 1990 Bray burn).

Northern goshawk: This species is an indicator of late seral stage ponderosa pine habitat. This species is dependent on the forest's ability to provide a continuous flow of habitat structural types over time, which provides for habitat characteristics for nesting and a wide variety of prey species. The Forest Plan was amended in 1996, in part, to provide guidelines for management of goshawk habitat. The goshawk preys on large to medium sized birds and mammals. Many of these are ground nesters and foragers, and the downed wood component of the forest floor is important for food and cover. Small mammal populations in particular are regulated more by the abundance of the large downed woody material than by herbage production. Understory vegetation does provide forage and cover for some prey species, and for the invertebrates on which they feed. There are no known territories within or adjacent to the project area.

Management Indicator Species (MIS)

The Coconino National Forest Land Management Plan (Forest Plan) identifies 17 Management Indicator Species (MIS). MIS were developed by vegetative type and seral stage, plus the snag component of forested areas (USDA Forest Service 1987), and are defined as: "...a plant or

animal whose population change reflects a population change in other species within a group. Indicator species respond to habitat changes early or at low levels of stress and, therefore, are sensors of the effect of management activities that occur in various habitats". There are eight MIS species considered for this analysis (Table 19).

Table 19. Management Indicator Species by Management Area and their Population Trend.

Management Indicator Species	MA 3	MA 19	Forest Status
Northern Goshawk (<i>Accipiter gentilis</i>)	X		stable
Mexican Spotted Owl (<i>Strix occidentalis lucida</i>)	X		stable
Elk (<i>Cervus elaphus nelsoni</i>)	X		stable
Abert's Squirrel (<i>Sciurus aberti aberti</i>)	X		stable
Red Squirrel (<i>Tamiasciurus hudsonicus mogollonensis</i>)	X		stable
Turkey (<i>Meleagris gallopavo</i>)	X		stable
Pygmy Nuthatch (<i>Sitta pygmaea</i>)	X		decline
Hairy Woodpecker (<i>Picoides villosus</i>)	X		stable
No Managements Indicator Species		X	

Goshawks are discussed in detail in the Sensitive Species Section of this document. Mexican spotted owls are discussed in detail in Status of Threatened and Endangered Species Section of this document. Conditions of elk and turkey in or near the project area are discussed earlier in this document under Game Species. Existing conditions for the remaining MIS within or near the project area are described here, along with the status of each.

Abert squirrels are highly dependent upon ponderosa pine habitat. The Forest Plan designates the Abert's squirrel as a management indicator species for early seral stage ponderosa pine forests. Trees may need to be at least 60 years old for seed production. Nests occur in large pines 16-90 feet high. They feed on bark, buds, flowers, seeds, mushrooms, mistletoe, acorns, insects, carrion, and the phloem of subterminal twigs. Management practices include the maintenance of clustered stands for cover, nesting, and truffle production (Patton 1977). Also, management corridors should be maintained to decrease localized damage to trees. The project area is only marginally suitable habitat for Abert squirrels because there is a limited amount of ponderosa pine habitat available.

Red squirrels are generally found on higher mountains in stands of spruce or a mixture of spruce and Douglas-fir. The Forest Plan designates the red squirrel as a management indicator species for late seral stage mixed conifer and spruce-fir forests. They are cavity nesters and feed on Engelmann spruce, Douglas-fir, white fir, fungi, buds, fruits, and insects. They harvest the cones from trees to get to the seeds. Dwarf mistletoe creates witches broom that may be helpful for nesting purposes. The three most important overstory variables controlling red squirrel habitat in southwest mixed conifer forests are size, density, and grouping of trees. Multi-storied stands of trees from 30 to 36 cm DBH in dense groups of 0.4 ha or less (Vahle and Patton 1983). The project area contains habitat for red squirrels, although much of it was burned in the Pack Rat fire.

Pygmy nuthatches are generally abundant overwintering resident species. They are tree trunk foragers that occur in ponderosa pine and pinyon-juniper up to 10,000 feet in elevation. Pygmy nuthatches feed on a variety of insects and seeds. They are more abundant in areas with a high, homogeneous canopy (Rosenstock 1996). They may also be more abundant in unburned areas (Block and Finch 1997). Pygmy nuthatches generally select larger trees for nesting and roosting. Specifically, they tend to select for aspen and ponderosa snags, use live aspen proportionally, and select, fir snags, and deciduous snags. They are usually secondary cavity nesters. Partial cuts such as irregular strip and silvicultural have caused declines in population numbers (Szaro and Balda 1979). Activities that reduce insects may also impact this species. The project area contains habitat for pygmy nuthatches; however, burned snags are not favored by nuthatches. The pygmy nuthatch is a management indicator species for late seral ponderosa pine habitat on the Coconino National Forest (USDA Forest Service 1987).

Hairy woodpeckers are overwintering cavity nesters that tend to prefer larger trees. For nesting purposes, they often select the dead or dying branches of live trees. They show strong selection for aspen snags, use live aspen proportional to availability, and select against non-aspen snags. Unlike the pygmy nuthatch, hairy woodpeckers tend to occur more often in burned areas (Block and Finch 1997). Seventy-five percent of food items are insects, including high numbers of wood boring larvae. Other foods include berries and acorns. Studies have shown little effect on populations due to selective harvests (Medin and Booth 1989, Szaro and Balda 1979). The project area provides good habitat for this species, as there are numerous snags that are infested with insects, on which woodpeckers feed. The Forest Plan lists the hairy woodpecker as a management indicator species for the snag component of ponderosa pine, mixed conifer, and spruce-fir.

Threatened, Endangered And Proposed Species (T&E)

There are no federally endangered or proposed species in or near the project area; however, there are four threatened species (Table 20), which are addressed below.

Table 20. Federally Threatened Species in the Pack Rat Salvage Analysis Area.

Species	Scientific Name	Status
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Federally Threatened
Mexican Spotted Owl	<i>Strix occidentalis lucida</i>	Federally Threatened
Little Colorado Spinedace	<i>Lepidomeda vittata</i>	Federally Threatened
Chiricahua Leopard Frog	<i>Rana chiricahuensis</i>	Federally Threatened

Federally Threatened Species

Bald eagles congregate around bodies of water, such as Blue Ridge and Knoll Lake Reservoirs, to forage on waterfowl and fish. They also fly over extensive areas searching for carrion and tend to frequent big game winter ranges in the pinyon-juniper woodland type. When winter storms occur, they move into the more protective ponderosa pine habitats. Eagles appear to opportunistically use roosts in response to food availability and weather conditions. Numbers of eagles counted on the District during winter surveys have been slowly increasing over the past 15 years. Bald eagles are rarely encountered in the project area, and only during the winter months and during migration. Bald eagles are not known to frequent the project area, and sightings are rare. The project area provides few foraging opportunities for eagles. There are no large bodies of water nearby, and

carrion is rare. Snags that could be used as roosts are not protected from inclement weather, as the project area would be located on the edge of the Mogollon Rim.

Mexican spotted owls (MSO) occupy mixed conifer and ponderosa pine-Gambel oak vegetation types, usually characterized by high canopy closure, high stem density, multi-layered canopies within the stand, numerous snags, and downed woody material. Steep slopes and canyons with rocky cliffs characterize much of the suitable nesting/roosting owl habitat. Potential foraging habitat provides adequate cover and downed woody material or rocky outcroppings to offer foraging opportunities for the owls (Facts on the MSO 1993). The Mexican spotted owl was identified as a management indicator species for the late seral stage of mixed conifer and spruce/fir. Along with several other species, management of spotted owls and their habitat is emphasized in Management Area 3, ponderosa pine and mixed conifer less than 40% slope, and Management Area 4, ponderosa pine and mixed conifer greater than 40% slope.

In the past, the project area and surrounding areas have been surveyed for owls and one PAC has been delineated adjacent to the project area. No activity is proposed within this PAC however; activity would take place immediately adjacent to the PAC. The 550-acre project area is mixed conifer, and is considered restricted habitat for the MSO.

Little Colorado Spinedace are endemic to the Little Colorado River Basin. The Upper Clear Creek (UCC) watershed (formerly East Clear Creek watershed) forms the southwestern extension of the Little Colorado River Basin. East Clear Creek proper is one of three drainages, within the basin, identified as critical habitat for this species. The designation of critical habitat was made in conjunction with the U.S. Fish and Wildlife Service listing of the Little Colorado spinedace. No critical habitat exists within or directly adjacent to the project area. A recovery plan for the spinedace was approved in January 1998.

Chiricahua Leopard Frog: (Federally threatened - July 15, 2002) - The Chiricahua leopard frog is known currently or historically from cienegas (mid-elevation wetland communities often surrounded by arid environments), livestock tanks (i.e., small earthen ponds), lakes reservoirs, streams, and rivers at elevations of 3,281 to 8,890 feet in central and southeastern Arizona; west-central and southwestern New Mexico; and in Mexico, northern Sonora and the Sierra Madre Occidental of Chihuahua and Durango. There is no aquatic habitat suitable for Chiricahua leopard frogs in the project area. There is one earthen tank in the project area, but it is small (<_ acre), lacks vegetation, and is intermittently dry.

Environmental Consequences

The area for cumulative effects analysis is the project area, and areas adjacent to the project area (i.e. within _ mile of the project area), for all wildlife except fish. The area of consideration for cumulative effects for fish is the East Clear Creek watershed. The duration for cumulative effects is 17 years for this analysis. Described below are several activities and natural events within the vicinity of the project area that already have, or will likely occur in or near the project area. The past activities and natural events have contributed to creating the existing condition. These activities may produce environmental effects on wildlife issues relevant to the proposal. Therefore, these activities and events have been considered in the above cumulative effects analysis for wildlife.

Past Activities:

Timber harvest and associated road building in or near the analysis area include:

- Bray Fire Salvage – 1991
- Dude Fire Salvage – 1991
- Immigrant Timber Sale – 1990
- General Springs Timber Sale – 1990
- Jones Timber Sale – 1986

Other activities that occurred within the last 10 year that may affect wildlife include:

- Fire suppression activities for the Pack Rat Fire of 2002
- BAER activities on the Pack Rat Fire of 2002
- Recreation use
- Firewood cutting and gathering
- Forest Road 300 improvements
- Maple Draw project

Alternative 1: No Action**Habitat Components*****Direct and indirect Effects***

There would be an abundance of snags retained in the project area that would fulfill the needs for wildlife. Snags would decay and fall in a natural manner. Cover would reestablish itself through natural regeneration, but it would take years for sufficient cover to grow. Old-growth and water sources are not present on or near the analysis area. There would be no direct or indirect adverse effects to snags, cover old-growth or water sources, from not implementing proposed project activities.

Cumulative Effects

Likewise, there would be no cumulative effects to snags, cover, or old-growth, from not implementing proposed project activities.

Non-MIS and Non-TES Species***Direct and Indirect Effects***

The Pack Rat Salvage project area is an important area for many species of wildlife that are not considered MIS or TES species. If the proposed project activities were not implemented, then the area burned by the Pack Rat fire would recover in a natural fashion. There would be no direct or indirect effects to non-MIS/TES species from not implementing proposed project activities.

Cumulative Effects

Likewise, there would be no cumulative effects to non-MIS/non-TES species from not implementing proposed project activities.

Migratory Birds***Direct and Indirect Effects***

There is currently a wide array of diverse habitats in the watershed, though a century of fire suppression has resulted in increasing tree densities and the loss of open meadows. There would be no direct or indirect effects to migratory birds from not implementing proposed project activities.

Cumulative Effects

Likewise, there would be no cumulative effects to migratory birds from not implementing proposed project activities.

TES Species***Threatened And Endangered Species (T&E)******Direct and Indirect Effects***

There would be no disturbance from noise that would affect T&E species during their breeding seasons. Also, dead and down woody material would accumulate over time, providing habitat for small mammals. If the proposed activity did not take place, however, fuel would continue to build up, and there could be a potential for catastrophic fire. Soils would not be stabilized through the addition of slash and small trees that are toppled. This could result in increased erosion and soil sedimentation in headwater areas. The only T&E species that may be negatively impacted by the “no action” alternative would be fish that are located outside of the project area, because there would likely be increased sedimentation from soil erosion.

Cumulative Effects

There have not been any other large fires near the project area in over 10 years. Suppression activities for the Pack Rat fire included constructing dozer line, hand line, and safety zones. These activities occurred in the project area as well as in the MSO PAC, and probably had a negative impact on the MSO. These suppression activities also increased the potential for erosion and soil sedimentation.

Sensitive Species***Direct and Indirect Effects***

Large numbers of snags would be available as wildlife habitat, if the project area was not salvaged. There would be no direct or indirect effects to sensitive species from not implementing the proposed project activities.

Cumulative Effects

Likewise, there would be no cumulative effects to sensitive species from the “no action” alternative.

MIS Species***Direct and Indirect Effects***

Large numbers of snags would be available as wildlife habitat, if the project area was not salvaged. There would be no direct or indirect effects to sensitive species from not implementing the proposed project activities.

Cumulative Effects

Likewise, there would be no cumulative effects to MIS species from the “no action” alternative.

Alternative 2: Proposed Action

Habitat Components

Snags

Direct and Indirect Effects

The Coconino National Forest has established a minimum requirement of two snags per acre, over 50% of acres analyzed (USDA 1987). Although there are areas where this requirement is met or exceeded, when the entire Forest is considered, snags may be below what is recommended in the Forest Plan. Conversely, as a result of the Pack Rat Fire (which burned approximately 1,074 acres on the Mogollon Rim RD), the project area currently has an over abundance of snags. The majority of the Pack Rat fire burned on the escarpment of the Mogollon Rim itself, and was located on the Tonto NF. The area of the fire on the Tonto NF is not within the analysis area, and due to steep and inaccessible terrain no salvage logging is proposed there. Of the approximately 1,074 acres on the Mogollon Rim RD, only 550 acres are being analyzed for this project. The remaining 524 acres are being left untreated. Furthermore, not all of the trees in the analysis area are dead, and therefore would not be considered eligible for harvest. Only dead trees (defined here as a tree with no green needles) would be harvested for this project. There would therefore be a mosaic of green trees, trees partially killed by fire, beetle killed trees, and completely burned snags left intentionally for wildlife habitat, across the analysis area. In other words, the analysis area was not completely consumed by the Pack Rat Fire, and the area still contains many live trees that are only partially burned and still retain some green needles. These partially burned trees would not be salvaged (because they still retain some green needles), and would provide many recruitment snags for the future.

Snags provide critical habitat for many species of birds, small mammals, and insects. The proposed action, by definition, removes most of the snags from the project area. The proposed action would decrease the number of snags in the project area, and have a negative direct effect on the number of snags per acre across the project area.

The negative effects of removing most snags from the project area would be largely mitigated because snags are locally abundant immediately outside the project area. There is a local abundance of snags because about 200 acres of the Pack Rat fire would not be salvaged. Additionally, the proposed action would only salvage in areas where tree mortality is severe (i.e. small, isolated pockets of dead trees would not be salvaged), and these small pockets of trees would provide snags. There are many trees that were partially consumed by the fire, and still retain some green needles, and they would not be salvaged. Some of these trees will die in the next few years, and provide for snags in the future.

The proposed action also provides for mitigation of the loss of snags by requiring that, on average, at least two large (>20" DBH) snags per acre be left in the project area. The goal of the project is to leave 4-6 snags/acre in areas where wildlife would likely use them. Snags would be selected based on large diameter, broken tops, and soft state of decay. Snags would be distributed in a clumped fashion, and not be uniformly distributed across the project area.

Saab and Dudley (1998) retained an average of 6 snags/acre on their salvage project area (3 of which were >20" DBH); however, they were working on a much larger scale (over 250,000 acres).

Saab and Dudley (1998) found that harvesting 50% of the area and leaving 50% unharvested, could fulfill the requirement of 6 snags/acre. The Pack Rat Salvage Project is leaving at least 200 acres unharvested, which would tremendously increase the number of snags retained near the project area. By not harvesting snags in the adjacent area, 6 snags/acre would be retained near the project area.

Cumulative Effects

Past, present and reasonably foreseeable projects included in this analysis of cumulative effects for snags include the Bray Salvage Project and the Dude Salvage Project, both of which occurred in 1991. There are no other present or future projects that would affect the number of snags in or near the project area. There is, however, a potential increase in the number of snags per acres due to current insect and disease outbreaks.

The Bray and Dude Salvage projects occurred after these large fires burned many acres on along the Mogollon Rim. These fires were immediately adjacent to the Pack Rat Salvage project area. The Dude Salvage was on the eastern side of the Pack Rat Salvage project area, and the Bray Salvage was on the western side of the Pack Rat Salvage project area. Both the Bray and Dude Salvage projects removed most of the snags created by those fires, and reduce the availability of snags near the Pack Rat Salvage project area. Many of the snags retained for wildlife that resulted from these projects have since fallen, further reducing snag availability in the area. Furthermore, the areas burned by the Bray and Dude fires is now open habitat with few trees that will provide future snags.

There would be a decrease in snags of all size classed resulting from proposed salvage of timber, but the effects would be mitigated by selecting groups of large diameter trees to be left within the salvage area, and designated and protected for use by wildlife. At least 2 large diameter (> 20" DBH) snags/acre, and selected for their value to wildlife would be retained. In many areas, 6-8 snags/acre (at least 2 of which would be > 20" DBH) would be retained in clumps for use by wildlife. There will be many additional snags left adjacent to the project area due to the fact that no snags would be removed from the nearby MSO PAC, which was also burned in the Pack Rat fire of 2002. The snags remaining in the MSO PAC would provide about 200 acres habitat with an abundance of snags for use by wildlife. Additionally, future tree mortality due to insects and disease would increase the number of snags available to wildlife. Overall, snags would occur in numbers well above those required by the Forest Plan. Therefore, the cumulative effects of removing snags from the Pack Rat Salvage project area would not be detrimental to wildlife.

Cover

The fire destroyed all of the hiding cover where it burned with high intensity. The proposed activities would take place in areas that where burned severely, and would therefore, have no direct, indirect, or cumulative affects on cover.

Old-growth

There is no old-growth in the project area. Therefore, there would be no direct, indirect, or cumulative affects on old-growth as a result of proposed project activities.

Non-MIS and Non-TES Species

Direct and Indirect Effects

There would be some localized displacement of elk from the project area during salvage operations, but it would be short in duration, and small in scope. Elk was selected as a big-game

indicator species for early-seral stage ponderosa pine, mixed-conifer and spruce-fir habitat types. There would be ample habitat nearby that elk could use during project implementation.

Roads negatively affect turkeys. The obliteration of roads in the analysis area would reduce road densities, and decrease disturbance and poaching opportunities. Project activities would take place after poults have grown, and are not dependants on insects.

Bears are known to use the project area. The timber at the heads of steep canyons would not be salvaged, and should not curtail potential use by bears.

The scope of this project would be small in size (550 acres maximum, with harvest on 200 to 500 acres) when compared to landscape level effects. The big game species considered here (elk, deer, turkey, and bear) require large areas to survive and reproduce. Salvaging timber from the analysis area would create opening that may positively affect big game species by improving foraging areas.

There would be no direct, indirect, or cumulative negative effects to big game species due to implementing the proposed project activities.

Cumulative Effects

Likewise, there would be no cumulative effects to big game species due to implementing the proposed project activities.

Migratory Birds

Direct and Indirect Effects

Three of the Arizona Partners in Flight (PIF) priority species (excluding TES species) require large snags or trees for nesting or perching (olive-sided flycatcher, purple martin, Cordilleran flycatcher). Salvage activity would remove many snags, however, numerous snags (2-6 per acre) would be retained. These snags will be selected based on high quality for wildlife (i.e. large snags that will persist). The proposed project activities would not compromise the diverse structural components of the surrounding area, especially considering the small size of the project area. Openings would be created, and large snags would be retained. There would be no direct effects to migratory birds as a result of proposed project activities. There would be some minor, indirect effects to these species by removing snags from the project area; however, leaving many snags that have high value to wildlife would mitigate these effects.

Cumulative Effects

There would be no cumulative effects to migratory birds as a result of proposed project activities.

Fish

Direct and Indirect Effects

Project activities would enhance soil stabilization and reduce erosion and sedimentation, through spreading logging slash, and felling small diameter trees. Ground disturbing activities would not take place in drainages that only have water intermittently. The project area would be over one mile from perennial streams, and the existing vegetation would retain most of the sedimentation before it got to streams. This soil stabilization would help mitigate the negative effects on fish due to increased soil erosion from the Pack Rat fire. There would be no direct or indirect adverse effects to fish resulting from the proposed project activities.

Cumulative Effects

Likewise, there would be no cumulative effects to fish as a result of proposed project activities.

Sensitive Species**Peregrine falcon*****Direct and Indirect Effects***

Project activities would take place within 1/2 mile of a cliff; however, these cliffs have been burned in wildfires and are not suitable for nesting. Project activity would occur after the breeding season for peregrines, so there would be no disturbance to falcons. Additionally, there are no known historic nests in or near the project area. There would be no direct, or indirect effects to peregrine falcons from the proposed action.

Cumulative Effects

Likewise, there would be no cumulative effects to peregrine falcons as a result of proposed project activities.

Northern goshawks***Direct and Indirect Effects***

The Pack Rat fire created openings in the forest that could potentially be used as foraging areas for goshawks, and may provide for a greater diversity of prey. There would therefore, be no adverse direct or indirect effects to northern goshawks from the proposed action.

Cumulative Effects

Likewise, there would be no cumulative effects to northern goshawks as a result of proposed project activities.

Management Indicator Species (MIS)

The Mexican spotted owl and northern goshawk are discussed under Threatened, Endangered, and Sensitive species. Elk and Turkeys are discussed under Big Game species.

Abert's Squirrel***Direct and Indirect Effects***

Hot fires that consume the duff layer destroy the hypogeous fungi that are a main food source for the squirrels (Patton 1977). The proposed salvage project would be in areas that burned under high intensity, where much of the ground was scorched. Also, the addition of coarse woody debris would help speed the recovery of soils, and promote the recovery of fungus. The proposed alternative would therefore, have no direct or indirect effects on this species.

Cumulative Effects

Likewise, there would be no cumulative effects to the Abert's squirrel as a result of proposed project activities.

Red Squirrels***Direct and Indirect Effects***

This squirrel is associated with mixed conifer forests, where they feed on cones of Douglas-fir and white fir. All of the trees that would be salvaged are dead and no longer produce cones. The proposed actions would therefore have no direct or indirect effects on squirrels or their habitats.

Cumulative Effects

Likewise, there would be no cumulative effects to red squirrels as a result of proposed project activities.

Pygmy Nuthatch and Hairy Woodpecker***Direct and indirect Effects***

These birds are insectivores that feed on bark beetles and other insects found on boles of trees. The hairy woodpecker is a primary cavity nester (creates its own cavity), while the nuthatch is a secondary cavity nester (uses abandoned cavities). The proposed salvage would reduce the availability of snags in the project area, and could potentially negatively impact both the pygmy nuthatch and hairy woodpecker. Numerous large snags, however, would be left standing as a mitigation measure for wildlife. Additionally, there will be many snags available for use by nuthatches and woodpeckers immediately adjacent to the project area. Proposed project activities would not be expected to result in a downward trend in these populations, nor would they contribute to listing the species as threatened or endangered. There would be no direct effects to these species due to proposed project activities. Indirect effects to these species would be slight due to the availability of snags in the vicinity of the project area.

Cumulative Effects

Likewise, there would be no cumulative effects to the pygmy nuthatch and hairy woodpecker as a result of proposed project activities.

TES Species***Bald Eagle******Direct and Indirect Effects***

Roost and foraging habitat for bald eagles occurs across the District, so the effects of losing of some potential habitat from the project area would be negligible. Although some large trees would be salvaged under the proposed activity, the fire created many large snags, and some would be retained for use by eagles. The project area does not provide roosting habitat for eagles, as there are no protected slopes to use as shields against inclement weather. Further, there would be sufficient snags retained to provide perch sites in the future. Wintering eagles feed on fish, waterfowl, terrestrial vertebrates and carrion. These prey types would not be affected by project activities, because there are no lakes in the project area, nor would terrestrial vertebrate or carrion abundance be affected. There would be no direct or indirect effects of this project to bald eagles.

Cumulative Effects

Likewise, there would be no cumulative effects to bald eagles as a result of proposed project activities.

Mexican Spotted Owl (MSO)***Direct and Indirect Effects***

Implementation of this proposed salvage project is planned for the fall of 2003, after the breeding season for MSO has ended (i.e. after August 31). There would, however be the possibility that if implementation does not occur in fall 2003, that the project would occur in the spring of 2004. Spring implementation of this project would take place during the MSO breeding season (March 1 to August 31). If this occurs, then the project area, plus a mile buffer would be re-surveyed for MSO. If MSO are determined to be present at that time, then the project would be reevaluated.

No project activity would occur in the nearby PAC. The project area (plus a $\frac{1}{2}$ mile buffer) would be surveyed for MSO prior to project implementation. If a MSO is detected outside of already established PACs, a new PAC would be developed, and the project would be reevaluated. Therefore there would be no direct effects to MSO as a result of implementing the proposed action.

A small portion of the proposed project activities would be immediately adjacent to the Immigrant MSO PAC. Breeding owls, however, would not be disturbed by project activities because proposed salvaging would take place outside of the MSO breeding season. Disturbance from noise, due to the use of heavy equipment for salvaging timber and piling slash, could affect non-breeding MSO in this PAC for a short period of time. Salvage activities would take place in restricted MSO habitat, and large snags (> 9" DBH) would be removed. Numerous large snags, however, would be retained for use by owls. This potential foraging area would be altered by a reduction in the number of snags left standing, but the addition of dead and down woody material resulting from salvage activity would help mitigate this modification to the habitat.

Part of these proposed project activities would occur adjacent to one MSO PAC. The PAC was partially burned in Pack Rat fire of 2002. Overall, the Pack Rat fire burned approximately 200 acres of the Immigrant PAC. Fire effects within the PAC varied from lightly burned areas with creeping ground fire, to areas that were heavily burned with trees being completely scorched. The draws within the PAC were lightly burned (about 100 acres), whereas the ridge tops were moderately (about 50 acres) to severely burned (about 50 acres). No snags would be salvaged within the PAC.

Cumulative Effects

Past actions also include the Bray and Dude Salvage (both in 1991) projects that were the result of large, high intensity fires. These fires burned about 1,400 acres on the Mogollon Rim Ranger District, of which about 750 acres were salvaged. These salvage projects occurred 12 years ago, and almost all of the snags left standing have since fallen. The proposed action for the Pack Rat Salvage would salvage about 200 to 500 acres, and actions would contribute to the overall forest structure that already exists. Implementing the proposed action would reduce the number of snags in the analysis area, and this would have an impact on the overall abundance of snags in the area. The snags would be salvaged from "restricted" MSO habitat that may be used for foraging.

Other Activities in the past 17 years include the fire suppression activities used during the Pack Rat fire, BAER activities on the Pack Rat fire, use of the area by recreationists, firewood cutting and gathering for personal use, improvements made to Forest Road 300, and the maple draw project. All of these have the potential to disturb MSO.

Little Colorado Spinedace

Direct and Indirect Effects

Effects from the proposed project are low in scope and magnitude. Only 200 to 500 acres of tree harvesting would occur. This project would avoid snowmelt drainages, and help decrease sedimentation, through soil stabilization. Furthermore, the drainages do not contain perennial water; therefore, there would be no direct effects to Little Colorado spinedace. Also, there would be very little sediment produced downstream as a result of project activities, and sediment delivery to streams would decrease due to soil stabilization actions. Additionally, the vegetative buffer that exists between the snowmelt drainages and perennial waters would retain any sediment that might be produced by localized soil disturbance. Proposed actions for this project would likely result in

increased soil stabilization (sooner than if left untreated), by leaving small diameter trees and some slash on the ground. Consequently, there would be no indirect impacts to spinedace due to project activities.

Cumulative Effects

Likewise, no cumulative impacts to spinedace would result from proposed project activities.

Chiricahua Leopard Frog

Direct and Indirect Effects

There is no present or potential habitat suitable for Chiricahua leopard frogs in or adjacent to the project area. There would therefore be no direct or indirect effects to Chiricahua leopard frogs from proposed project activities.

Cumulative Effects

Likewise, no cumulative impacts to the Chiricahua Leopard Frog would result from proposed project activities.

Vegetation

Affected Environment

The Pack Rat fire burned approximately 1,074 acres of mixed conifer forest on the Mogollon Rim Ranger District. Within the 550 acre project area, roughly 147 acres (27 %) burned intensely killing an estimated 60% of conifer trees. The remaining 403 acres (73 %) of the project area burned at a low to moderate intensity. Approximately 20% of the project area is comprised of Ponderosa pine (*Pinus ponderosa*), roughly 35% is Douglas-fir (*Pseudotsuga menziesii*) and about 44 % is white fir (*Abies concolor*).

Field reconnaissance data (PR # 30) collected two months after the fire in the fall of 2002, measured conifer trees 12 inches DBH and greater and focused on the high intensity burn areas (approximately 200 acres) (Figure 6). During field reconnaissance, isolated occurrences of red turpentine beetle were observed in individual ponderosa pine trees. The red turpentine beetle (*Dendroctonus valens*) attacks the lower bole of injured, weakened, or dying trees and often predisposes them to attack by other more aggressive species, such as the western pine beetle or Ips species (Frank 1997, Wilson 1996). The western pine beetle (*Dendroctonus brevicomis*) typically attacks ponderosa pine trees larger than 6 inches in diameter, selecting trees that survived fire and sustained injury. Trees with 75 to 100 percent crown scorch are most likely to be attacked and this probability is increased when cambial scorch occurs (Frank 1997, Wilson 1996, McHugh et al. 2003). Pine engravers (*Ips spp.*) commonly attack trees with moderate to severe fire damage, especially those with complete crown and basal scorch (Frank 1997, Wilson 1996, McHugh et al. 2003).

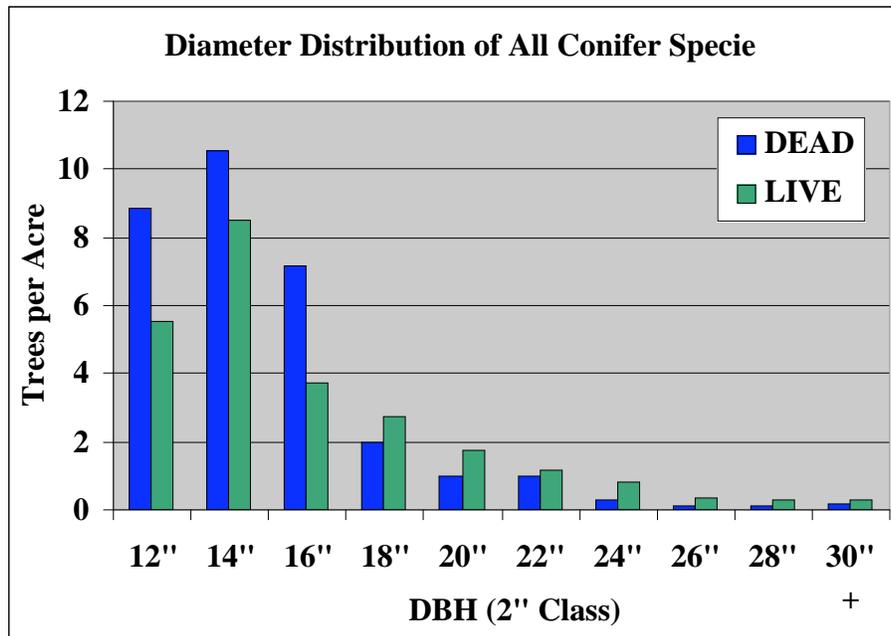


Figure 6. Distribution of All Conifer Species (Live and Dead) by 2 inch Diameter Class for High Intensity Burn Areas in the Pack Rat Salvag Project Area.

Ponderosa pine and Douglas-fir resistance to and/or recovery from fire related damage has been extensively studied (Flanagan 1996, Harrington 1987, McHugh 2003). Douglas-fir is less resistant to fire damage than ponderosa pine because sufficiently thick bark is not attained until the second century of growth, the primary lateral root system is shallow, and crowns are susceptible to scorch and consumption. Past activities have left first century growth as the dominant component of Douglas-fir in the project area. Both species are however susceptible to bark beetle attacks after fire damage has occurred and this susceptibility increases the probability of post-fire mortality (Flanagan 1996). Fire damage occurring during the active growing period also increases the likelihood of mortality (Harrington 1987). Prolonged drought and high stand density compound the effects of fire damage by elevating water stress and reducing available soil nutrients, further increasing the likelihood of immediate and delayed mortality from a fire and susceptibility to bark beetles after a fire.

A large proportion of the forest in the project area is comprised of trees less than 12 inches DBH. Additional data collected over roughly 475 acres of the project area in June 2003 (PR # 30) showed approximately 80% of the trees (ponderosa pine, Douglas-fir and white fir) in the project area are less than 12 inches DBH (Figure 7 and Table 21). These trees are also susceptible to bark beetle attack, especially by Ips species, due to high density in conjunction with drought and fire stress. The data also showed that approximately 75% of conifer trees in the project area were dead, with the majority of mortality (80%) occurring in trees less than 8 inches in diameter. During data collection in June 2003, bark beetle activity was observed in the project area on dead and dying trees (mainly ponderosa pine) of various sizes. Bark beetle activity in the project area and on the Mogollon Rim is expected to continue spreading to nearby areas.

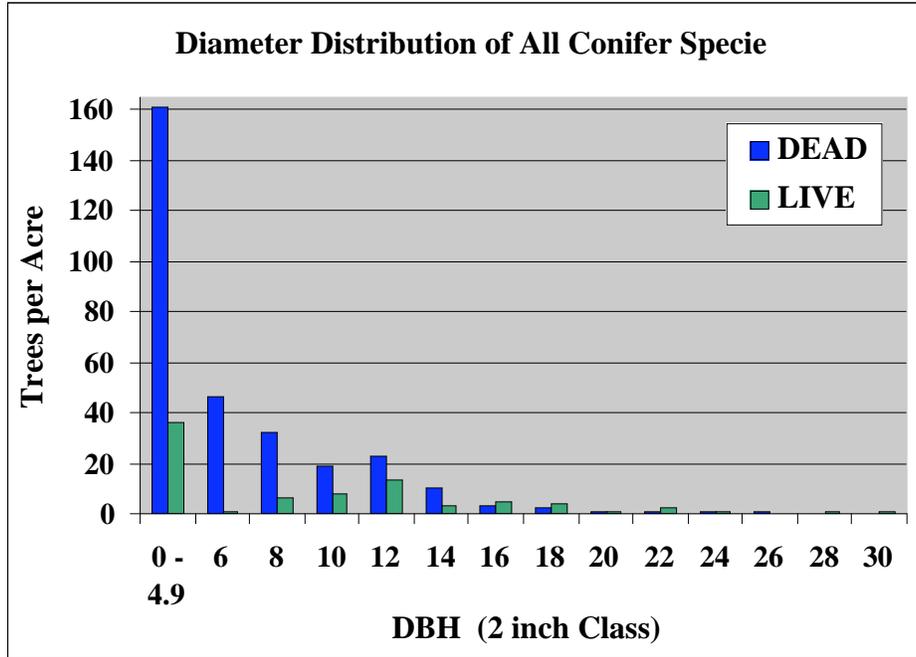


Figure 7. Distribution of All Conifer Species (Live and Dead) by 2 inch Diameter Class for the Pack Rat Salvage Project Area.

Table 21. Trees Per Acre (TPA) of Live and Dead Conifers (ponderosa pine, Douglas-fir and white fir) by 2 inch Diameter Class for the Pack Rat Salvage Project Area.

DBH CLASS	LIVE TPA	DEAD TPA
0 - 4.9	36	161
6	1	46
8	6	32
10	8	18.5
12	13.5	22.5
14	3	10.5
16	5	3.5
18	4	2
20	1	1
22	2	0.5
24	0.5	0.5
26	0	0.5
28	1	0
30	0.5	0
TOTAL	81.5	298.5

Charles McHugh and others (2003) examined bark beetle attacks in ponderosa pine following fire in Northern Arizona. The study showed that *Dendroctonus* and *Ips* species as a group, when at endemic population levels, have a preference for heavily fire-damaged ponderosa pine trees (McHugh et al. 2003). Attacks by these species were intermediate in the summer fire, when compared to a fall and spring fire (McHugh et al. 2003). However, the preference of *Dendroctonus* and *Ips* species to attack fire damaged trees could lead to an increase in bark beetle populations if injured trees are readily available (McHugh et al. 2003). Existing populations in the area also influence the probability of an increase in bark beetle activity.

The Immigrant Timber sale of 1992 included approximately 461 acres of regeneration cuts. To help promote ponderosa pine natural regeneration, mechanical site preparations were conducted in 1996 in these units. In 2000, one 36 acre unit located within the Pack Rat Salvage project area was certified as stocked. However, the Pack Rat fire of 2003 killed most of the seedlings and saplings thereby delaying the process of moving the 10K analysis area towards proper age class distribution.

Environmental Consequences

The geographic setting for analysis of Vegetation is the Pack Rat Salvage project area. Time frame for past actions is 10 years.

Alternative 1: No Action

Direct and Indirect Effects

Under the No Action Alternative recently killed trees will not be removed, allowing bark beetles to possibly colonize the area. Trees recently killed and severely injured by the fire, which are highly attractive to bark beetles (turpentine, western, Ips), provide a readily available food source for beetles, in turn building populations. These trees could act as brood trees for future populations of bark beetles as well, indirectly causing tree mortality to spread throughout the project area.

If bark beetle populations are allowed to build in the burn area, beetles will have to seek healthy trees for additional food. Leaving all dead trees in the project area will possibly contribute to a damaging increase in bark beetle populations over time, resulting in the spread of bark beetle activity outside of the project area. The end result from drought, wildfire, and increased beetle activity would be an altered forest landscape for a long period in time and space.

Implementation of this alternative would not meet the Purpose and Need and Objectives.

Cumulative Effects

None of the past, present or foreseeable future activities are expected to contribute cumulatively to the effects on vegetation in the Pack Rat Salvage project area.

Alternative 2. Proposed Action

Direct and Indirect Effects

Under Alternative 2 dead trees will be removed on about 550 acres in both the high intensity and low to moderate intensity burn areas. This would reduce the risk of bark beetle infestation by removing a readily available food source for beetle species that prefer recently killed and fire-damaged trees. The probability of bark beetle populations building is also decreased, thus

minimizing tree mortality in the project area. Bark beetle populations are not expected to immensely increase, therefore healthy trees in the surrounding area are not as likely to be attacked.

Although activities on the proposed 550 acres may be considered miniscule, it is an attempt to minimize the spread of bark beetle activity. If this alternative were implemented, it would meet the Purpose and Need and Objectives.

Cumulative Effects

None of the past, present or foreseeable future activities are expected to contribute cumulatively to the effects on vegetation in the Pack Rat Salvage project area.

Range _____

Affected Environment

The Pack Rat Salvage project area is overlaid by the Hackberry/Pivot Rock and the Buck Springs Range Allotments (USDA 1987, USDA 1986 and USDA 1988). The majority of the project area is in the Hackberry/Pivot Rock Allotment (Kehl Pasture), with only a small portion (less than 10 acres along the eastern edge of the project area) on the Buck Springs Allotment (South Battleground Pasture).

Permitted livestock numbers on the Hackberry/Pivot Rock Allotment total 760 head and 746 on the Buck Springs Allotment. Season of use in both allotments generally occur from May through October, for a two to three week interval where cattle are actually in the project area.

Range condition in the project area before the wildfire can generally be described as fair to poor, primarily attributable to the dense tree overstory. The dense overstory resulted in a depauperate herbaceous understory, displaying the relationship between the two components (Moore and Dieter 1992 and Covington and Fox 1991).

Fences in the project area total approximately one mile, which is a boundary fence between the two Allotments. The fence is of barbed wire construction.

Environmental Consequences

Alternative 1: No Action

Direct and Indirect Effects

Direct effects to the herbaceous understory are expected to be the opening of tree overstory over time as dead trees fall in the intensely burned areas within the project area. This will result in openings that will be occupied with a diverse mix of grasses and forbs. Over time, in areas that burned less intensely, there will be a continuous opening of tree canopies as dead trees continue to fall. This will also result in openings becoming occupied with grass and forbs.

Herbage production in burned areas is expected to increase compared to adjacent unburned areas (Pearson, et al 1972). This is attributable to nutrient cycling and the removal of heavy layers of litter that have prevented herbaceous plant establishment. Over time, however, herbaceous

production in intensely burned areas is expected to decline compared to those areas that only burned moderately (Oswald and Covington 1983).

Direct effects to range improvements (fences) are that dead trees will fall over time on the fence, damaging it and resulting in an investment in time and materials from permittees, who are responsible for maintenance.

Indirect effects to the herbaceous understory are expected to occur as ungulates, both wild and domestic, graze these areas, possibly affecting both species composition and total biomass. This is expected to be more of a problem from unregulated ungulates (elk) that often occupy the area year-round, depending on winter conditions. This will be offset somewhat, as fallen trees are expected to provide some protection from grazing.

Indirect effects to the range improvements (fences) are expected to occur as dead trees continue to fall over time, contributing to large fuel loadings, and possibly an intense fire, destroying the fence completely.

Cumulative Effects

Cumulative Effects to herbaceous understory are expected as other activities (fires, timber sales, thinnings, etc) occur on the two Allotments. Within the project area, there will be an increase in openings as dead trees naturally fall over time. If there are no or few other activities, the herbaceous understory will be impacted as elk focus in on this area of lush growth. Cumulative effects are minimized, if other activities occur, as this will distribute grazing pressure across a wider area. The time frame for cumulative effects is 10-20 years, as regeneration occurs that will displace the herbaceous understory.

There are no cumulative effects on the fences.

Alternative 2: Proposed Action

Direct and Indirect Effects

Direct effects to herbaceous understory are expected to be the opening of tree overstory over time as dead trees fall in intensely burned areas in the project area. This will result in openings that will be occupied with a diverse mix of grasses and forbs. Over time, in areas that burned less intensely, there will be a continuous opening of tree canopies as dead trees fall. This will also result in openings being occupied with grass and forbs.

Herbage production in burned areas is expected to increase compared to adjacent unburned areas. This is attributable to nutrient cycling and the removal of heavy layers of litter that have prevented herbaceous plant establishment. Over time, however, herbaceous production in intensely burned areas is expected to decline compared to those areas that only burned moderately (Oswald and Covington 1983).

In addition, direct effects of the Proposed Action are expected to be positive overall on the herbaceous understory, as the tree component is removed, thus reducing the overstory as project activities are implemented, providing suitable sites for occupation by a diverse mix of grasses and forbs.

Direct effects on range improvements are expected to be positive, as dead trees that could fall on the fences are removed, reducing the potential for damage.

Indirect effects to the herbaceous understory will be minor overall, caused by timber activities such as creation of skid trails and landings, which may disturb topsoil, creating an interval before herbaceous understory is fully established.

Cumulative Effects

As stated previously, cumulative effects on herbaceous understory are tied to whether other activities occur on these two Allotments that create opportunities for tree canopies to be opened up or removed.

Cumulative Effects are expected to the herbaceous understory within the Project Area as other activities (fires, timber sales, thinnings, etc) occur on the two Allotments. Within the project area, there will be an increase in openings as dead trees naturally fall over time. If there are no or few other activities, the herbaceous understory will be impacted as elk focus in on this area of lush growth. Cumulative effects are minimized, if other activities occur, as this will distribute the grazing pressure across a wider area. The time frame for cumulative effects is 10-20 years, as regeneration occurs that will displace the herbaceous understory.

There are no cumulative effects on the fences.

Invasive Plants

Affected Environment

Several highly invasive exotic weeds are known in the general vicinity of the proposed action, based on an inventory from 1995. Three invasive exotic species are currently mapped (from 1995) in scattered small populations; cheatgrass (*Bromus tectorum*), bull thistle (*Cirsium vulgare*) and common mullein (*Verbascum thapsus*). Small populations of Dalmatian toadflax (*Linaria dalmatica*) have also been reported in the project area. These species are currently present in small acreages and are category 'B' or 'C' species, therefore, treatment of them should be relatively simple if done soon. These weed populations have been prioritized for treatment based on invasiveness of the species and size of the population, as described in the Invasive Weeds Specialist Report (PR #20).

Bull thistle and Dalmatian toadflax are the highest priority species currently known in the project area. All populations should be treated before any ground disturbing actions take place in the vicinity. The mullein and cheatgrass should be avoided if possible, and one or two species of first-successional NATIVE or STERILE (weed free seed) grasses may be planted to compete with the mullein and cheatgrass in large areas of extreme disturbance (down to mineral soil). Small areas should be maintained clean of contamination (introduced seed in materials or equipment) and allowed to re-vegetate naturally.

Environmental Consequences

Table 22. Comparison of Alternatives as related to invasive plant species.

Unit of Measure	Alternative 1: No Action	Alternative 2: Proposed Action W/ Weed Mitigations
# of invasive plant species	4 KNOWN + 4 MORE LIKELY w/in 5 years	4
Predicted acres of invasive plants	25	10
Invasiveness and severity of weed populations*	4 Category 'A' species 3 Category 'B' species 1 Category 'C' species	3 Category 'B' species 1 Category 'C' species
Invasive plant risk assessment rating	HIGH (60) (Project should be modified to include Full Mapping, Treatment, Monitoring, and follow-up treatments as necessary)	MODERATE (36) (Limited Mitigation, Monitoring, and follow-up treatments as necessary)

(* - USDA Forest Service Region 3 Invasive Weed Classification System)

(^ - Coconino, Kaibab, & Prescott National Forests Noxious Weed Strategic Plan, 1998)

See Invasive Plants Specialist Report for explanation of these categories and rating system.

Alternative 1: No Action

Direct and Indirect Effects

If nothing is done to control weeds invading into the burned area, weed infested acreages will rise rapidly in these management areas. There are four highly invasive (Category 'A') species near the project area: Russian knapweed (*Acrotilon repens*), camelthorn (*Alhagi pseudoalhagi*), oxeye daisy (*Chrysanthemum leucanthemum*), and Scotch thistle (*Onopordum acanthium*). If these species are allowed to move into the project area, this will have the affect of diminishing available wildlife forage habitat and decreasing recreational value of these lands. An indirect affect will be the spread of these invasive weeds and their ecological impacts into the adjacent management areas including the Mogollon Rim Botanical Area and the Mexican Spotted Owl PAC. The 'No Action' alternative will not meet the purpose and need for action.

Cumulative Effects

A cumulative effect of this alternative would be road maintenance equipment and/or recreation vehicles spreading invasive weeds into the disturbed/bare soil of the project area. This would introduce more plants and possibly new species into the project area. Preventative BMP's and follow-up monitoring should minimize the long-term effects of these introductions.

Expansion of invasive weed populations in this area could be especially damaging at this point in time as a Maple Restoration Project is currently planned for the adjacent Botanical Area. Some

soil disturbance is necessary to complete this project and if there were large weed populations nearby they would rapidly spread into the Botanical Area.

Alternative 2: Proposed Action

Direct and Indirect Effects

In Northern Arizona exotic species are more than 5 times more likely to invade after moderate to severe burns than in areas with a light burn or no burn (Crawford et al. 2000, Griffith et al. 1999). Very near the Pack Rat Salvage project Area there are small populations of five highly invasive weeds (Category 'A' species: Russian knapweed (*Acroptilon repens*), camelthorn (*Alhagi pseudoalhagi*), oxeye daisy (*Chrysanthemum leucanthemum*), and Scotch thistle (*Onopordum acanthium*)) and all of the populations are located on possible access routes to the project area. If the proposed action is implemented without weed mitigation practices these species will move into the project area, diminishing available wildlife forage habitat and decreasing recreational value of these lands. An indirect affect will be the spread of these invasive weeds and their ecological impacts into the adjacent management areas including the Mogollon Rim Botanical Area and the Mexican Spotted Owl PAC.

Mulching with needles, small limbs, and/or chipped local products has been demonstrated to be a very effective method of minimizing weed spread and germination into newly disturbed sites (The Arboretum At Flagstaff, personal communication 2002, paper in progress). The proposed action prescribes lop and scatter of small diameter slash, which should act as a mulch to help minimize weed spread. Chipping of onsite material is more effective as mulch and is highly recommended if practical.

Use of large tracked equipment for tree removal, piling, road construction and obliteration can noticeably increase the rate of introduction and spread of invasive weeds. From an invasive plant management standpoint it is always safer to minimize use of this type of equipment. However, if the Best Management Practices and Equipment Cleaning Contract Clause are strictly followed, this increased risk can be mitigated.

Cumulative Effects

Cumulative effects are the same as those for Alternative 1.

Heritage Resources

Affected Environment

The Pack Rat Salvage project area is located at the southern edge of the Mogollon Plateau, often referred to at the Mogollon Rim or Tonto Rim. Roughly 42 percent (235 acres) of the Pack Rat Salvage project area has been intensively surveyed (Appendix V) for Heritage Resources (Martine 2003). This level of inventory exceeds ten percent, the recommended level for Heritage Resources inventory in the Coconino National Forest Land and Resource Management Plan (Coconino National Forest 1998:51) where ground disturbance will be less than 100 percent. Only one archaeological site, the General Crook Road or General Crook Trail (Coconino National Forest site number AR-03-04-01-240) is in the project area. This supports the Coconino National Forest Site Prediction Model, which predicts a low archaeological site density for this area.

While no archaeological sites that can be attributed to indigenous Native American populations have been identified in the Pack Rat Salvage project area, nearby lithic scatters and isolated projectile points indicate that the region was used seasonally for hunting and plant collection by Late Archaic populations (Effland and Macnider 1991:40) between 2,500 BC and AD 1. Rock art sites, trails, caves, rock shelters, and artifact scatters representing the remains of seasonally occupied camp and habitation sites suggest that Southern and Northern Sinagua groups from the Verde Valley and Flagstaff areas, and Ancestral Puebloan populations from the Kayenta area to the northeast continued to use the area from AD 700 to AD 1450 for plant gathering, game hunting, and travel between prehistoric communities. The region appears to be abandoned by these groups around AD 1450, after which time use by Hopi, Yavapai, Apache, and possibly the Navajo and Hualapai probably occurred.

Historic Euro-American use of the Mogollon Plateau began as early as the 1860s, and the Rim Country was a well-used seasonal source of forage for livestock by 1880. Sites attributed to this period and culture include log cabins; livestock corrals, tanks, and fences; trails; and wagon roads. Conflicts between Euro-American settlers and Apaches prompted a greater Euro-American military presence in the region after 1860. One result of these conflicts was the establishment of the General Crook Road or General Crook Trail, a 2.9 mile (4.7 km) long section of which crosses through the Pack Rat Salvage project area. The Crook Trail was initially established by General George Crook in 1871 to facilitate the movement of troops and supplies between Forts Apache and Verde, and is marked by blazed trees and “V” monuments that indicate the distance traveled from Fort Verde. Many of these markings can still be seen along the trail today. After the end of the Apache Wars in Arizona the trail was used as a mail delivery route between Payson and Camp Verde, and may have been used as a stage route by private citizens.

The General Crook Trail is the only documented historic site in the project area. The site has been formally determined eligible for nomination to the National Register of Historic Places, is listed on the Arizona State Register of Historic Places, and is Arizona’s first State Historic Trail. The trail is historically significant for its association with General George Crook, a critical figure during Arizona’s Indian War period. The trail is also significant for its role as a military and civilian transportation route essential to the development of the Camp Verde and Tonto Basin areas of Arizona by Euro-Americans, and for its potential to contribute to the understanding of early road engineering and construction techniques. The General Crook Trail is a designated National Recreation Trail, providing scenic hiking opportunities to the public. The National Recreation Trail is marked by reflective chevrons on trees, and in many places overlaps with the historic General Crook Trail.

The Battle of Big Dry Wash, the last major conflict between the U.S. Cavalry and the Apaches, took place in 1882 to the north of the current project area. General Springs Cabin, a common campsite for people traveling along the General Crook Trail, is just northeast of the project area.

The project area was incorporated in the National Forest system in 1906, after which time grazing continued, and fire looks-outs and administrative sites were established. The Civilian Conservation Corps (CCC) established the current route of FR 300, which crosses through the project area, in the early 1930’s. CCC projects on the Coconino National Forest occurred between 1933 and 1942, and CCC spike camps are thought to have been established at Kehl Springs, west

of the project area, and at General Springs, east of the project area (John Irish, personal communication 2003). Timber harvesting commenced on the Mogollon Rim Ranger District in 1942, and timber in the Pack Rat Salvage project area has been harvested several times.

No known areas of traditional use or traditional cultural importance are known in the project area. However, nearby areas are used by Native American populations and the project area has the potential to be used by these populations in the future.

Environmental Consequences

Table 23. Impacts to Heritage Resources and Comparison of Alternatives.

	Alternative 1	Alternative 2
Maintenance of Crook Trail Alignment and Associated Features	Blazed and “V” trees fall. Water erosion damages trail. Trail alignment is no longer visible. Crook Tail integrity diminished.	Retention of blazed and “V” trees for longer duration. Less erosion damage to trail alignment. Trail alignment remains intact. Crook Trail retains integrity.

Alternative 1: No Action

Direct and Indirect Effects

Alternative 1 is the no action alternative. If no action is taken, trees will deteriorate and fall through natural processes, and sediments denuded and destabilized by intense burn temperatures of the fire could erode. As trees fall, direct effects to the General Crook Trail (AR-03-04-01-240) could include loss of historic blazed trees and “V” monuments that mark the route of the historic trail and the distance traveled from Fort Verde. Trees marked with chevrons denoting the route of the National Recreation Trail could also fall. Soil erosion could directly affect the existing General Crook Trail alignment by causing sheet erosion and rills across the surface of the site, obliterating the original trail alignment. If the long-term accumulation of fallen woody material continues, the area could experience another high-intensity surface fire, further damaging to the General Crook Trail and associated features.

Indirect effects to Heritage Resources resulting from the no action alternative could include diminished integrity of General Crook Trail components that contribute to the National Register eligibility of the site. Long-term damage to the trail alignment from water erosion, and loss of blazed trees, “V” trees, and chevron markers might make the trail indistinguishable from the surrounding landscape. Furthermore, fallen trees could make the trail impassible, prohibiting use of the trail by Forest-visitors.

Cumulative Effects

Cumulative direct and indirect affects to Heritage Resources resulting from implementation of Alternative A are the same as those discussed in the preceding paragraphs. Affects include loss of the physical General Crook Trail alignment due to soil erosion, loss of historic blazed trees and “V” monuments, and loss of trees with chevrons that mark the General Crook National Recreation Trail route. Where the General Crook Trail passes through the nearby Bray Fire area, which burned in 1990, blazed trees, “V” trees, and trees with chevrons have fallen, making the trail difficult to distinguish from the surrounding landscape and impassible for hikers. The section of

the General Crook Trail in the Packrat project area would experience similar effects, and within 10 – 15 years the trail might be indistinguishable from the surrounding landscape and blocked by fallen trees. This would make the trail impassible for hikers, and diminish the physical and historic integrity of the trail.

Allowing the condition of the General Crook Trail to deteriorate could adversely affect the site, and is inconsistent with direction provided in the Coconino National Forest Land and Resource Management Plan and other Forest Service directives. These affects are not compounded by other past, present, or foreseeable future actions in the project area because the potential affects, such as soil disturbance associated with timber sales, are generally mitigated through avoidance of the site.

Alternative 2: Proposed Action

Direct and Indirect Effects

Alternative 2, the proposed action would have the direct effect of removing a high volume of trees that would eventually overturn in and around the General Crook Trail (AR-03-04-01-240). This would reduce tree-fall within the Crook Trail alignment. The potential for loss of historic blazed trees and “V” monuments, and loss of trees with chevrons that mark the National Recreation Trail route might also be reduced because the possibility that these trees will be struck and overturned by other falling trees would be lessened. Removal of dead trees would also reduce the potential for future high intensity surface fires that might occur as a result of accumulated woody material, consequently reducing the potential for additional fire-related damage to the trail and associated features. Regeneration of surface vegetation would also stabilize soils and reduce sheet wash and the development of rills across the surface of the site.

The primary indirect effect of implementing the proposed action is retention of many elements of the General Crook Trail that currently contribute to the National Register Eligibility of the site for a longer time period than if Alternative A was implemented. An additional effect would be that fewer fallen trees would restrict use of the trail by Forest-visitors.

Cumulative Effects

The cumulative affects of implementing Alternative B are similar to those described in the preceding two paragraphs. The likelihood of soil erosion obliterating the General Crook Trail alignment would be lessened by the presence of slash, which would stabilize soil and allow vegetation to become reestablished. Harvesting trees that will eventually fall would prolong the physical and historic integrity of the General Crook Trail and the National Recreation Trail corridor by removing trees that could fall and damage associated blazed trees, “V” trees, and trees marked with chevrons. Fewer trees falling in the trail would also allow continued use of the trail by Forest-visitors. Although existing chevron markers would need to be replaced, the National Recreation Trail corridor would be preserved for long-term use. Some long-term effects of the fire would not be entirely avoided. While historic blazed trees and “V” monuments might remain standing for the next three to five years, many blazed and “V” trees in high intensity burn areas were killed during the Packrat Fire. Most of these trees will probably fall within the next 20 years. The historic integrity of the General Crook Trail will be retained in the short-term, but will ultimately deteriorate through loss of features that contribute to the National Register Eligibility of the site. Effects are not compounded by other past, present, or foreseeable future actions in the project area because the potential affects, such as soil disturbance associated with timber sales, are generally mitigated through avoidance of the site.

Public Safety

Affected Environment

The Mogollon Rim is a valuable scenic byway and draws large numbers of recreationists for camping and other activities. Areas on the Mogollon Rim that have burned in the past, such as the Dude and Bray burn areas, are now vista points and highly used for dispersed recreation. Hazard trees adjacent to travel corridors, such as roads and the General Crook Trail, and dispersed recreation sites pose an immediate threat to the public and Agency employees.

Experience managing the Dude and Bray burn areas suggests there will be a large number of trees falling in the next ten years, threatening travelers on the Rim Road (Forest Road 300) and recreationists in the area. The amount of blow down in the area is considerably increased as a result of winds associated with the topography of the Mogollon Rim, especially in burn areas. According to past experience and the weather associated with the Mogollon Rim, there is a high probability that dead trees will fall on forest roads and in dispersed recreation areas.

Environmental Consequences

The geographic setting for analysis of Public Safety is the Pack Rat Salvage project area.

Alternative 1: No Action

Direct and Indirect Effects

Alternative 1 will not address public safety concerns in the project area. Dead trees along forest roads will be left to fall causing traffic problems and compromising the safety of individuals traveling in the area. Given the amount of recreation use on the Mogollon Rim, it is highly likely that accidents will occur due to dead trees falling.

Cumulative Effects

The only additional activities that will affect public safety are maintenance activities on Forest Road 300. Routine maintenance will provide for short-term improvement in road surface condition through blading and spot surfacing. Improvements in site distance through the thinning of trees along the roadside may also occur. The effects of Alternative 1 will persist and may be partially minimized by road maintenance activities. Public safety of individuals traveling and recreating in the area will be compromised, even with annual road maintenance.

Alternative 2: Proposed Action

Direct and Indirect Effects

Alternative 2 will directly deal with safety concerns by removing the hazard threatening individuals in the area along 6.2 miles of forest roads. The proposed activities necessitate safety measures during operations, such as traffic control, flagpersons and appropriate signing. Assuming these measures are taken, the short-term hazard associated with tree removal operations will be significantly reduced.

Cumulative Effects

The only additional activities that will affect public safety are maintenance activities on Forest Road 300. Routine maintenance will provide for short-term improvement in road surface

condition through blading and spot surfacing. Improvements in site distance through the thinning of trees along the roadside may also occur. Cumulatively Alternative 2 will provide a safe recreating environment, especially after tree removal operations have been completed.

Air Quality

Affected Environment

The project area is located on the divide between the Little Colorado River Airshed and the Verde River Airshed. The majority of the analysis area is within the Little Colorado River Airshed. Prevailing southwest winds and the topographical nature of the analysis area typically cause smoke from burns in this area to carry north and east into the Little Colorado River Airshed and away from communities and non-attainment areas located in the Verde River Airshed to the south.

Modeling used in the Fire and Fuels section applies to the Air Quality analysis as well. An electronic copy of all files associated with the modeling of effects for this analysis are included in the project record as part of the Fire, Fuels and Air Quality Specialist Report (PR #28).

Environmental Consequences

The geographic setting for analysis of Air Quality includes the Little Colorado River Airshed and the Verde River Airshed.

Alternative 1: No Action

Direct and Indirect Effects

There will be no direct changes in short-term or long-term affects to air quality as a result of a No Action alternative. However, this alternative does increase the long-term potential for a high intensity surface fire in the existing high intensity burn areas within the project area. This alternative also increases the long-term potential for crown-replacing wildfire in the low and moderate intensity burn areas. Both types of fire will generate considerable amounts of smoke and airborne particulates in exceedence of state air quality standards. However, these wildfires generally occur during unstable atmospheric conditions when optimal smoke dispersal conditions exist, mitigating some of the effects of heavy smoke production on rural and urban residents within the immediate airsheds.

Cumulative Effects

Alternative 1 does not involve intentional fire use and therefore will not contribute cumulatively to the effects of other activities such as prescribed burning in either the Little Colorado or Verde River airsheds.

Alternative 2: Proposed Action

Direct and Indirect Effects

Pile burning will generate smoke which includes particulate matter (PM) that will negatively affect air quality on a *short-term* basis. Some of these impacts can be reduced (see Mitigations) through timing of the burn and scheduling the burn to be completed during periods of favorable atmospheric conditions. Impacts will be greatest on the day of ignition with decreasing impacts

lasting 2-4 days following a single days ignition, and up to 1-2 weeks following multiple day ignitions. Table 24 summarizes the range of potential 2.5 micron (PM2.5) and 10 micron (PM10) diameter particulate matter. For comparative purposes, state and national standards are 150 micrograms per cubic meter for PM10 and 65 micrograms per cubic meter for PM2.5.

Table 24. Summary of potential range of smoke emissions measured in micrograms per cubic meter from pile burning in the Pack Rat Salvage Project Area.

	PM2.5	PM10
2003 emissions from burning of piles	43 - 109	37 - 93

Much of the smoke that is generated by pile burning in the Pack Rat Salvage project area will pass over East Clear Creek during the daytime with winds that are predominately out of the southwest. Nighttime flows of smoke are usually downhill, down stream into East Clear Creek. This will result in potentially heavy concentrations of smoke at the bottom of East Clear Creek with moderate to light concentrations at higher elevations. Residents in the Clints Well and Blue Ridge areas north and northeast of the project area may receive some light nighttime smoke impacts. Nighttime flows of smoke can occasionally drain downhill, and down stream into the Verde River Airshed, potentially effecting the residents of Washington Park, Pine, Strawberry, Payson and interspersed rural residents. Smoke may impact recreationists camped in drainages and other depressions near the burn area, particularly at night. Conducting ignitions during the early portion of the day will mitigate nighttime smoke impacts (see Mitigations). This provides maximum consumption and smoke dispersion time before nighttime inversions develop.

Smoke emissions were projected using the Simple Approach Smoke Estimation Model (SASEM). Two of the fourteen stands used in the FVS-FFE modeling had fuel loading greater than 15 tons per acre after salvage. The surface fuel characteristics from these stands were used as SASEM input to model potential smoke emissions from pile burning. The SASEM manual recommends using broadcast burning to model smoke from small piles or windrows. Therefore SASEM modeling for this analysis was conducted using broadcast burning as an input.

Runs of the model were conducted using static fuel loadings and National Fire Danger Rating System fuel model J, which represents clearcuts or heavily thinned stands of conifer. Fuel model J was used because it is expected that low/moderate intensity areas that are salvaged will be at least a couple of acres in size with 80% or better mortality and will therefore have an open overstory. The surface area of piles will range from 3 – 7 acres (Pack Rat Salvage Project Soil and Watershed Specialist Report, pg. 18). Therefore two runs were conducted, one for 3 acres of broadcast burning and one for 7 acres of broadcast burning. Projected emissions from the two runs were averaged to show the average potential particulate matter emissions from pile burning (Table 24).

The projected emissions in Table 24 are for days with fair to excellent ventilation. Emissions from burning on days with poor ventilation greatly exceeded state and federal standards for PM2.5 and PM10 and were not included in the summary because they greatly skewed the range of potential

emissions. As a result, burning is not expected to be approved by ADEQ for days with poor ventilation to mitigate the effects of excessive emissions.

Winds used in the SASEM runs ranged clockwise from east-southeast to west. No smoke impacts to the communities to Payson or Pine/Strawberry and associated rural residents were projected under these winds. Residents of the Clints Well and Blue Ridge area to the north and northeast may be impacted by slightly decreased visibility resulting from a mild haze primarily on the day of ignition.

Cumulative Effects

Cumulative effects of smoke from prescribe burning on air quality will be short-term. Most of the smoke impacts to the Verde and Colorado River Airsheds will come from prescribed or wild fires on federal, state, municipal and/or private lands greater than 10 miles from the project area. Alternative 2 is not expected to significantly impact air quality in either airshed.

Access/Roads

Affected Environment

There are 8.6 miles of roads in the project area. Of these, 4.8 miles are currently open, and 3.8 miles are currently closed. Forest Road 300 is a major travel route along the Mogollon Rim and is maintained annually, as well as Forest Road 141H. The remainder of the road system has not been maintained since the Immigrant Timber Sale in 1990.

The district completed a roads analysis in the spring of 2003 for the project area (PR#15) (USDA, 2003). The roads analysis recommended the following:

- There is an opportunity to reduce the impacts to aquatics from roads by closing Forest Road 9366T through the botanical area and completing spot obliterations on the following currently closed roads: 9388Y, 9389Y, and 9355N. The 141H road should be a priority in maintenance budgeting to minimize impacts to aquatic resources (spinedace).
- There is an opportunity to minimize impacts to wildlife from roads by closing the 300J and 9266A roads under this action (roads into the PAC and bear habitat). Forest Road 9388Y is currently closed, and is a candidate for spot obliteration where necessary—this minimizes impacts to the MSO and spinedace. The proposed closure of the 9366T would also benefit spinedace and the MSO, but the salvage may not be the proper tool to achieve this. Spot obliteration on the 9355N and 9389Y roads will benefit spinedace. There is a conflict between keeping the 320A road open and access needs, pertaining to the MSO.
- Identified access and recreation needs are being met by leaving the 300, 659 (portion), 501, 320A, and 300K open. If ATV trails begin to be established off of the 659 and 300K roads, these roads should be closed as per MA 19 direction (not under this NEPA).

Environmental Consequences

Alternative 1: No Action

The current road system receives very little maintenance, and the potential for sedimentation will continue to increase as the road system further degrades. No road maintenance is scheduled on Level II roads within the project area for the next 5 years. Damage is presently occurring to drainage structures, and is expected to continue with lack of scheduled maintenance. Lack of maintenance results in long stretches of running water on forest roads, thus increasing water velocity and removing the road surface in the form of sediment. The effect of this is threefold: 1) introduced sediment; 2) snow-melt redirection and concentration; and 3) increased surface flow (Johnson, 1995). This effect is expected to continue and the amount of sedimentation to stream courses will increase over time as more road drainage structures fail. Haines (1993) notes that roads are not playing a major role on sediment production within the sub-watersheds that he studied (Kehl, Leonard and Willow Creek). However, his study was conducted when road maintenance was regularly occurring due to a widespread timber program, and roads have not been maintained at the same level since the study occurred.

The current amount of connected disturbed area will increase over time as more drainage structures fail, thus increasing the area where sediment can be generated and delivered to non-riparian stream courses. This could have a negative effect on water quality in East Clear Creek. The timing of how water is delivered through the system will also be affected by the no action alternative. Peak flows will increase as the watershed becomes more efficient through increased failures of road drainage structures.

Roads in filter strips confine the channel, thus water moves through at a greater speed (Rosgen, 1997). This also increases downcutting and sediment production, as well as increasing peak flows and decreasing the duration of flow. This will continue on approximately 2 miles of road that occur within filter strips. The potential to increase the wetted area perimeter for meadow systems will continue to decrease as more water energy is delivered to the meadows from roads.

The major affect from the existing road system will be to Little Colorado spinedace in stream crossings on the 141H, and possible disturbance effects to the Mexican spotted owl (MSO) from keeping Forest Road 320A open. The annual maintenance on forest road 141 H will help to mitigate possible impacts to the spinedace. The current road system is listed in Table 25 below. Note that the miles of road in the table include portions of road segments that are actually outside the project area, but it was logical to include the entire road segment in the analysis since roads are continuous features.

Table 25. Current Road System in the Pack Rat Salvage Project Area.

Road Number	Miles	Current Open Miles	Current Closed Miles	Current Obliterated Miles
300	2.98	2.98	0.0	0.0
501	0.52	0.52	0.0	0.0
659	1.19	1.19	0.0	0.0
9266	0.95	0.0	0.95	0.0
00141H	0.59	0.59	0.0	0.0
00300J	0.02	0.02	0.0	0.0
00300K	0.38	0.0	0.38	0.0
00320A	0.51	0.51	0.0	0.0
09266A	0.03	0.03	0.0	0.0
09355N	0.80	0.0	0.80	0.0
09360L	0.78	0.0	0.78	0.0
09360M	0.02	0.0	0.02	0.0
09366T	0.03	0.03	0.0	0.0
09388Y	0.29	0.0	0.29	0.0
09389Y	0.64	0.0	0.64	0.0
TOTALS	9.73	5.87	3.86	0.00

Alternative 2: Proposed Action

Alternative 2 will build roughly .4 miles of temporary roads, so the total miles of road will be approximately 10.5 miles under this alternative. The temporary roads will be obliterated after use. The effects of the road system will differ slightly from Alternative 1 because there will be pre-haul and post-haul maintenance on the following roads: FR300, FR 320A, FR 141H, FR 659, FR 300J, FR 300K, FR 9360L, FR 9360M, and FR 9266. Forest roads 9266, 9360L, and 9360M will be re-opened and closed after use.

The pre-haul and post-haul maintenance will minimize affects from lack of maintenance and will decrease the effects of sediments for up to 5 years. The recommended road system for Road Access Travel Management (RATM) is listed in Table 26 below. Note that the miles of road within the table include portions of road segments that are actually outside the project area, but it was logical to include the entire road segment in this analysis.

Table 26. Recommended Road System for Alternative 2 of the Pack Rat Salvage Project.

Road Number	Miles	Recommended Action	Proposed Open Miles	Proposed Closed Miles	Proposed Obliterated Miles
300	2.98	open	2.98	0	0
501	0.52	open	0.52	0	0
659	1.19	open	0.99	0.20	0
9266	0.95	close	0	0.95	0
00141H	0.59	open	0.59	0	0
00300J	0.02	open	0.02	0	0
00300K	0.38	open	0.38	0	0
00320A	0.51	open	0.51	0	0
09266A	0.03	open	0.03	0	0
09355N	0.80	obliterate	0	0	0.80
09360L	0.78	close	0	0.78	0
09360M	0.02	close	0	0.02	0
09366T	0.03	close	0	0.03	0
09388Y	0.29	obliterate	0	0	0.29
09389Y	0.64	obliterate	0	0	0.64
Temporary Roads Built	0.4	obliterate after use	0	0	0.4
TOTALS	10.13		6.02	1.98	2.13

Identified access and recreation needs are being met by leaving Forest Roads 300, 659 (portion), 501, 320A, and 300K open. If ATV trails become established off Forest Roads 659 and 300K, these roads should be closed as per MA 19 management direction.

Environmental Justice

The Forest Service examined the social, economic, and environmental impacts of this project and determined that none of the alternatives considered in this analysis would have a disproportionate impact on any minority population in the immediate area, within the surrounding counties, or in the Northern Arizona region (PR# 24).

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:

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FEDERAL, STATE, AND LOCAL AGENCIES:

Payson Ranger District, Tonto National Forest, USDA Forest Service
US Fish and Wildlife Service
USDA Natural Resource Conservation Service
Arizona Game and Fish Department
Arizona State Parks
Fort Verde State Park

TRIBES:

Fort McDowell Mohave-Apache
Fort McDowell Yavapai Nation
Hopi Tribe
Hualapai Tribe
Hualapai Tribe
Navajo Nation
Pueblo of Zuni
San Carlos Apache Tribe
San Juan Southern Paiute Council
The Havasupai Tribe
Tonto Apache Tribe
White Mountain Apache Tribe
Yavapai-Apache Nation
Yavapai-Prescott Indian Tribe

OTHERS:

Arizona Trail Association
Arizona Wildlife Federation
Arizona Nature Conservancy
Arizona Public Service
Audubon Society
Blue Ridge Fire District
Coconino Forest Watch
Crooked H Ranch
Forest Guardians
Friends of the Coconino N.F.
Grand Canyon Trust
High Desert Investment
Northern Arizona Nature Conservancy
Permittee-Buck Springs Allotment
Phelps-Dodge Morenci, Inc .
Precision Pine and Timber
Rim Country 4 Wheelers
Sierra Club Plateau Group
Silvercreek Forest Products
Southwest Center for Biological Diversity
Southwest Forest Alliance
Southwest Forest Products
Southwest Forest Watch
Stone Forest Industries, Inc.
Wally Smith Logging, Inc.

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APPENDICES

Appendix A: Management Area (MA) Map for the Pack Rat Salvage Project Area

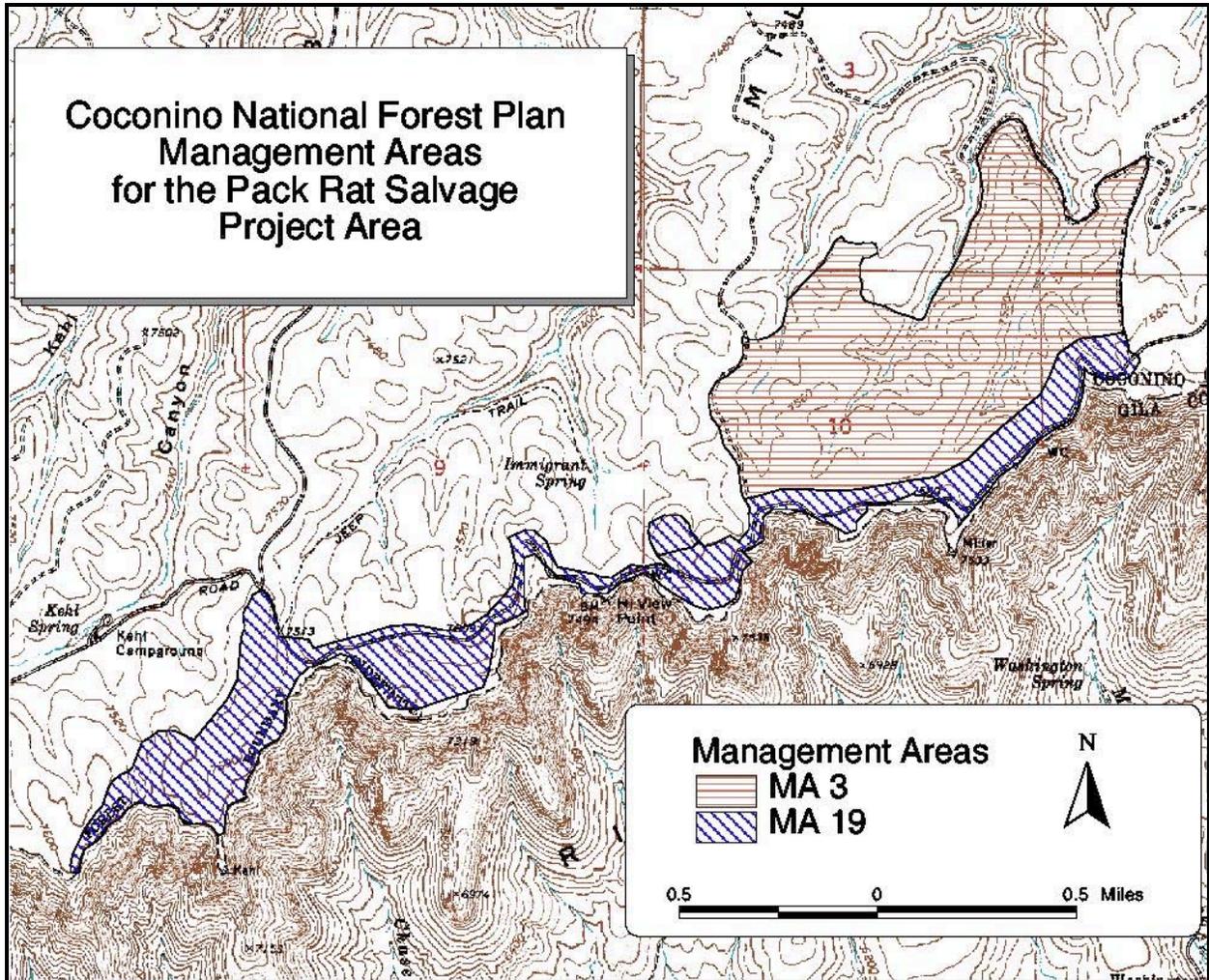
Appendix B: Mitigation Measures for the Action Alternative

Appendix C: Water Quality Data for the Upper Clear Creek and East Verde River Watersheds, as pertaining to the Pack Rat Salvage Project Area

Appendix D: Recreation Opportunity Spectrum (ROS) Classification

Appendix E: Sensitive Species Not Addressed in this Analysis

APPENDIX A: Management Area (MA) Map for the Pack Rat Salvage Project Area



APPENDIX B: Mitigation Measures for the Action Alternative

#	Soil and Water Mitigation*	Why
SW1	BMP's 25.13 and Control of Sanitation Facilities outline methods for mitigating hazardous materials and sanitation facilities. BT6.34 and BT6.341	To minimize impacts to water quality from contractors camping sites and from hazardous materials spills.
SW2	Roads should be located out of filter strips, except at approved crossings. Temporary roads may be used to keep log landings out of drainages and to minimize the number of stream crossings. The Timber Sale Contract (TSC) outlines road use authority under BT5.12 . Temporary roads will be no wider than 12', used only when dry or frozen, existing grass should be left in place where possible, and be obliterated after use (BMP 41.2, 41.27, 41.28 and 41.3). The use conditions will be agreed to prior to construction.	Proper transportation planning to alleviate on-site soil movement and maintain water quality.
SW3	Do not use the following closed Forest Roads: 9355N, 9388Y, and 9389Y . These should be specified on the Sale Area Map and BT5.12 and CT5.12 in action alternatives .	To not use roads located in filter streams and stream courses to minimize soils movement and maintain water quality.
SW4	On 102 acres of high intensity burn sites, there will be needed for the Timber Sale Contract to restrict whole tree skidding. Whole tree skidding should be limited to trees under 18" DBH. It is felt that tree limbs on the smaller size class trees (less than 18") are not large enough to cause large gouges in skid trails (no more than would normally occur). Standard provision BT6.42 is the contract clause to limit whole tree skidding by designating no whole tree skidding on trees over 18" diameter. The BT provision for mechanical harvesting restriction could be used in combination with the lopping off of 3-6 tops per acre to provide for mineral cycling. This option would still allow for whole tree skidding and would require use with the written approval.	Create coarse woody debris on high intensity burns to aid in soil recovery.
SW5	Designated skid trails and log landings will be required within the Timber Sale Contract (BT6.422, CT6.4# and BMP 24.18) on all cutting units. Skid trail design should not have long, straight skid trails that would direct water flow. Skid trails should also be located out of filter strips (exceptions are approved crossings).	To minimize the number of acres disturbed.
SW6	Felling to the lead will be utilized as necessary to minimize ground disturbance from skidding operations (CT6.4# and BMP 24.18).	Felling of timber should be done to minimize ground disturbance from skidding operations.
SW7	The TSC outlines the timing and application of erosion control methods in BT6.31, BT6.6, BT6.63, BT6.64, BT6.65, CT6.6, CT6.601#, and CT6.602 to minimize soil loss and sedimentation of stream courses. Seed mix can include the following certified weed free native seed at a minimum of 3 lbs/acre pure live seed: Arizona fescue (<i>Festuca arizonica</i>) Screwleaf muhly (<i>Muhlenbergia virescens</i>) Western wheatgrass (<i>Elymus smithii</i>) Mountain muhly (<i>Muhlenbergia Montana</i>)	Minimize soil loss and sedimentation of stream courses from skidding operations.

	<p>Purple geranium (<i>Geranium caespitosum</i>) Western yarrow (<i>Achillea millefolium</i>) Pussytoes (<i>Antennaria marginata</i>) Arizona peavine (<i>Lathyrus arizonicus</i>) Fringed sagebrush (<i>Artemisia frigida</i>)</p> <p>The seed mix can contain a mixture of all or some of these suggested species, but should not contain all of these species. The seed mix depends on the availability and costs of these species.</p> <p>Corresponding BMP's to minimize soil loss and sedimentation of include 24.13, 24.21, 24.22, 24.23, 24.24, and 24.25. Erosion control on the 102 acres of high intensity burn area and 45 acre moderate to high intensity burn areas will be spreading slash on the skid trails. Other acceptable erosion control measures include, but are not limited to, waterbarring (waterbars should not be more than two feet deep and need at least a ten foot leadout), removing berms, seeding, mulching and cross-ripping. Erosion control after skidding operations must be timely to minimize the effects of log skidding.</p>	
SW8	<p>The designation of filter strips also minimizes on-site soil movement from timber harvest activities (BMP 24.16). Filter strips shall be 1 chain wide on each side of the riparian stream reach, and .5 chain wide on each side of the non-riparian stream reaches. These stream reaches will be designated as protected stream courses. Locations of protected stream courses are included in the Sale Area Map (SAM) and will be designated with a protected stream course designation (BT6.5).</p>	To minimize soil movement and maintain water quality adjacent to stream courses.
SW9	<p>Road drainage is controlled by a variety of methods (BMP 41.14), including rolling the grade, insloping outsloping, crowning, water spreading ditches, and contour trenching. Sediment loads at drainage structures can be reduced by installing sediment filters, rock and vegetative energy dissipaters, and settling ponds. Design of roads is included in the transportation plan of the Timber Sale Contract, Table 1, and T-specs.</p>	To minimize soil movement and maintain water quality.
SW10	<p>Road maintenance (BMP 41.25 and CT5.31#) through the TSC should require prehaul and post haul maintenance on all roads to be used for haul.</p>	To minimize soil movement and maintain water quality.

SW11	The following are recommendations to protect stream courses within the proposed Pack Rat Fire Salvage. The guidelines for filter strip designation are as follows: EROSION HAZARD/ FILTER STRIP SLOPE DISTANCE Severe/ 1.5 chains on each side of stream course Slight / 0.5 chains on each side of stream course Accepted harvest activities within nonriparian filter strips include limited skidding and tree felling. Landings, decking areas, machine piles, skid trails, and roads (except at designated crossings) are planned outside of nonriparian filter strips.	Filtering sediment and/or providing bank stability.
SW12	A minimum of 10 to 15 tons per acre will be left on-site on all cutting unit sites. This will be accomplished through “rough piling” on low to moderate burn intensity sites (using TSC contract clause #CT6.7 and on the sale area map with the “Mpile/lop” designation. On high intensity and moderate to high intensity burn sites, fuel treatment will be lop and scatter. This will be designated through #CT6.7 and on the sale area map with the “Lop” designation.	To promote long-term soil productivity.
SW13	Mechanical fuel treatments will not occur on slopes greater than 25% slope. To accomplish this, fuel treatments will be designated within the TSC through #CT6.7 and on the sale area map with the “Mpile/lop” designation.	To reduce ground disturbance.
SW14	Mechanical crushing of lopped slash can only occur on 0-15% slopes on high and moderate to high intensity burn areas. This will occur in the area identified on the SAM with “Lop” designation and must be approved prior to implementation by the Purchaser and the Forest Service as per #CT6.7.	To incorporate slash into the soil to promote long-term soil productivity.
#	Visual Quality Mitigation	Why
VQ1	Cut all stumps as low to the ground as possible or 6 to 8 inches in MA 19.	Minimize visual impacts
VQ2	Do not leave paint on trees in MA 19. Any trees left with visible paint after the sale needs to have the paint removed or painted over with brown or black paint.	Minimize visual impacts
VQ3	Lop and scatter slash less than 2 feet high and do not create piles within MA 19.	Minimize visual impacts/impacts to dispersed recreation users.
VQ4	Preferred method of closing and obliterating roads is to remove roadbed and spread slash at less than 2 feet in height.	Minimize visual impacts and restrict unwanted off-road access
#	Health and Safety Mitigation	Why
HS1	Salvage operations and associated roadwork occur during the week, unless otherwise agreed upon. Detour traffic around operations as specified in the TSC and ensure that detour route is well signed. Designate Forest Road 300 as a safety zone on the Sale Area Map.	Maximize public and driver safety along Forest Roads.
#	Vegetation Management Mitigation	Why
VM1	Slash created from tree removal activities should be lopped and scattered in openings, piled and burned or chipped. If slash is chipped, do not pile chips more than 3 inches deep.	To help maintain bark beetle populations at or near current levels.

#	Invasive Plants Mitigation**	Why
INV1	Ensure all Off Road Equipment is free of soil, seeds, vegetative matter or other debris that could contain or hold noxious weed seeds. CT6.35	Reduce potential of noxious weed spread.
#	Fire and Fuels Mitigation	Why
FF1	All burning will be coordinated daily with the Arizona Department of Environmental Quality (ADEQ). Burning will not take place on any portion of the project without prior approval from ADEQ. Coordination with ADEQ will take place through the Coconino National Forest Zone Dispatch Center and the Prescribed Burning Boss.	To ensure that smoke management objectives are met.
FF2	In low and moderate intensity burn areas: pile slash in openings, outside the drip line of green trees.	To minimize potential damage to roots and crowns of residual trees when burned.
FF3	Control the duration of heavy smoke conditions (1-3 days). The following guidelines will be initiated when heavy smoke conditions are occurring. a) New ignitions will not take place every day. b) Burning will be conducted early in the day or at night to allow heavy materials time to be consumed, and give smoke most of the day to disperse. c) Ignitions will not take place on Saturday or Sunday d) Smoke from prescribe burning activities of adjacent Forests will be monitored and considered in scheduling prescribe burn ignitions in the Pack Rat Salvage analysis area. e) Burn with winds that will carry smoke away from the Verde Airshed and into the Little Colorado Airshed	To minimize impacts to residents of the Blue Ridge area, the Verde Airshed and to recreationists caused by heavy smoke conditions from prescribe burning. a) To decrease the amount of continuous smoke in the area. b) To lessen the potential impacts of smoke from nighttime inversions common to the area. c) To lessen impacts of smoke during the weekend when the most impacts to homeowners and recreationists will occur. d) To minimize the cumulative impacts of smoke from multiple sources within the same airshed. e) To prevent smoke impacts to the more populous communities south of the analysis area.
#	Range Mitigation	Why
R1	Remove burned trees that are within falling distance from fencelines	Protect fences from damage from falling trees
R2	Do not graze with livestock for two growing seasons (from date of wildfire)	Provide protection from grazing for understory species (grasses, forbs, shrubs)
#	Heritage Resources Mitigation	Why
HR1	Notify District Archaeologist prior to initiation of project activities	General Crook Tail (AR-03-04-01-240) is marked for avoidance
HR2	If previously undocumented archaeological sites are discovered, avoid them and report the site(s) to the District Archaeologist. BT6.24	Protection of significant, undocumented Historic Properties in the project area
HR3	Portions of General Crook Trail (AR-03-04-01-240) that contribute to the National Register eligibility of the site are avoided where project activities could alter the character of the site	Protection of Crook Tail integrity

HR4	District Archaeologist is directly involved in selecting leave-trees in the 200 ft. wide Crook Trail management corridor	Historic and recreational/scenic value of the trail is maintained
HR5	General Crook Trail crossings are placed in previously disturbed areas or segments evaluated as non-contributing elements to the site's National Register eligibility	Protection of Crook Tail integrity
HR6	General Crook Trail crossings are rehabilitated to their current condition before project termination	General Crook Trail will experience No Adverse Effect from project
#	Wildlife Mitigation	Why
WL1	Project activities during the MSO breeding season will be minimized by implementing most activities after August 31, 2003. Activities may occur in the spring of 2004, however, in which case the appropriate measures will be taken to minimize disturbance to MSO	Minimize disturbance to MSO
WL2	No project work in MSO PACs	Minimize disturbance to MSO
WL3	Leave at least 2-4 large (>20" DBH) snags/acre where available	Retain snags for use by wildlife

*Soil and Water BMP's are found in the USDA Forest Service Soil and Water Conservation Practices Handbook (See Literature Cited and References).

**Invasive plants BMP's are found in Northern Arizona Integrated Weed Management Practices (See Literature Cited and References).

APPENDIX C: Water Quality Data

Water Quality Standards for Water Courses Connected to the Pack Rat Salvage Project Area

Reach ID	Designated Uses	Agency, Program, site ID, site description	Samples Year-Number	Standards or Criteria Exceeded						
				Constituent	Units	Standard	Range of values	Frequency exceeded	Mean or median	Use Support
East Verde River										
East Verde River	A&Wc,FC, FBC,DWS, Agl,AgL	ADEQ Biocriteria EVD1-00RF Below Washington Park	1995-1 water	OK						Full
Upper Clear Creek										
Barber-shop Canyon Creek	A&Wc,FC, FBC,AgL	ADEQ Biocriteria BAR1-00RF At Merritt Draw	1992-1 water 1993-1 water 1994-1 water	Ok						
Barber-shop Canyon Creek	A&Wc,FC, FBC,AgL	ADEQ Biocriteria BAR1-00RF Near East Clear Creek	1992-1 water 1993-1 water 1994-1 water	Ok						
Buck Springs Canyon Creek	A&Wc,FC, FBC,AgL	ADEQ Biocriteria BCK1-00RF In cattle enclosure	1995-2 water	Ok						
Buck Springs Canyon Creek	A&Wc,FC, FBC,AgL	ADEQ Biocriteria BCK1-00RF Outside cattle enclosure	1995-1 water	Dissolved oxygen	Mg/l	7.0 (90% saturation)	8.1-6.8	2/2		Partial A&wc
				Turbidity	NTU	10	9.5-14.6	1/2		Partial A&Wc

APPENDIX D: Recreation Opportunity Spectrum (ROS)

Table 1. Recreation Opportunity Spectrum activity characterization. ^a

Primitive	Semi-Primitive non-motorized	Semi-Primitive motorized	Roaded Natural	Rural	Urban
Land based (Includes aircraft)	Land based (Includes aircraft)	Land based (Includes aircraft)		Land based (Includes aircraft)	
Viewing scenery	Viewing Scenery	Viewing scenery		Viewing scenery	
Hiking and Walking	Automobile (off-road use)	Viewing activities		Viewing activities	
Horseback riding	Motorcycles and scooters	Viewing works of humankind		Viewing works of humankind	
Camping (all)	Specialized landcraft	Automobile (inc. off-road use)		Automobile (inc. off-road use)	
Hunting (all)	Aircraft (motorized)	Motorcycles and scooters		Motorcycles and scooters	
Nature Study (all)	Hiking and walking	Specialized landcraft		Specialized landcraft	
Mountain Climbing	Horseback riding	Train and bus touring		Train and bus touring	
General Information	Camping (all)	Aircraft (motorized)		Aircraft (all)	
	Hunting (all)	Aerial trams and lifts		Aerial trams and lifts	
	Nature Study (all)	Hiking and walking		Hiking and walking	
	Mountain Climbing	Bicycling		Bicycling	
	General Information	Horseback riding		Horseback riding	
		Camping (all)		Camping (all)	
		Organization camping (all)		Organization camping (all)	
		Picnicking		Picnicking	
		Resort and Commercial services		Resort and Commercial services	
		Resort Lodging		Resort Lodging	
		Recreation cabin use		Recreation cabin use	
		Hunting (all)		Hunting (all)	
		Nature studies (all)		Nature Studies (all)	
		Mountain climbing		Mountain climbing	
		Gathering forest products		Gathering forest products	
		Interpretive services (all)		Interpretive services (all)	
				Team sports	
				Individual sports	
				Games and play	
Water based:	Water based:	Water based:		Water based:	
Canoeing	Boating (powered)	Tour boat and ferry		Tour boat and ferry	
Sailing	Canoeing	Boat (powered)		Boat (powered)	
Other non-motorized watercraft	Sailing	Canoeing		Canoeing	
Swimming	Other watercraft	Sailing		Sailing	
Fishing (all)	Swimming	Other Watercraft		Other watercraft	
	Diving (snorkel or scuba)	Swimming and water play		Swimming and water play	
	Fishing (all)	Diving (snorkel and scuba)		Diving (snorkel and scuba)	
		Water skiing and water-sports		Water skiing and water-sports	
		Fishing (all)		Fishing (all)	
Snow and Ice based:	Snow and Ice based:	Snow and Ice based:		Snow and Ice based:	
Snow play	Snow play	Snow play		Snow play	
Cross Country skiing/snow shoeing	Cross Country skiing/snow shoeing	Cross Country skiing/snow shoeing		Cross Country skiing/snow shoeing	
	Ice and snowcraft	Ice and snowcraft		Ice and snowcraft	
	Ice and snowcraft	Skiing (downhill)		Skiing (downhill)	
	Skiing (downhill)	Ice skating		Ice skating	
		Sledding and tobogganing		Sledding and tobogganing	

^a These characteristics are illustrative only, and may vary within a ROS class depending on local situations. (USDA Forest Service 1982)

Table 2. Recreation Opportunity Spectrum size criteria.

Primitive	Semi-Primitive non-motorized	Semi-Primitive motorized	Roaded Natural	Rural	Urban
5,000 acres ^a	2,500 acres ^b	2,500	No size criteria	No size criteria	No size criteria

^a may be smaller if contiguous to semi-primitive Non motorized Class

^b may be smaller if contiguous to Primitive Class

(USDA Forest Service 1982)

Table 3. Recreation Opportunity Spectrum remoteness criteria.

Primitive	Semi-Primitive non-motorized	Semi-Primitive motorized	Roaded Natural	Rural	Urban
An area designated at least 3 miles from all roads, railroads, or trails with motorized use.	An area designated at least <u>-mile but not further than 3 miles from all roads, railroads or trails with motorized use; can include the existence of primitive roads and trails is usually closed to motorized use.</u>	An area designated within <u>-mile of primitive roads of trails used by motor vehicles; but not closer than <u>-mile from better than primitive roads.</u></u>	An area designated within <u>-mile from better than primitive roads, and railroads.</u>	No distance criteria	No distance criteria

(USDA Forest Service 1982)

Table 4. Recreation Opportunity Spectrum setting characterization.

Primitive	Semi-Primitive non-motorized	Semi-Primitive motorized	Roaded Natural	Rural	Urban
Area is characterized by essentially unmodified natural environment of fairly large size. Interaction between users is minimal. The area is managed to be essentially free from evidence of human-induced restrictions and controls. Motorized use within the area is not permitted.	Area is characterized by predominately natural or natural-appearing environment of moderate-to-large size. Interaction between users is low, but there is evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but are subtle. Motorized use is not permitted.	Area is characterized by a predominately natural or natural-appearing environment of moderate-to-large size. Concentration of users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but are subtle. Motorized use is permitted.	Area is characterized by predominately natural or natural-appearing environment of moderate-to-large size. Concentration of users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but are subtle. Motorized use is permitted.	Area is characterized by substantially modified natural environment. Resource modification and utilization practices are to enhance specific recreation activities and to maintain vegetative cover and soil. Sights and sounds of humans are readily evident, and the interaction between users is often moderate to high. A considerable number of facilities are designed for use by a large number of people. Facilities are often provided for special activities. Moderate densities are provided far away from developed sites. Facilities for intensified motorized use and parking are available.	Area is characterized by a substantially urbanized environment, although the background may have natural –appearing elements. Renewable resource modification and utilization practices are to enhance specific recreation activities. Vegetative cover is often exotic and manicured. Sights and sounds of humans, on site, are predominant. Large numbers of users can be expected, both on-site and in nearby areas. Facilities for highly intensified motor use and parking are available with forms of mass transit often available to carry people throughout the site.

Table 5. Recreation Opportunity Spectrum Experience characterization.

Primitive	Semi-Primitive non-motorized	Semi-Primitive motorized	Roaded Natural	Rural	Urban
Extremely high probability of experiencing isolation from the sights and sounds of humans, independence, closeness to nature, tranquility, and self-reliance through application of woodsman and outdoor skills in an environment that offers a high degree of challenge and risk.	High, but not extremely high, probability of experiencing isolation from the sights and sounds of humans, independence, closeness to nature, tranquility, and self-reliance through the application of woodsman and outdoor skills in an environment that offers challenge and risk.	Moderate probability of experiencing isolation from the sights and sounds of humans, independence, closeness to nature, tranquility, and self-reliance through the application of woodsman and outdoor skills in an environment that offers challenge and risk. Opportunity to use motorized equipment while in the area.	About equal probability to experience affiliation with other user groups and for isolation from sights and sounds of humans. Opportunity to have a high degree of interaction with the natural environment. Challenge and risk opportunities associated with more primitive types of recreation are not very important. Practice and testing of outdoor skills might be important. Opportunities for both motorized and non-motorized forms of recreation are possible.	Probability for experiencing affiliation with individuals and groups is prevalent, as is the convenience of sites and opportunities. These factors are generally more important than the setting of the physical environment. Opportunities for wild-land challenges, risk-taking, and testing of outdoor skills are generally unimportant except for specific activities like downhill skiing, for which challenge and risk-taking are important elements.	Probability for experiencing affiliation with individuals and groups is prevalent, as is the convenience of sites and opportunities. Experiencing natural environments, having challenges and risks afforded by the natural environment, and the use of outdoor skills are relatively unimportant. Opportunities for competitive and spectator sports and for passive uses of highly human-influenced parks and open spaces are common.

(USDA Forest Service 1982)

Developed and Road-based Recreation Activities:

Table 6. Recreation Opportunity Spectrum social setting criteria.

Primitive	Semi-Primitive non-motorized	Semi-Primitive motorized	Roaded Natural	Rural	Urban
Usually less than 6 parties per day encountered on trails and less than 3 parties visible at campsite.	Usually 6-15 parties per day encountered on trails and 6 or less visible at campsites.	Low to moderate contact frequency. ^a	Frequency of contact is Moderate to High on roads; Low to moderate on trails and away from roads. ^a	Frequency of contact is Moderate to High in developed sites, on roads and trails, and water surfaces; Moderate away from developed sites. ^a	Large numbers of users onsite and in nearby areas

(USDA Forest Service 1982)

^a Specific numbers must be developed to meet regional or local conditions.

Table 7. Recreation Opportunity Spectrum managerial setting criteria.

Primitive	Semi-Primitive non-motorized	Semi-Primitive motorized	Roaded Natural	Rural	Urban
On-site regimentation low with controls ^a primarily off-site.	On-site regimentation and controls ^a present but subtle.	On-site regimentation and controls ^a present but subtle.	On-site regimentation and controls ^a are noticeable, but harmonize with the natural environment.	Regimentation and controls ^a obvious and numerous, largely in harmony with man-made environment.	Regimentation and controls ^a obvious and numerous.

^a Controls can be physical (such as barriers) or regulatory (such as permits) (USDA Forest Service 1982)

Table 8. Recreation Opportunity Spectrum evidence of human criteria.

Primitive	Semi-Primitive non-motorized	Semi-Primitive motorized	Roaded Natural	Rural	Urban
Setting is essentially an unmodified natural environment. Evidence of humans would be unnoticed by an observer wandering through the area. Evidence of trails is acceptable, but should not exceed standard to carry expected use. Structures are extremely rare.	Natural ^a setting may have subtle modifications that would be noticed but not draw the attention of an observer wandering through the area. Little or no evidence of primitive roads and the motorized use of trails and primitive roads. Structures are rare and isolated.	Natural ^a setting may have moderately dominant alterations but would not draw the attention of motorized observers on trails and primitive roads within the area. Strong evidence of primitive roads and the motorized use of trails and primitive roads. Structures are rare and isolated.	Natural ^a setting may have modifications which range from being easily noticed to strongly dominant to observers within the area. However from sensitive ^b travel routes and use areas these alterations would remain unnoticed or visually subordinate. There is strong evidence of designated roads and/or highways. Structures are generally scattered, remaining visually subordinate or unnoticed to the sensitive ^b travel route observer. Structures may include power lines, micro-wave installations, etc.	Natural ^a setting is culturally modified to the point that it is dominant to the sensitive ^b travel route observer. May include pastoral, agricultural, intensively managed wildland resource landscaped, or utility corridors. Pedestrian or other slow moving observers are constantly within view of culturally changed landscape. There is strong evidence of designed roads and/or highways. Structures are readily apparent and may range from scattered to small dominant clusters including power lines, microwave installations, local ski areas, minor resorts and recreation sites.	Setting is strongly structure dominated. Natural or natural appearing elements may play an important role but be visually subordinate. Pedestrian and other slow moving observers are constantly within view of artificial enclosure of spaces. There is strong evidence of designed roadways and/or highways and streets. Structures and structure complexes are dominant, and may include major resorts and marinas, national and regional ski areas, towns, industrial sites, condominiums or second home developments.

^a In many southern and Eastern forests what appears to be natural landscapes may have actually been strongly influenced by humans. The term natural appearing may be more appropriate in these cases. (USDA Forest Service 1982)

^b Sensitivity level 1 and 2 travel routes from Visual Management System USDA Handbook 461. (USDA Forest Service 1982)

APPENDIX E: Sensitive Species Not Addressed in this Analysis

Common Name	Scientific Name	Comments on No Potential Habitat
Common black-hawk	<i>Buteogallus anthracinus</i>	Require cottonwood-willow associations - nesting
Western Yellow-billed Cuckoo	<i>Coccyzus americanus occidentalis</i>	Elevational range in Arizona is below 5,000 feet
Bell's Vireo	<i>Vireo bellii</i>	Habitat is dense riparian thickets, mesquite, and scrub oak near water.
Eared Trogon	<i>Euptilotis neoxenus</i>	Transient to Mogollon Rim. Does not prefer burned habitat.
Lowland Leopard Frog	<i>Rana yavapaiensis</i>	Elevational range is less than 3,300 feet
Northern Leopard Frog	<i>Rana pipiens</i>	Highly aquatic. No aquatic habitat on or near the analysis area
Arizona Southwestern Toad	<i>Bufo microscaphus microscaphus</i>	Elevation range is 2,00-6,000 feet. Occurs in rocky streams. There are no streams in analysis area, and elevation is above 7,000 feet.
Narrow-headed Gartersnake	<i>Thamnophis rufipunctatus</i>	Prefers quite, rocky pools along permanent streams. There are no streams in the analysis area.
Mexican Garter Snake	<i>Thamnophis eques megalops</i>	Gen. between 3,000 and 5,000 feet. Higher in cienegas in desert grasslands.
Arizona Night Lizard	<i>Santusia vigilis arizonae</i>	Habitat is chaparral-oak belt, and mixed desert and woodland.
Blue-black Silverspot Butterfly	<i>Speyeria nokomis nokomis</i>	Uses moist meadows, seeps, marshes, and streamside, generally in desert landscapes. This habitat is not on or near the analysis area
Mountain Silverspot Butterfly	<i>Speyeria nokomis nitocris</i>	Requires moist meadows, seeps, marshes, or streamside, which are not on/near the project area.
Early Elfin		May be restricted to northern Coconino County. Larva feed on cliffrose. There is no cliffrose on or near the analysis area.
Spotted Skipperling		Habitat consists of moist meadows and streamside, of which there is none in or near the analysis area.
Freeman's agave borer	<i>Agathymus baueri</i>	Requires agaves, which do not occur on area.
Obsolete Viceroy butterfly	<i>Limenitis archippus obsoleta</i>	Upper sonoran life zone, 3,300 to 4,800 feet. Asso. with riparian canyons and desert arroyos.
Aryxna Giant Skipper	<i>Agathymus aryxna</i>	Host plant is agave – not found on or near area.
Comstock's Hairstreak	<i>Callophrys comstocki</i>	Occurs in desert mountains, dry rocky areas.
Neumogen's Giant Skipper	<i>Agathymus neumoegeni</i>	Host plant is agave – not found on or near the analysis area.
Tiger Beetle	<i>Cicindela hirtocollis corpuscular</i>	Associated with perennial or intermittent streams, on sandy banks. There are no intermittent streams with sandy banks on or near the analysis area.
Maricopa Tiger Beetle	<i>Cicindela oregona</i>	Always in sandy riparian habitat. There is no sandy, riparian habitat on or near the analysis area.
Tonto Basin Agave	<i>Agave delamateri</i>	Gen. between 2,800 and 3,400 feet.
Heathleaf Wild Buckwheat	<i>Eriogonum ericifolium</i> var. <i>ericifolium</i>	Occurs in heavily calcareous soils of tertiary lakebed deposits, shady clay soils, volcanic tuffs.
Ripley Wild Buckwheat	<i>Eriogonum ripleyi</i>	Elevational range from about 2,000-6,000 feet. Soils same as above.

Hualapai Milkwort	<i>Polygala rusbyi</i>	Occurs on limestone derived soils, especially those of Verde Formation, 3,200-5,000 feet.
Mearn's Sage	<i>Salvia dorrii ssp. Mearnsii</i>	Restricted to open desert-scrub communities.
Tusayan Rabbitbrush	<i>Chrysothamnus moestus</i>	Habitat is open pinyon-juniper or scrublands
Mogollon Thistle	<i>Cirsium parryi mogollonicum</i>	Found only around Dane Springs. Not in analysis area.
Cliff Fleabane	<i>Erigeron saxatilis</i>	Found between 4,400-7,000 feet on shaded cliff faces. Analysis area is above 7,000 feet, and does not contain cliff faces.
Mt. Dellenbaugh Sandwort	<i>Arenaria aberrans</i>	Found in oak and pine forests, which are not present in or near the analysis area.
Arizona Bugbane	<i>Cimicifuga arizonica</i>	Very habitat specific. Requires shady moist environments, with tall cliffs. Habitat not present in or near the analysis area.
Flagstaff Beardstongue	<i>Penstemon nudiflorus</i>	Uncommon species that grows in dry pine forests between 4,500-7,000 feet. Analysis area is above 7,000 feet.
Flagstaff Penyroyal		Restricted to small, scattered limestone and sandstone outcrops in north central Arizona ranging from 4,500-7,000 feet. Not in analysis area.
Eastwood Alum Root	<i>Heuchera eastwoodiae</i>	Found in sandy soils on moist slopes. This habitat type is not found in the analysis area.
Rusby's Milkvetch	<i>Astragalus rusbyi</i>	Requires open, wet areas. Not found on project area.
Arizona Sneezeweed	<i>Helenium arizonica</i>	Found in ephemeral drainages near Mormon Lake
Fossil Springsnail	<i>Pyrgulopsis simplex</i>	Known only from Fossil Springs.
Little Colorado Sucker	<i>Catostomus sp.</i>	No aquatic habitat in or near project area
Rountail Chub	<i>Gila robusta</i>	No aquatic habitat in or near project area
Southwestern River Otter	<i>Lutra canadensis sonora</i>	Formerly from rivers in the Colorado River Basin, including Verde River.