Chiricahua National Monument

Fire Management Plan

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Chapter I
Introduction

Chiricahua National Monument is located in the northern end of the Chiricahua Mountains in southeastern Arizona (Figure I-1). It is 124 miles southeast of Tucson, Arizona and 70 miles north of Douglas and the Mexican border in Cochise County. Most of the 11,985-acre monument is designated wilderness. It is bordered on three sides by the Coronado National Forest (CNF) and on the west side by private land in the Sulphur Springs Valley (Figure I-2). This plan includes collaboration with the USDA Forest Service under which both agencies jointly manage fire on Forest Service land immediately north, east, and south of monument boundaries. This zone of cooperation (ZOC) includes parcels within watersheds that span the monument-forest boundary.

Cochise County and the area around the monument are rural, with ranching and agriculture providing 70% of resident income. Neighbors still ranch, relying on a combination of their own lands and Forest Service grazing permits. Relations with the private neighbors are generally cordial, though not necessarily close or active. Some of the ranchers use prescribed fire as a range management technique. All have concerns about uncontrolled wildfires. The current generation is not staying at home to continue the ranching tradition, and it is possible that the future may see housing subdivisions coming into this area as they have in many other parts of the West.

Tree rings within the monument record a 400-year fire history that likely extends further back in time (Swetnam et al. 1989; Swetnam and Baisan 1996; Kaib et al. 1996; Baisan and Morino 1999). Consequently, it is concluded that fire has shaped the landscape in this mountain range, and local fauna and flora have adapted to or are even dependent upon disturbances created by periodic fires. Signs of past fires are visible in the many vegetation types of the monument—fire-scarred trees, charcoal on the ground, blackened stumps, multiple-stemmed oaks and other trees, mature open-growth pines with branchless lower trunks, open-growth mature oaks, thickets of pine regeneration, and even-aged stands of oak and manzanita. Lack of recent fire shows itself as encroachment of trees into the semi-arid grasslands and continuous, heavy fuel loading.

It is against this natural background that the current fire management plan has been developed. The National Park Service Director's Order 18 (1998) states:

> Wildland fire may contribute to or hinder the achievement of park management objectives. Therefore, park fire management programs will be designed to meet resource management objectives prescribed for the various areas of the park and to ensure that firefighter and public safety are not compromised. Each park with vegetation capable of burning will prepare a fire management plan to guide a fire management program that is responsive to the park's natural and cultural resource objectives and to safety considerations for park visitors, employees, and developed facilities.

This fire plan is an interpretation and application of national direction at the local level for Chiricahua National Monument and is the primary reference for conducting all fire management

activities in the park. People consulting this plan must put it in the perspective of the enabling legislation, other related legislation, policies, regulation, and guidelines. This plan will be revised periodically to incorporate new knowledge of fire effects and fire behavior, as well as changing policies and guidelines.

The monument's previous fire management plans were approved in 1982 and 1992. This 2004 document is a revision of the 1992 plan based on changes to servicewide fire policies and more knowledge of ecology and fire management in the monument. The plan has been written to provide the justification and foundation of a complete fire management program, addressing both fire suppression and prescribed fire.

An interdisciplinary team prepared an Environmental Impact Statement (EIS) for this plan to comply with the National Environmental Policy Act (NEPA). The team, composed of managers and subject matter experts, gathered information, developed alternatives, prepared the draft and final documents, and involved the public and other agencies to carry out the compliance process. Chapter XI describes the team members and project coordination activities. Archeologists of the Western Archeological and Conservation Center and of the Southern Arizona Group Office, National Park Service (NPS) addressed National Historical Preservation Act (NHPA) requirements. Additional review was requested from the Arizona State Historic Preservation Office. The NHPA Assessment of Effects is included with the EIS. The interdisciplinary team also prepared a Biological Assessment for U.S. Fish and Wildlife Service that began a formal consultation on listed species. Finally, this FMP presents provisions of an agreement between Chiricahua National Monument and the USDA Forest Service covering joint fire operations in a zone of cooperation just outside and adjacent to the park.

This plan will implement fire management policies and help achieve resource management and fire management goals as defined in: (1) Federal Wildland Fire Management Policy and Program Review; (2) Managing Impacts of Wildfires on Communities and the Environment, and Protecting People and Sustaining Resources in Fire Adapted Ecosystems—A Cohesive Strategy (USDI/USDA); and (3) A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy Implementation Plan.

The authorities and guidelines for implementing this plan are contained in:

- Chiricahua National Monument General Management Plan (NPS 2001)
- Chiricahua National Monument Natural and Cultural Resources Management Plan (NPS 1996)
- A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy Implementation Plan (National Interagency Fire Center 2002)
- Departmental Manual (910 DM)
- Director's Order 18 Wildland Fire Management (1998)
- Federal Wildland Fire Management Policy (1995) Review and Update (National Interagency Fire Center 2001)
- Interagency Federal Wildland Fire Management Policy and Review (1995)

- Managing Impacts of Wildfires on Communities and the Environment, and Protecting People and Sustaining Resources in Fire Adapted Ecosystems—A Cohesive Strategy (USDI/USDA 2002)
- National Fire Plan (USDI/USDA 2004)
- National Park Service Organic Act (1916)
- National Park Service Strategic Plan (2000)
- Natural Resources Management (NPS 1989a)
- NEPA and NHPA requirements
- NPS Management Policies (NPS 2001a)
- Reference Manual 18 Wildland Fire Management (2001b)
- Reference Manual 77 (NPS 1999b and in progress)
- Chiricahua National Monument Statement for Management (NPS 1987)
- Director's Orders 12 (2001c) NEPA and NHPA Requirements
- Director's Orders 28 (1998) Cultural Resources Management
- Reference Manual 28 (1998) Cultural Resources Management

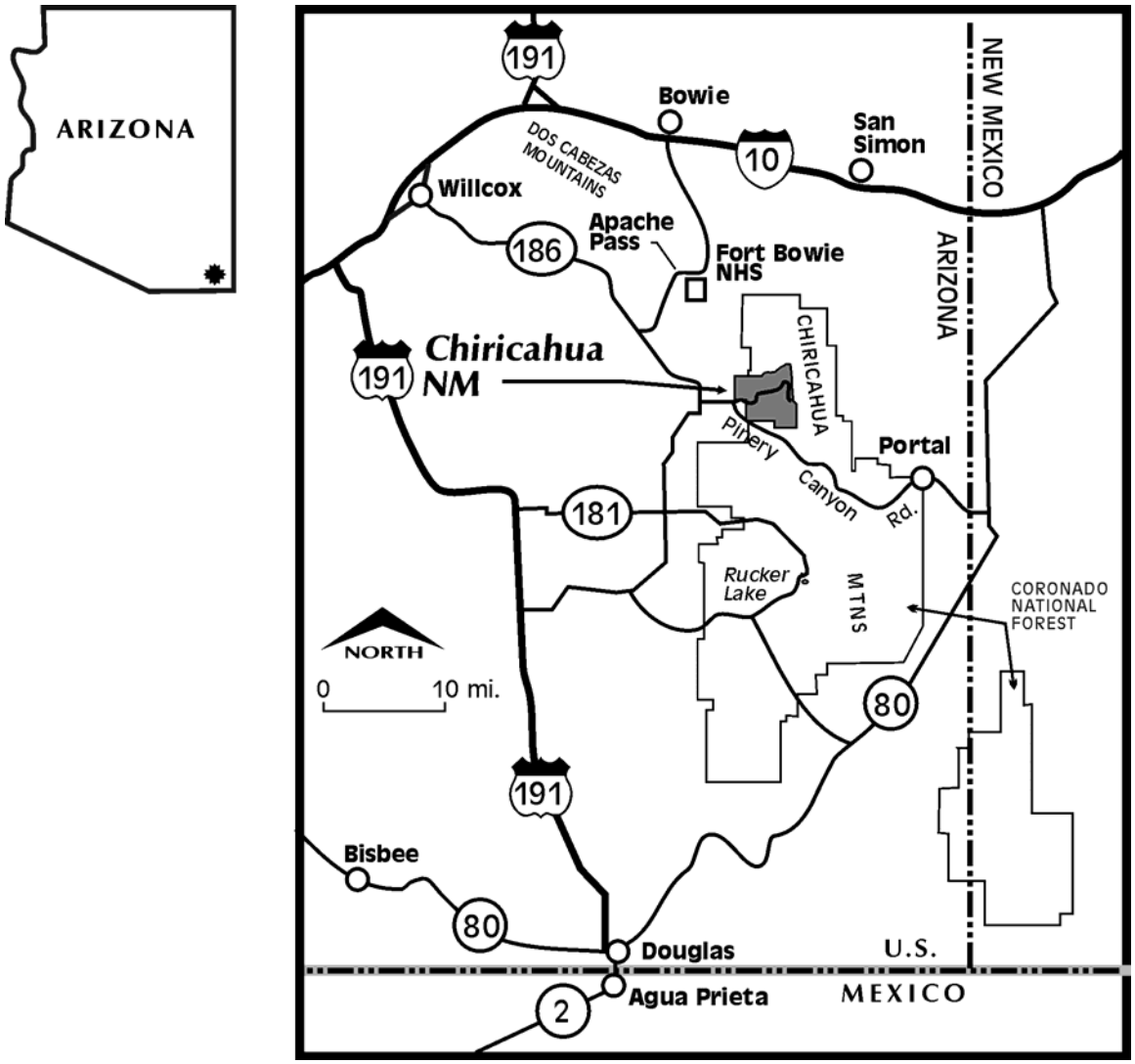

Figure I-1. Location of Chiricahua National Monument.

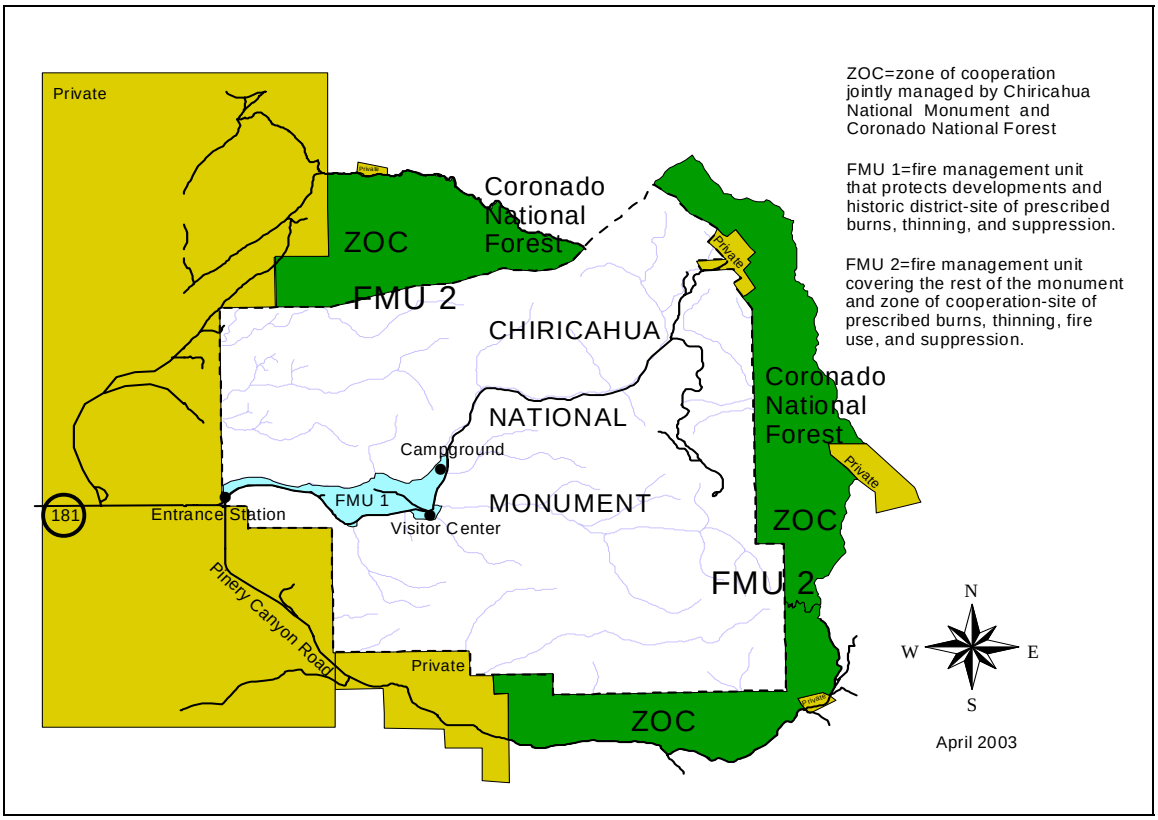

Figure I-2. Chiricahua National Monument Features with Fire Management Units.

Chapter II
Relationship to Land Management Planning and Fire Policy

Management Policies Statements

The National Park Service recognizes the occurrence as well as the absence of fire as integral factors influencing parks. Fire management policies are set forth in section 4.5 of 2001 Management Policies (NPS 2001) and are summarized below:

- fire management programs will meet resource management objectives while ensuring protection of life and property
- parks with vegetation capable of burning will prepare fire management plans and address funding and staffing required by fire programs
- fire plan development will include the NEPA compliance process and necessary collaborations with outside parties
- fires in vegetation are to be classified as wildland or prescribed fires
- wildland fires are managed according to considerations of resource values, safety, and cost
- prescribed fires are ignited to achieve resource management goals and closely monitored to determine whether they successfully meet objectives
- parks lacking approved plans must suppress all wildland fires using methods that minimize impacts while protecting life, property, and resource values

- suppression in wilderness will be consistent with the "minimum requirement" concept—minimizing adverse impacts associated with accomplishing necessary objectives in wilderness as described in DO-41 (NPS 1999).

Enabling Legislation

The fire management plan directly supports the monument's mission, as defined by it's enabling legislation. Chiricahua National Monument is charged with protection of scientifically significant geologic formations, wilderness and natural ecological values, and historic structures. The General Management Plan (2001) states the monument's purposes:

- preserve and protect all natural and cultural resources and values
- provide recreational opportunities that are compatible with the protection and appreciation of park resources for diverse groups
- provide educational opportunities to foster understanding and appreciation of the natural and human history of the area.

Legislative Mandates

The Organic Act of August 25, 1916, established the National Park Service and gave it the charge "...to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." It also gave the Secretary of the Interior authority to conduct certain management actions.

Chiricahua National Monument was created by Presidential Proclamation 1692, signed April 18, 1924 (43 Stat 1946), pursuant to the Antiquities Act, for protection of a monument. It stated that the "natural formations, known as 'The Pinnacles,'...are of scientific interest, and it appears that the public interests will be promoted by reserving as much land as may be necessary for the proper protection thereof, as a National Monument." The monument was established within the Coronado National Forest, and management responsibility remained with the Forest Service.

An administrative reorganization in 1933 (August 30, 1933) transferred the monument to National Park Service administration. Presidential Proclamation 2288 dated June 10, 1938 (52 Stat 1551), added 6,407 acres and specifically placed it under the direction of the NPS Organic Act of August 25, 1916. According to the proclamation, the enlargement occurred:

> ...for the proper care and management of the objects of historic and scientific interest being protected by the said monument...The Director of the National Park Service, under the direction of the Secretary of the Interior, shall have the supervision, management, and control of the monument as provided in the act of Congress entitled "An act to establish a National Park Service, and for other purposes," approved August 25, 1916,...and acts supplementary thereto or amendatory thereof.

On October 20, 1976, legislation designated 9,440 acres (approximately 95 percent) of Chiricahua as wilderness to be managed in accordance with the Wilderness Act of September 3, 1964 (PL 94-567). The National Parks and Recreation Act of 1978 (PL 98-625) expanded the boundary of Chiricahua National Monument with the acquisition of the 440-acre Faraway Ranch. The Arizona Wilderness Bill of August 28, 1984 (PL 98-406) added 850 acres of the

Bonita Creek watershed increasing the monument size to 11,985 acres. The purpose of the latter acquisition was to protect the watershed, and the 850 acres, also, was designated wilderness.

By virtue of the National Historic Preservation Act of October 5, 1969 (PL 89-665, 80 Stat 915), several structures were designated as having special historic significance. The Stafford Cabin and Faraway Ranch (8 buildings) are on the National Register of Historic Places. Eleven of the park residential and administrative buildings, constructed by the Civilian Conservation Corps, are on the List of Classified Structures.

Chapter III of this plan describes CNM's significant resources and values that relate to fire management. In brief, the 11,985-acre monument features spires and unusual rock formations that are the eroded remnants of a 2000-foot layer of ash and pumice fused into rock called rhyolite tuff. These materials were deposited by an immense volcanic eruption 27 million years ago. This geologic attraction sits at the intersection of the Chihuahuan and Sonoran deserts, and the southern Rocky Mountains and northern Sierra Madre. "Crossroads" geography and a range in elevation of approximately 5,000 to 10,000 feet within the Chiricahua Mountains (5,160 to 7,825 feet within the monument) result in one of the premier areas for biological diversity in the northern hemisphere.

As mentioned above, the monument's cultural resource highlights include the Faraway Ranch, a pioneer homestead and later a working cattle and guest ranch; Stafford Cabin; and buildings, trails, and other improvements constructed by Civilian Conservation Corps workers between 1934 and 1940. Identified archeological sites include pictographs, caves, work sites, and villages.

Meeting the General Management Plan and Resource Management Plan Objectives
Implementation of this fire management plan helps the monument meet several resources objectives listed in the General Management Plan (NPS 2001) and the Natural and Cultural Resources Management Plan (Chiricahua NM 1996). This fire plan addresses the perpetuation of native species and communities, protection of cultural resources, human safety, interpretation to the public, and enactment of NPS philosophies and policies. In addition, the Fire Management Plan is a detailed program of action to carry out fire management policies and objectives.

General Management Plan Objectives
The 2001 General Management Plan discusses specific fire-related objectives. Implementing the GMP will allow for safer operation of the fire program, especially relocating a combined monument headquarters and visitor center away from its current wooded, shrubby site. Upgrading roads and the water system has improved access and suppression capabilities. Continuing a prescribed fire program would help return vegetation to its historic less dense, more mosaic-like structure in many locations and reduce fuel loads where fire could threaten structures. Joint planning with the USDA Forest Service would facilitate fire in the wilderness as would explain the natural role of fire in interpretive materials.

Resource Management Plan Objectives
Management objectives stated in the Natural and Cultural Resources Management Plan (1996) include:

- to identify, protect, and perpetuate the geological formations, flora, fauna, and wilderness values
- to preserve and manage lands designated as wilderness
- in cooperation with the Forest Service, to manage fire as a natural process affecting ecological resource conditions in the monument
- to work with outside agencies and landowners to eliminate adverse impacts to monument resources
- to restore natural qualities to impacted sites within the monument
- to preserve the scenic qualities of the monument
- to protect and preserve air quality related values
- to develop a baseline of air quality information and provide an early warning detection of air quality impacts
- to identify, preserve, and interpret the aspects of human activities and events
- to seek and gather objects and information which have significance to the monument's cultural resources

Agreement with Coronado National Forest

Chiricahua National Monument and the Douglas Ranger District of the Coronado National Forest have entered into an agreement (Appendix A) that establishes conditions for joint management of the zone of cooperation with respect to fire. This agreement allows each agency to protect resources and serve stakeholders according to its mission. The management of this area is currently dictated by Coronado National Forest Land and Resource Management Plan (1986) The revised Land and Resource Management Plan will be implemented in 2005. Grazing, mining, hunting, and backcountry camping occur on USFS lands covered by the agreement.

Roughly 5,300 additional acres lie in the ZOC (see Figure I-2). The agencies will divide the decision-making as follows:

- NPS will take the lead on planning prescribed burning within the zone.
- The two agencies will together decide when and where wildland fire use is appropriate.
- When suppression is necessary, CNF will decide how to suppress within the zone.

Chapter III
Wildland Fire Management Strategies

In the mid-1970s, as awareness grew nationwide of the detrimental effects of exclusion of fire in ecosystems, monument staff recognized ecological changes resulting from decades of little or no fire. The absence of fire has altered stand structure, composition, and succession, and has affected wildlife habitats. At the species level there is variation in the sensitivity to fire, and many plants either require fire or benefit from fire during some stage of their life cycle. The monument began a prescribed burn program to assess ecological effects of fire, to develop burn prescriptions, and to reintroduce fire back into the system. Since that time, the program has expanded in response to an increased understanding of the complex nature of the fuels and vegetation. Degradation of scenic values, road closures, aircraft and equipment noise, and temporary reassignment of staff necessitated by prescribed and wildland fires can disappoint and

inconvenience park visitors. However, fire offers educational opportunities, and interpretation of burn sites can teach valuable lessons to visitors about fire and vegetation.

General Management Considerations

Fire management units (FMUs) are the foundation of the FMP. They are areas of the monument governed by distinct fire management strategies. Boundaries are clear and procedures are laid out in detail for each FMU. This document designates two FMUs and allows for wildland fire use over most of the area. This reflects the recognition that lack of fire has a detrimental effect on some monument ecosystems. This plan increases the beneficial use of fire to achieve desired ecological conditions while continuing to protect life, park property, and surrounding lands.

As introduced in the previous chapters, in the zone of cooperation NPS and the Forest Service will jointly decide appropriate management actions; however, the Forest Service will maintain responsibility for suppression, and NPS will plan (with FS review) and conduct fires that burn beyond the straight section lines that separate agency properties to natural watershed boundaries outside the monument.

Fire Management Goals and Objectives

The interdisciplinary team overseeing the writing of the present plan developed the following goals and objectives for the Chiricahua National Monument fire program.

Goal 1: Make firefighter and public safety the highest priority of every fire management activity. Protect life, property, and resources from the unacceptable effects of unwanted wildfires and from fire management activities by providing for safe, aggressive suppression of wildfires.

Objectives:

- Provide for the safety of visitors, monument employees, and the firefighting team as the first priority through thorough planning and implementation of all fire activities.
- Ensure that fire personnel are appropriately qualified for the position they will hold, and ensure that these personnel promote the safe and skillful application of fire management strategies and techniques.
- Ensure that all personnel receive a safety briefing that covers all aspects of fire hazards, mitigation measures, goals and objectives, strategies and tactics, and fire weather and behavior.
- Assign a resource advisor to any fire with the potential to adversely affect sensitive resources.
- Minimize unacceptable effects of wildland fire suppression and burned area rehabilitation on natural and cultural resources by employing Minimum Impact Suppression Tactics and ensuring thorough planning and implementation of suppression tactics.
- Develop burn prescriptions and objectives that minimize unacceptable effects of prescribed fire on natural and cultural resources.
- Ensure that park staff, visitors and neighbors are informed of all planned and unplanned fire management activites that may affect them.
- Manage all wildland fire incidents in the most cost effective manner possible commensurate with values at risk.

- Assure safe, rapid response to wildland fires with trained and qualified personnel and equipment.
- Complete annual and regular preparedness reviews to assure program readiness.
- Ensure staff responsible for fire operations understands wildland fire standards, guidelines and policy.
- Maintain an effective fire prevention program that eliminates human-caused fires and minimizes threats to life and property.

Goal 2: Apply prescribed fire and wildland fire use to accomplish desired resource management objectives, and to maintain and restore natural resources and natural ecological processes and conditions.

Objectives:

- Maintain species diversity and natural patterns of succession.
- Improve habitat of sensitive floral and faunal species.
- Control non-native plant species.
- Restore or improve watershed values.
- Restore or maintain the historic scene or cultural landscape.
- Reduce fuels that could adversely affect monument developments, cultural resources, and ecologically sensitive areas using prescribed fire and mechanical fuel reduction.
- Meet federal, state, and local air quality regulations.

Goal 3: Reduce wildland fire hazard around structures, cultural resources, and developed areas to ensure protection of these features.

Objectives:

- Implement mechanical hazard fuel reduction projects and prescribed fire within and adjacent to suppression zones to reduce fire intensity and severity to lesser levels.
- Implement mechanical hazard fuel reduction projects and prescribed fire around those cultural and historic sites vulnerable to unwanted wildland fire.

Goal 4: Base the fire program on sound data obtained through scientific investigations and monitoring.

Objectives:

- Determine cultural and natural resources fire-related data needs.
- Conduct studies and acquire information.
- Incorporate results into resource management planning and implementation.

Goal 5: Integrate fire program management into activities of all monument divisions.

Objectives:

- Openly communicate about fire activities with all monument divisions.
- Incorporate fire management tasks into all monument divisions.
- Keep the public informed about monument fire operations.
- Meet annually with monument division chiefs to discuss fire program management.

Goal 6: Manage fire cooperatively with adjacent land management agencies and private landowners.

Objectives:

- Keep interagency and cooperative agreements current and continue to collaborate on joint fire-management projects.
- Keep neighbors and the interested public informed about monument fire operations.

These goals help to accomplish the goals listed in the 10-year Comprehensive Strategy (National Interagency Fire Center 2002), the National Fire Plan, as well as the NPS Strategic Plan (2000). Five program goals reflect federal fire policy, the core principles and goals of the Comprehensive Strategy, and the Cohesive Strategy (USDI/USDA 2002) where supported by land and resource management plans.

Wildland Fire Management Options
Four strategies play equally important roles in fire management at the monument.

- Appropriate management response (suppression) is applied around high visitor use, developed areas, certain sensitive resources needing protection, and when wildland fire use is not feasible or safe.
- Prescribed fire is used to reduce fuels in high-risk areas and accomplish ecological goals.
- Wildland fire use allows natural ignitions to burn when they meet predetermined prescriptions related to safety and ecological goals.
- Non-fire applications—most notably thinning and herbicides—are treatments that are used instead of prescribed burning in areas where fire is inherently unsafe or undesirable given current fuels conditions.

Physical and Biotic Characteristics
Chiricahua National Monument is a place characterized by striking geology that is also rich in ecological and cultural resources. Fire is one of the processes that has shaped the character of the monument, and it is a constant consideration relative to protection of important monument resources. A summary of key physical, biological, and cultural features of the monument that relate to the fire program appears below. All physical and biotic characteristics, historic role of fire, fire ecology, historic weather analysis and fire season, vegetation types and fuel characteristics, and fuels challenges are relevant for both fire management units and so are discussed here. The summary also covers relevant information about the zone of cooperation, part of FMU 2 on the Coronado National Forest. The 5,300-acre ZOC lies within the elevation range of the monument. FMU descriptions in sections that follow itemize resources and objectives distinct to each area.

Figures I-1 and I-2 in Chapter I show the location of and land ownership around Chiricahua National Monument. The monument sits on the western slope of the north end of the Chiricahua Mountains in Cochise County, Arizona. The mountain range lies in the southeast corner of the state within the Mexican Highland section of the Basin and Range Biogeographical Province. Mountains in this region are nicknamed “sky islands,” since they are separated from other mountain “islands” by expanses of lower elevation grassland. “Madrean Archipelago” is another descriptor of this collection of mountains that lies between the Colorado Plateau and the main mass of the Sierra Madre Occidental (Lowe 1992); the term “Madrean” also implies the presence of pine-oak plant communities that dominate the Sierra Madre Occidental in Mexico.

The majority of the 11,985 acres of Chiricahua National Monument is designated as wilderness, where the overall management is for the maintenance of ecological processes with a minimum of human intervention. Lands to the west of the monument are privately owned, and the monument is surrounded on the other three sides by the Douglas Ranger District of the Coronado National Forest. Along the approximately 20-mile perimeter, the monument boundaries follow legal section lines, except for the north portion where topographic ridge lines are followed for approximately 5 miles (see Figure I-2). The configuration creates administrative and physical challenges for fire management as well as some other monument programs. Vegetation, elevation, and slope are continuous across the boundaries and would not stop fire spread into or out of the monument. Because of this configuration, NPS and the Coronado National Forest have conceived the ZOC outside the linear boundaries on the north, east, and south sides of the monument.

Park elevation ranges from 5,160 feet at the northwest corner to 7,825 feet on the north boundary, a span of 2,665 feet. Major drainages in the monument run through Picket, Bonita, Rhyolite, Whitetail, and Jesse James Canyons. Elevations in the ZOC lie within the monument range.

Geology

Chiricahua National Monument is largely volcanic in origin. Successive layers of hot ash gradually cooled and welded together to form the rhyolite "tuff" that fractured along fault lines and joints to form blocks. Some blocks were uplifted while others remained in place, resulting in spectacular columns up to 150 feet tall and 30 feet in diameter. Wind, rain, snow, and ice eroded columns into the unusual spires and balanced rocks characteristic of the monument. The Rhyolite Canyon and Faraway Ranch formations are the predominant outcrops in the monument (Sabins 1957). An ancient streambed exposed in Bonita Canyon is an interesting feature. These geological features make effective fuel breaks throughout the monument.

Hydrology

Permanent streams or lakes do not exist at the monument, and the fractured geology contributes to little water storage. Lower elevation alluvial soils are more permeable than the volcanic rocks and can store and deliver greater amounts of water, depending on precipitation (Johnson 1962).

Surface flows in Rhyolite and Bonita creeks may occur during the summer monsoon (see Fire Weather/Season discussion in this chapter), with the former possibly running for several months while the latter only intermittently. The variation in runoff patterns between the two probably relates to differences in vegetation cover and degrees of fracturing in the rock beneath their drainages. Several springs exist with some being permanent and dependable water supplies for wildlife. Floods occur with heavier than normal precipitation in the summer; the most recent significant flooding occurred on Bonita Creek in August 1999.

This FMP guides management of fire along watershed rather than political boundaries by adding the zone of cooperation on Coronado National Forest land. Management will continue along straight-line borders with private neighbors. Moving clockwise from its northwest corner, the edge of the ZOC follows West Whitetail Creek, meets the ridgeline that forms the northeast monument boundary, intersects and continues south along Indian Creek, intersects and continues

south through Blumberg Canyon, intersects the North Fork drainage and sweeps around to the west, and finishes along Pinery Creek (Pinery Canyon Road) (see Figure I-2).

Soils

A recent soils report (Denny and Peacock 2000) named 13 soils and defines 24 map units for the monument. Bennett et al. (1996) contains descriptions of soils found in the mountain range on (1) valley floor, river bottom, and alluvial fans, (2) valley slopes and foothills, and (3) mountains. "K" values (that rate erosion susceptibility on a scale of 0.02 to 0.69) run between 0.02 and 0.28 for the monument's soils (Denny and Peacock 2000). Universal rockiness keeps soils in place under most conditions, but there is evidence of past debris flows and mass wasting.

In the park, canyons are typically steep, with rock outcrop complexes defined by slopes as steep as 75%. Upper slope soils are rocky and poorly developed with excessive drainage. Lower slopes frequently have deeper colluvial soils on moderate grades or locally around vegetation bases and pockets in rocks. On lower surfaces, the soils are mixtures of sediments deposited by both stream and downslope movement (Gile and Hawley 1966). Climatic gradients of the canyons interact with complex drainage and soil patterns of sideslopes to produce a variety of vegetation types (Moir 1974).

Canyon bottoms generally have deep, stable alluvial soils and provide the most mesic habitats. While the stream channels are scoured by runoff from summer storms, the adjacent, relatively level terraces are usually covered with heavy deposits of litter and support stands of oak, pine, and Arizona cypress.

Permissible conditions for prescribed fire and wildland fire use under this FMP preclude high-intensity fires that could result in soils that resist wetting (hydrophobic soils) (Baker 1990).

Vegetation

Chiricahua National Monument is floristically and physiognomically diverse. The diversity reflects many factors, including latitude, elevation, topography, soil composition, precipitation, climate, and natural fires (Reeves 1976). Beginning about 11,000 years ago, grasslands and deserts gradually replaced the oak-pine woodlands that extended from the Sierra Madre in Mexico and restricted this Madrean woodland type to mountain slopes and washes where it occurs today (Van Devender and Spaulding 1979).

Two biogeographical transition zones affect species composition. The lowlands of Chiricahua National Monument are in the Chihuahuan-Sonoran desert interface; Lowe and Zweifel (1992) place the Chiricahuas just south of the line dividing Rocky Mountain from Madrean influences in the Madrean Archipelago. These transitions cause some overlap of generally east-west and north-south species distributions but also mark the region as the limit to many geographical ranges (Lowe 1992; Felger and Johnson 1995).

Table III-1 summarizes five different classification systems for vegetation at CNM. Four structural vegetation types form the basis of this fire plan: pine with mixed conifers and hardwoods, mixed oaks, manzanita shrub community, and mixed grasses with minor shrub-tree

component. “Historic Role of Fire” later in this chapter discusses fire ecology of these types. Plant species of concern are described in Chapter IX, Protection of Sensitive Resources.

Wildlife

The presence and rich variety of wildlife are key to visitor enjoyment of Chiricahua National Monument. Many Madrean species occur in the U.S. only in the Chiricahuas and other sky islands of the region. While fire can cause mortality and injury to wildlife in the short run, it renews fire-adapted habitats, creates edge, and increases available forage when followed by adequate rain. The fire program seeks to minimize the short-term effects on wildlife species where possible. Table III-2 lists species of interest to visitors, particularly birdwatchers. Rare and protected species are treated separately in Chapter IX.

Air

Air quality is generally excellent for the monument and vicinity, which has Class I designation due to its wilderness status. Monitoring of acid deposition, ozone, and visibility began in 1987, with dioxin levels added in 2000 and a nephalometer in 2004. Prescribed burns proceed only with the approval of the Arizona Department of Environmental Quality, the state agency responsible for air quality issues. Smoke from prolonged fires would hamper visitor enjoyment of the dark, starry night sky. Smoke may also negatively impact staff living in the monument and neighbors. Chapter IV discusses the regulatory requirements for the fire program relative to air quality. The zone of cooperation lies within the same airshed as the monument and will be treated as a Class I airshed.

Cultural History

Chapter IX, Protection of Sensitive Resources, contains the cultural resources matrix prepared to evaluate the effects of fire on significant archeological and historical resources in the monument. The discussion here provides some background for understanding fire-related issues.

The existing evidence dates human habitation of what is now Chiricahua National Monument and surrounding areas to 8000 BC. By AD 1200 agriculture became important and supported local villages. By 1450 the occupants of these villages abandoned the area. Apache ancestors were believed to have arrived in the late 17th century. The Spanish were the first Europeans in the southwest and the first to deal with the Apache (Spicer 1962). The ebb and flow of European settlement in the southwest in the late 18th and 19th centuries—first the Spanish, then the Mexicans, then the Americans—was dependent to a great extent upon relations with the Apache. Remnants of villages, camps, worksites, and cultural landscapes from pre-Apache, Apache, and early Anglo times have become important cultural resources for the monument.

From 1790 to the early 1820s, numerous land grants were issued by the Spanish and Mexican governments for cattle ranches throughout what is now southern Arizona. Cattle numbers increased greatly, with herds running feral over much of the range (Wagoner 1975). Arizona became part of the United States after the Gadsden Purchase in 1853. Cattle ranching resumed in earnest with overgrazing taking its toll on much of the range by 1890 (Haskett 1935).

At the site of the future monument, the Stafford homestead lasted from 1880 to 1918. The ranching era continued into the 20th century when, in 1917, the pioneering Erickson family began to operate a guest ranch—the Faraway Ranch that sits at the west end of Bonita Canyon in the

Table III-1. Plant Community Classification at Chiricahua National Monument.

Roseberry and Dole (1939) Vegetation Map	
Grassland	Woodland
Sagebrush	Pinon-Juniper-Cypress
Transition chaparral	Douglas-fir
Semi-desert chaparral	Pine-Douglas-fir
Woodland chaparral	[Residential]
Woodland-grass	[Barren]

Vegetation Types Derived from Brown (1982) (Used in 1992 FMP.)		
Climatic Zone	**Biome**	**Community**
Temperate Forest	Montane Conifer Forest	Douglas-fir
		Pine
	Relict Conifer Forest	Arizona Cypress
	Riparian Deciduous Forest	Mixed Broadleaf
Temperate Woodland	Madrean Evergreen Woodland	Oak
		Mexican Oak-Pine
Temperate Scrubland	Interior Chaparral	Evergreen Sclerophyll
Temperate Grassland	Semi-desert Grassland	Mixed Grass-Shrub

NPS Resource Management Staff (Dennett et al. 1998) (Used as the basis for this FMP.)	
Pine with Mixed Conifer and Hardwoods	20% of overstory consisting of *Pinus arizonica [P. ponderosa var. arizonica], P. englemannii, or P. leiophylla*
Mixed Oak	at least 60% of the overstory comprised of oak
Manzanita Shrub Community	*Arctostaphylos pungens* predominant species
Mixed Grasses with Minor Shrub/Tree Component	predominantly grama grasses with <40% shrub cover

Laboratory of Tree Ring Research (Baisan and Morino 1999) (Used in fire history study.)	
Canyon Woodlands and Coniferous Forest	10-15% of park landscape
Piñon-Juniper-Cypress Woodlands and Forest	40%; chaparral understory in some places, high canopies and oak understory in other places
Transition Chaparral	15%; characterized by an abundance of manzanita, grasses, and bare ground
Grassland and Open Woodland	20%; cover predominately evergreen oaks, grasses, and manzanita

Alan Taylor (2000) (Used in landscape change study—see Chapter VII.)	
Grassland	grass abundant, shrub and tree cover <10%
Savanna	grass abundant, shrub and tree cover 10-25%
Savanna/Rocky	grass abundant, tree and shrub cover 10-25%, rock cover exceeds tree cover
Open Woodland	grass present, tree cover 25-60% but patchy and discontinuous
Open Woodland/Rocky	rock abundant on the ground surface, tree cover 20-60% but patchy and discontinuous
Closed Woodland	canopy continuous and overlapping, tree cover > 60%
Open Chaparral	shrub canopy patchy ad discontinuous, shrub cover 25-60%
Closed Chaparral	shrub canopy continuous and overlapping, shrub cover >60%
Residential	housing or land altered for human use

monument today. The house at Faraway was built in 1887. Besides the houses, features such as fences, fruit trees, windmills, dumps, and machinery are among the significant ranching-era relics. The Faraway Ranch and Stafford cabin are listed on the National Register of Historic Places as a historic district. The entire district includes eight ranch buildings and a cemetery.

A highlight of the "federal" era—the time since 1879 when the area came under the management of first the Forest Service, then the National Park Service—was the encampment of the Civilian Conservation Corps (CCC) in Bonita Canyon between 1934 and 1940. Today in the monument there are more than twenty buildings (including a fire lookout), trails, and support system units listed on historic registers that are the CCC legacy (Black and Neilsen 1999).

Human Application of Fire

There is no detailed, recorded use of fire as a tool in or near the monument. It is probable that prehistoric and historic native cultures of the Chiricahuas used it as noted elsewhere—for improving game range, clearing forest and brush, clearing fields, opening vistas, and improving feed for horses (Pyne 1982). However, Seklecki et al. (1996) found no conclusive evidence that periods of high fire frequency in Rustler Park, above the monument in the Chiricahua range, could be explained by Apache activities. There is some debate in the literature about how common Apache-set fires really were. Hastings and Turner (1965) reviewed 19th-century U.S. military accounts that recorded little use of fire; Dobyns (1981) suggests the military diarists were exactly the sort of people Apaches wanted to avoid, thus they would not set fires when troops were nearby. Dobyns bases his view that Apaches frequently set large fires in grasslands to drive game on earlier Spanish and Mexican accounts, and on early 20th-century ethnographers that interviewed Apaches about their former customs. The late 19th-century press in southern Arizona frequently attributed fires to Apaches but provided little documentation for such claims (Bahre 1991).

On modern ranches at the mouth of lower Bonita Canyon, fire is still routinely used to maintain pastures. Local ranchers commonly burn pastures on a rotation ranging from two to five years. Lower Bonita Canyon was homesteaded, farmed and grazed from about 1879 to 1960. Fire was used periodically during this time to clear fields and orchards, and to improve pastures. Historical photographs show fields and an open grassland/woodland in lower Bonita Canyon, which are now encroached by trees and shrubs. There was also a military encampment in lower Bonita Canyon during the campaign to capture Geronimo in 1886.

It will not be a goal of the monument's fire management program to replicate prehistoric or historic fire uses. This decision has been made in light of the evidence that fire appears to have had an incidental purpose prior to the 20th century and information is lacking for site-specific uses by indigenous peoples. The historical scene of the immediate surroundings of the ranch house will be maintained, and prescribed burning or mechanical means may be used for vegetation manipulation in this area.

Zone of Cooperation

No identified cultural resource sites lie on the Forest Service zone of cooperation, according to Coronado National Forest records in 2002. Subsequent cultural resources discovered in this zone

will be treated similarly as to those found within the monument; all policy, guidelines, and laws relevant to the resource will apply.

Table III-2. Madrean Wildlife Species of Interest to Visitors.

Common Name	Scientific Name	Recent Monument Studies
Reptiles		
mountain (Yarrow's) spiny lizard	*Sceloporus jarrovii*	
banded rock rattlesnake	*Crotalus lepidus klauberi*	Prival et al. 2000
Sonoran mountain kingsnake	*Lampropeltis pyromelana*	
Birds		
zone-tailed hawk	*Buteo albonotatus*	
thick-billed parrot	*Rhynchopsitta pachyrhyncha*	
Mexican spotted owl	*Strix lucida occidentalis*	
violet-crowned hummingbird*	*Amazilia violiceps*	
berylline hummingbird*	*A. beryllina*	
white-eared hummingbird*	*Hylocharis leucotis*	
blue-throated hummingbird	*Lampornis clemenciae*	
magnificent hummingbird	*Eugenes fulgens*	
Anna's hummingbird	*Calypte anna*	
black-chinned hummingbird	*Archilochus alexandri*	
broad-tailed hummingbird	*Selasphorus platycerus*	
rufous hummingbird	*Selasphorus rufus*	
elegant trogon	*Trogon elegans*	
eared trogon	*T. neoxenus*	
Arizona (Strickland's) woodpecker	*Picoides arizonae*	
bridled titmouse	*Baeolophus wollweberi*	
juniper titmouse	*B. ridgwayi*	
Mexican chickadee	*Poecile sclateri*	
Grace's warbler	*Dendroica graciae*	
olive warbler	*Peudedramus taeniatu*	
hepatic tanager	*Piranga flava*	
Mammals		
white-nosed coatimundi	*Nasua narica*	Koprowski 2001a
Chiricahua fox squirrel	*Sciurus nayaritensis chiricahuae*	Koprowski 2001b
javelina	*Pecari tajacu*	
* occasional Mexican visitor		

Historical Weather Analysis & Fire Season

Table III-3 presents annual average temperatures and precipitation for Chiricahua National Monument from the Headquarters weather station (NWS #021664) (Western Regional Climate Center 2001). Data have been compiled from 1909 through 2004. Temperatures are generally moderate with the average maximum at 90.5º F degrees in June and the average minimum at

29.7º in January. Summer temperatures can exceed 90 º (and even 100°) but not for extended periods, since the monsoons bring humidity and reduced temperatures. A RAWS (Remote Automated Weather Station) was added in 1995 (NWS #021409), and collects hourly data that is archived in WIMS.

Table III-3. 1909 to 2004 Summary of Annual Temperature and Precipitation. Readings were taken from the National Weather Service station at headquarters, elevation 5,407 feet (Western Regional Climate Center 2001 and CNM weather records 2003-2004).

	Average Air Temperature (°F)			**Average**
Month	**Maximum**	**Minimum**	**Mean**	**Precipitation (inches)**
January	56.1	29.7	42.9	1.45
February	59.1	30.8	45.0	1.21
March	64.7	34.2	49.5	1.18
April	72.8	39.4	56.1	0.51
May	81.2	46.0	63.6	0.33
June	90.5	55.2	72.9	0.84
July	89.1	59.9	74.5	3.98
August	86.2	58.8	72.5	4.16
September	83.5	54.9	69.2	1.76
October	75.1	45.9	60.5	1.22
November	64.2	35.7	50.0	1.05
December	56.7	30.2	43.5	1.61
Annual	73.3	43.4	58.4	19.30

Most precipitation falls during summer and winter. Annual precipitation averages 19.32 inches, with slightly over half of it falling as rain during the monsoon season from July through mid-September. “Monsoon” denotes the summer convective storm pattern that develops each year in response to orographic lifting of moisture-laden air that flows primarily from the Gulf of Mexico. Storms from late fall through early spring may leave up to a foot of snow, but it rarely lingers except on shaded northern aspects above 6,500 feet elevation. Winter months average less than 2 inches of precipitation, with November showing the least. Summer rainstorms can be quite heavy at times, releasing several of inches with one storm cycle and occasionally bringing flash floods. Prolonged strong winds occur during spring and as a precursor to summer storms.

Fire Season and Phenology

The Southern Arizona fire season runs from April into October. Two overlapping periods can be identified during the summer season; the "false monsoon" and the "true monsoon." Table III-4 illustrates how much the timing of the monsoon season onset shifts from year to year. The false monsoon season is the period of highest fire danger. Hot, dry surface winds create thermals and carry moisture that is beginning to flow aloft from the Gulf of Mexico to form weak storm cells over the mountains (Bock et al., 1976; Pyne 1984). Virga, high surface winds, and lightning are common occurrences, along with occasional ignitions from ground strikes. During the 1981 fire season, there were 15 ignitions with subsequent spreading fires that occurred in the Chiricahua Mountains during a four-day period in late June. Prolonged, strong winds occur in the monument during spring and summer.

Table III-4. Onset of monsoon season, 1981-2004. Onset is considered date of first rainfall with significant rainfall following. Average start date is June 22, with 9 years starting July 4 or later.

Year	Onset	Year	Onset	Year	Onset
2004	July 9	1996	June 22	1988	July 2
2003	July 17	1995	July 12	1987	June 4
2002	July 15	1994	July 17*	1986	May 31
2001	June 25	1993	July 9	1985	July 16
2000	June 17	1992	May 4	1984	June 18
1999	June 14	1991	June 1	1983	July 6
1998	July 3	1990	July 4	1982	July 1
1997	May 16	1989	July 10	1981	June 28
*This date marks the end of the 27,500-acre Rattlesnake fire in the central Chiricahua Mountains that was a June 28 lightning ignition.					

False monsoon fires are the most intense and typically have the highest spread rates. Fire occurrence peaks during a several-week period before the height of the monsoon in late July (Swetnam et al. 1989). In addition to high temperatures, low humidities, high winds, and dry lightning storms, vegetation factors contribute to the intensity of the initial fire season. The spring season at CNM is not green, but rather more typical of fall in areas outside the Southwest. The perennial, mainly warm-season grasses remain dry until July. Spring green-up of cool-season grasses is usually restricted to the valleys and riparian areas, and depends upon winter and early spring precipitation. Abundant dry grass fuels are a readily available, significant fuel. In addition, the oak species at CNM generally drop (and replace) their leaves during the spring dry period that occurs from late April through early July.

The second fire season begins with the "true monsoon" onset. Storms are usually well developed by the third week in July and occur almost daily throughout the Chiricahua Mountains. Green-up typically begins during the first fourteen days of the season. Although fuel moisture and burning indices are usually lower than in the first fire season, more fires occur in the second season because there are many more storms and, consequently, more lightning (Figure III-1). By August, when thunderstorm activity is often very high, soils and woody fuels at upper elevations are typically saturated with moisture and fire activity declines. When drier conditions return toward the end of September, few thunderstorms are occurring and fire activity remains low (Swetnam et al. 1989).

During the second season, fires typically occur in vegetation types that have minimal grass or herbaceous cover and where litter is the primary carrier of fire—the pine and oak vegetation communities. The manzanita and grass-scrub communities are usually very green in late July and August which sharply reduces the probability of a spreading fire. An exception was noticed in forested areas with significant amounts of *Muhlenbergia* as ground cover; the 1992 FMP states that *Muhlenbergia* will readily burn even when fully green in the peak of the growth season.

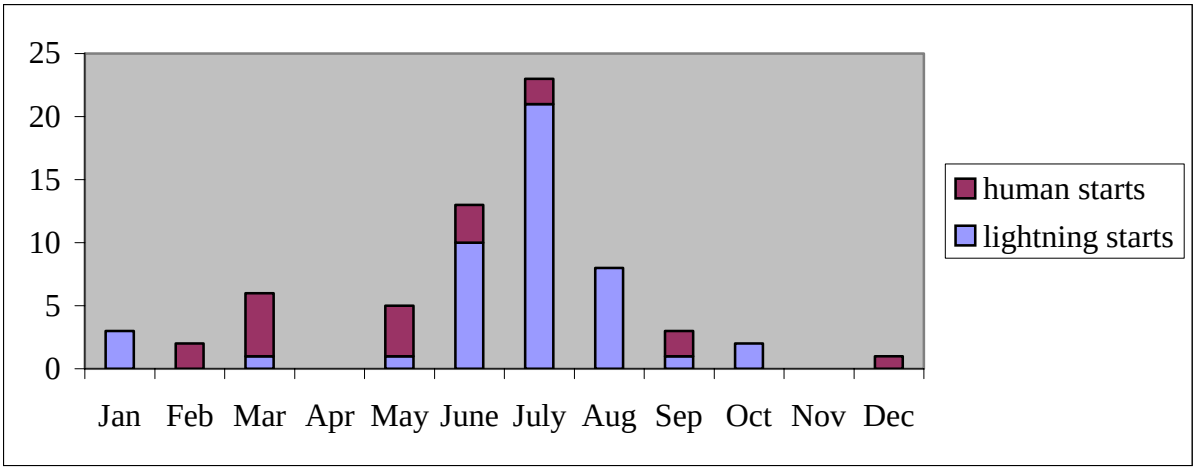

Figure III-1. Total Fire Starts by Month at Chiricahua National Monument (1924-2004). Prescribed burns are not included.

Historic Role of Fire in Park Ecosystems

Dendrochronological studies in Chiricahua National Monument have documented the historical presence of frequent fire. This section reviews those studies and then discusses fire ecology in the four structural vegetation types defined for fire management purposes.

Rhyolite Canyon Study

Swetnam et al. (1989) collected fire scar samples along the length of Rhyolite Canyon in "mixed conifer and oak woodland forest that is restricted to canyon bottom and north-facing slopes…" Rhyolite Canyon was chosen as the primary study site because it has high visitor use, facilities and residences are built in the mouth of the canyon, and some prescribed burning has been done to reduce hazardous fuels. Records were obtained from ponderosa pine in the higher reaches of the study area and Apache pine in the lower canyon. Arizona cypress, oaks, and Arizona madrone *(Arbutus arizonica)* also displayed fire scars.

Thirty-three samples from living and remnant material formed the basis for the Rhyolite Canyon record. Prior to 1801, fire-scarred trees recorded fairly regular canyon-wide events. With few exceptions, trees at the canyon mouth documented fires with the same frequency as those at the canyon head. The report stated that large fires burned through most or all of Rhyolite Canyon with a mean fire interval (MFI) of 14.6 years and a range of 9 to 22 years.

In general, for the period 1655 to 1801, the MFI estimates did not differ appreciably from the upper to the lower reaches of the canyon. After 1801, however, this pattern of episodic, canyon-wide fires changes dramatically. At this point, a 50-year gap in the fire record appeared in the upper and middle part of the canyon. Only a single fire in 1818 was recorded by one tree above Sarah Deming Canyon. Fires continued to burn in the lower canyon with a MFI similar to the period prior to 1801.

Disruption in fuel continuity likely explains the puzzling 50-year gap in the record during the early 1800s. The study proposes two mechanisms. First, researchers noticed flood-scarred trees and large debris flow berms. A flood may have deposited debris that created barriers to fire spread in several places in the canyon and scoured the creek bottom to such an extent that fuels were sparse. Second, human activities may have contributed to the lack of fires or to the increase in frequency after the 1801–1851 gap.

After 1851, fires again scarred trees in the upper and middle portions of the canyon until 1886 when the last widespread fire was recorded. The lower canyon during this period experienced a pronounced increase in fire frequency. Lower canyon trees recorded fires in 1852, 1856, 1859, 1867, 1873, and 1882 for a much reduced MFI of 6.0 years. Only the fire of 1873 appeared in samples in other areas of the canyon. After the late 1880s, only two fires were recorded anywhere in the drainage. The fire recorded in 1886 by trees in the mid-canyon groups may represent the fire mentioned in Roseberry and Dole (1939) that reportedly burned from the area of Sugarloaf Mountain south to Pinery Canyon.

For more than 50 percent of the fire scars, Swetnam et al. (1989) were able to determine the seasonal occurrence of past fires by identifying the position of the scar within the annual ring. Their results showed that 80 percent of the fires occurred within some portion of the earlywood, indicating that growing season fires occurring from May to August would be most typical of pre-settlement times. For example, the fires of 1685, 1707, 1765, and 1801 appeared to have occurred in May or June. The fires of 1738, 1789, 1851, 1867, and 1886 appeared to have occurred possibly as late as August or September.

Barton (1996) tested the hypotheses that (1) age structure of Arizona pine in Rhyolite Canyon should reflect the fire history and (2) fire events have positive impact on subsequent growth of trees. Stems dating from each decade corresponded with the fire history; periods of low fire frequency accounted for many stems, while high frequency periods showed fewer stems. Barton found results opposing the second prediction. Despite their ability to increase light, moisture, and nutrients, fires had negative effects on tree-ring widths. While some of the fire history research from the Chiricahua Mountains is based on small sample sizes, Barton’s study included 229 trees.

Inter-Canyon Fire Study

Kaib et al. (1996) constructed a fire history for Pine Canyon, just south of the monument, using fire-scarred Apache and Arizona pine logs and stumps in pine-oak forests adjacent to grasslands. They compared the Pine Canyon record with the Swetnam et al. (1989) Rhyolite Canyon results and the work of Seklecki et al. (1996) from Rustler Park at higher elevation east of the monument. The histories extended back to the mid-1600s; analysis covered 1700–1876.

The study found 21 out of 71 fires synchronous between Pine and Rhyolite canyons. Using fires recorded by at least 2 trees, a conservative estimate of inter-canyon fire frequency of 8 years was generated. Kaib et al. (1996) estimated individual canyon fire frequency at 4 years and suggested the grassland fire frequency is somewhere between 4 and 8 years. Sixteen of 90 fires were recorded in both canyons plus Rustler Park, higher in the Chiricahua Mountains. These events were considered larger-scale fires.

The authors propose that fires regularly spread into mountain canyons from adjacent grasslands. "Intercanyon synchronicity of fire dates would support this hypothesis and therefore historical fire frequencies in gallery forests provide a conservative (i.e. minimum) estimate of fire frequencies sustained in the lower semidesert grasslands." They argue that within the mountain ranges, topographic and vegetative barriers to fires discourage spreading between canyons.

Kaib et al. (1996) also reviewed historical accounts of fire in the region found in ethnographies, early government reports, and newspaper articles. Indian use of fire corresponded with periods of war that coincided with above average fire frequencies in the Chiricahuas for those times, but Seklecki et al. (1996), also from the tree-ring lab, could not "conclusively distinguish the Apache influence from other factors regulating fire regimes, especially climate."

Monument-Wide Fire History Study
Baisan and Morino (1999) looked at fire regimes across the monument, combining data from previous studies with new sampling. They reduced Roseberry and Dole's (1939) vegetation classes to four—canyon woodlands and coniferous forest, pinyon-juniper-cypress woodlands and forest, trans-chaparral, and grassland and open woodland (see Table III-1) New data came mainly from fire-scarred and charred remnant wood samples and border pinyon cores from trees in the vicinity of vegetation plots. They assumed that age of the oldest living members of this fire-sensitive species on a site represented the time since the last fire.

For canyon woodlands and coniferous forest, Baisan and Morino's results matched earlier work (Swetnam et al. 1989) that showed fire frequencies of 1–50 years. Broken down, the 62-tree dataset revealed an increasing average time between fires with increasing extent of fires:

- 13-year mean return interval (range = 1–31 yrs) for fires scarring ≥ 25% of sampled trees
- 21-year mean return interval (range = 9–53 yrs) for fires scarring ≥ 50% of sampled trees
- 39-year mean return interval (range = 27–53 yrs) for fires scarring ≥ 75% of sampled trees

Baisan and Morino estimated this vegetation class covered 10–15% of the monument.

Comprising roughly 40% of the monument, pinyon-juniper-cypress woodlands and forest type varies in composition such that woodland sites are often characterized by a chaparral understory, and canyon sites sometimes support high canopy cypress stands with oak understory. Fire-sensitive conifers were diagnostic for this mixed type, indicating stand-replacing fire regimes. Baisan and Morino found ample evidence, generally in the form of charred wood, of past but not recent fires. Pinyon-juniper-cypress data showed wide variation in tree age (mean = 190, s = 107, mode = 299, range = 61–419 yrs) and infrequent fire occurrence at irregular intervals. Frequency

was estimated from tree ages from 50s to 100s of years with a mean near 200 years. Oldest stands occupied patches surrounded by barren, rocky areas that may have hampered fire spread.

Transition chaparral plots contained 34% manzanita and other woody shrubs, 11% grasses, and 55% bare ground. Baisan and Morino estimated type coverage at 15% of the monument and found 25% of their plots showed direct evidence of fire. Tree ages within the chaparral ranged from 46 to 359 years with a mean of 130. Baisan and Morino speculate that much of this community burned in the big 1886 fire—roughly half of the cored pinyons were less than 110 years old. The grass may have carried fires from adjacent woodlands and forests into the chaparral. Fire-return intervals probably ranged from 30 to 80–90 years. Longer fire-free periods allowed succession to pinyon-juniper-cypress type (that converts to chaparral under a regime of frequent fires).

Tree-age data from grassland and open woodland imply fire-intolerant pinyon invaded over the last century. Mean tree age of 92 years suggests fires were frequent enough before the early 20th century to prevent establishment. Charred wood and fire-scarred oaks were found on 25% of plots in this vegetation type. Baisan and Morino cite the 8–15-year fire frequency generated by Kaib et al. (1996) and Kaib (1998) for this plant community.

Monument Records

Table III-5 summarizes the records on hand at the monument through 2004. Total suppression was the fire policy for the first five decades of the monument's history under both the USDA Forest Service and the National Park Service. The numbers in Table III-5 show that the prescribed fire program is responsible for most of the area burned over the period of record.

Table III-5. Chiricahua National Monument Fire Record Summary.

Year	Prescribed Fires		Human-caused Fires		Lightning-ignited Fires	
	Acres burned	# events	Acres burned	# events	Acres burned	# events
1924-1945					0.3	3
1946-1950			0.6	1	1.71	4
1951-1955					0.01	1
1956-1960			0.23	3	2.9	5
1961-1965			0.85	2	28	8
1966-1970			0.1	1	4.8	7
1971-1975			4.1	2	10.65	7
1976-1980	27	3	0.1	1	2.6	3
1981-1985	555	6			1	1
1986-1990	72.2	5			0.2	2
1991-1995	183.5	20	0.2	2	0.2	2
1996-2000	1603	16	241.4	5	1.7	3
2001	12	2	0.1	1	0.1	1
2002	535	2				
2003	1079	3				
2004	1081	3				
total	5147.7	60	247.68	18	54.17	47

Fire Ecology
The presence and importance of fire within woodland communities have been noted for decades (Leopold 1924; LeSueur 1945; Wallmo 1955; Marshall 1957, 1963; Niering and Lowe 1984). While surveying birds in the Mexican pine-oak woodlands, Marshall (1963) noticed that in Mexico, where fire suppression was minimal, the woodlands were open with a dense grass understory. Across the border in the United States where land managers suppressed fire, Marshall saw stunted woodlands with much accumulated fuel and little grass understory. Fires in this situation were often severe and killed most of the overstory trees and understory plants. Escobedo et al. (2001) documented heavier loadings of downed woody fuels on pine-oak forests sites in southeastern Arizona compared with northeastern Sonora.

Observations such as those made by Marshall led to the reversal of long-standing fire suppression policies within the NPS. Researchers have brought to light adaptations to fire in individual plant species, the role of fire in vegetation communities, and the fire history of particular places. The monument has been the site of several studies that provide information on the role of fire. The work of fire ecologists is the basis for many fire program goals.

Figure III-2 shows the distribution of the four monitoring types in the monument. Appendix B contains tables that summarize information from the literature about fire ecology and adaptations of the species that make up each type. The Coronado National Forest uses basically the same four types to describe vegetation in the area but maps at a coarser scale. The ZOC is shown on Figure III-2 as consisting primarily of mixed oaks.

Pine with Mixed Conifers and Hardwoods Community
Approximately 1,900 acres of this monitoring type is found in Rhyolite and Jesse James canyons and their tributaries and at the highest park elevations (Figure III-2). As described in Table 1 of Appendix B, the Arizona *(P. arizonica),* Apache (*P. engelmannii),* and Chihuahua (*P. leiophylla* var. *chihuahuana*) pines that are important components of this structural type are thick-barked, fire-tolerant species that will dominate with increasing fire frequency. Ponderosa pine also needs the kind of exposed, mineral seedbed that fire helps create for successful germination. As overstory trees and understory shrubs thin out, grasses and forbs move in and recreate what is thought to be a more historically natural scene. The forbs and grasses become the fine fuels that help carry frequent low-intensity fires; longtongue muhly *(Muhlenbergia longiligula),* bullgrass *(M. emersleyi),* and pinyon rice grass *(Piptochaetium fimbriatum)* are characteristic of this type. A recent USDA Forest Service review (Paysen et al. 2000) attributes the fire regime common to southwestern ponderosa pine “woodlands” to the early summer dry weather, the presence of grass and pine needles, and plentiful lightning. Under this regime, effects on trees might vary, but the pine overstory generally survives fires as whole trees. The monitoring type description (Dennett et al. 1998) includes a time since last burn of 9–21 years in the prescription for this type.

Other trees and shrubs associated with this monitoring type either resprout (oaks [*Quercus* spp.], silktassel [*Garrya wrightii*]) or are killed and reseed (Colorado pinyon, pointleaf manzanita [*Arctostaphylos pungens*]). Barton (1999) suggests that fire tolerance in pines versus sprouting in oaks might determine the relative success of the two groups in pine-oak woodlands; oaks would

be favored by infrequent or low-intensity fires, and pines by moderate-intensity or more frequent fires. Chihuahua pine, unlike the others, also has the ability to sprout after fire.

Mixed Oaks Community

Figure III-2 shows that oak woodlands grow on more than half the monument (7500 out of 12,000 acres). Emory oak (*Quercus emoryi*), Arizona white oak (*Quercus arizonica*), and silverleaf oak (*Quercus hypoleucoides*), the major species of this vegetation type, all resprout following topkill by fire, as outlined in Table 2 of Appendix B. Other species in this woodland mix include alligator juniper (*Juniperus deppeana*), Apache pine (*Pinus engelmannii*), netleaf

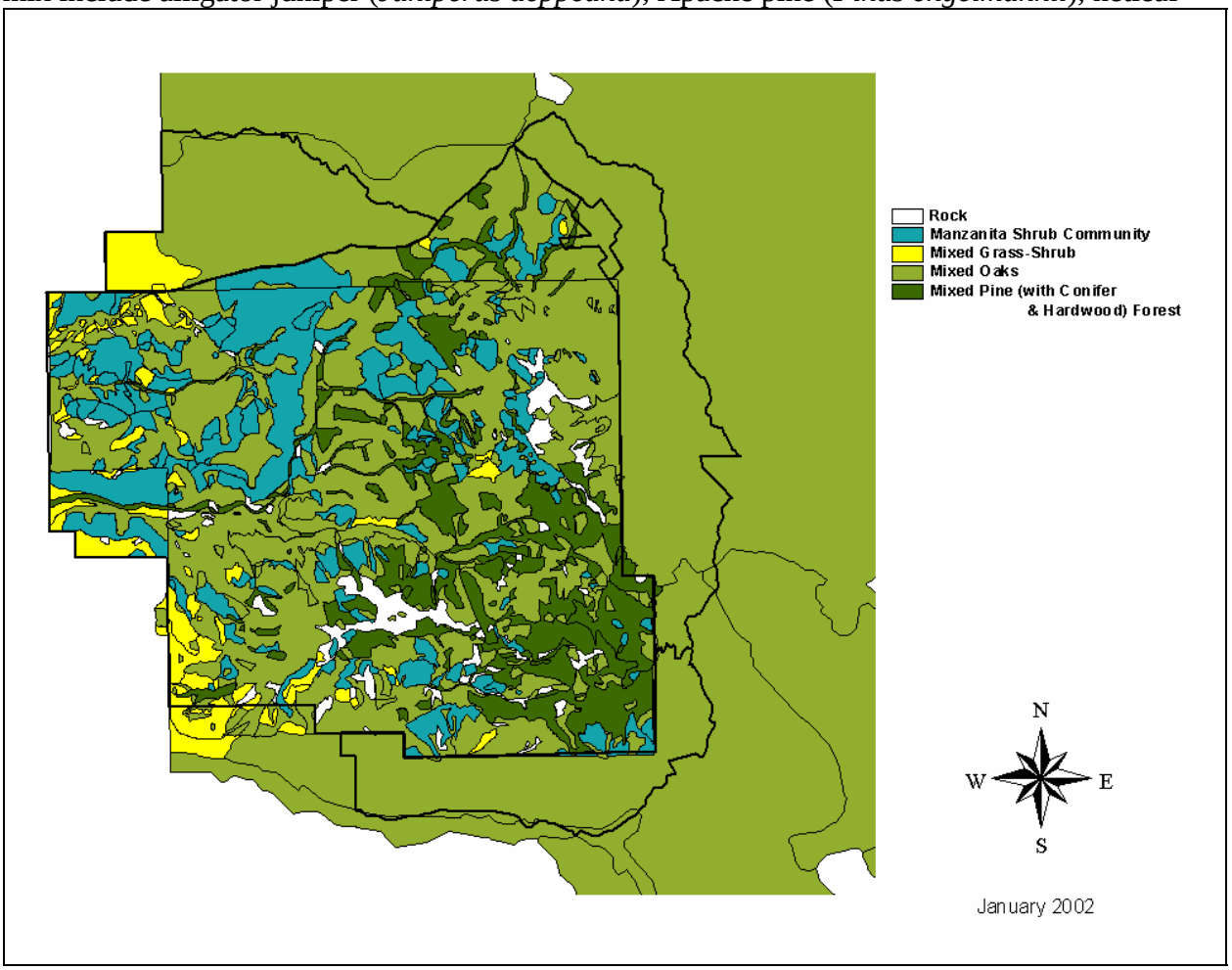

Figure III-2. Distribution of Vegetation Monitoring Types.

oak (*Quercus rugosa*), turbinella oak (*Quercus turbinella*), Arizona cypress (*Cupressus arizonica*), Gambel oak (*Quercus gambelii*), Toumey oak (*Quercus toumeyi*), and Chihuahua pine (*Pinus leiophylla* var. *chihuahuana*). Arizona cypress will not reproduce adequately in the absence of an exposed mineral soil seedbed, which fire helps to develop. In some locations a shrub layer covers up to 50% of the site. These may include pointleaf manzanita, catclaw (*Acacia greggii*), birchleaf buckthorn (*Rhamnus betulaefolia*), California buckthorn (*Rhamnus california* ssp. *ursina*), silktassel, and sumac (*Rhus* spp.). Scattered perennial bunchgrasses such as muhly grass (*Muhlenbergia* spp.) and pinyon ricegrass, as well as seasonal forbs compose the open herbaceous layer.

As in the predominantly pine-oak mixture described above, more frequent fire is thought to have kept oak woodlands more open, with fewer trees, more grass, and fewer shrubs in the understory. Abbott (1998) suggests a historical fire frequency in southeastern Arizona woodlands of minimally 10 to 30 years based on conservative frequencies established for neighboring coniferous forests and grasslands. The monument prescription for mixed oaks currently aims for 9–15 years between burns to open up stands.

Manzanita Shrub Community
Manzanita shrub community covers about 1600 acres scattered through the monument in a mosaic mixture with oak woodlands (Figure III-2). The dominant shrubs in this interior chaparral type have dense, compact crowns with small, thick, and stiff evergreen leaves. Shrubs resprout or regenerate from heat-triggered seed germination post-fire (Appendix B, Table 3; see also Wright and Bailey 1982). Species such as pointleaf manzanita, mountain mahogany *(Cercocarpus montanus),* and Wright's silktassel, become large in the absence of fire. High density-stands of manzanita and low-growing oaks are thought to result from normal ecological succession, and stand-replacing fires are to be expected. The monument prescription for this chaparral type includes a time since last burn of 20–50 years. These thick stands pose a problem for fire managers where residential areas, facilities, campgrounds, and interpretive and viewing areas were built in these vegetation types.

Mixed Grasses with Minor Shrub-Tree Component Community
At the lowest elevations in the park that lie along the western edge, the grass-scrub community occupies about 1000 acres. The area was grazed from the 1880s to 1960s and also subject to fire suppression, thus its original floristic composition is difficult to determine. Most researchers conclude grazing and lack of fire in semi-desert grasslands encourage shrubs at the expense of grass (Wright and Bailey 1982). Time since last burn for this type is 2–5 years in the monument prescription.

Table 4 in Appendix B reviews fire effects for the grass-shrub type. Blue grama (*Bouteloua gracilis*), hairy grama (*B. hirsuta*), slender grama (*B. repens*), sideoats grama (*B. curtipendula*), and purple grama (*B. radicosa*) are the chief native grasses. Other grasses include bullgrass, wolftail (*Lycurus phleoides*), and Texas beardgrass (*Schizachrium cirratum*). Shrubs and small trees may be present, including honey mesquite (*Prosopis glandulosa*), catclaw, yerba de pasmo (*Baccharis pteronioides*), silktassel, joint fir (*Ephedra trifurca*), sagebrush (*Ericameria laricifolia*), and threadleaf groundsel (*Senecio douglasii*).

Non-native Lehmann lovegrass *(Eragrostis lehmanniana)* makes up 20–25% of the cover in Chiricahua National Monument grasslands. It is an African perennial, warm-season bunchgrass that is drought- and fire-tolerant species and whose spread is difficult to control; the grass is mechanically removed around developed areas.

Vegetation Types and Fuel Characteristics
All four monitoring types described in detail in the Fire Ecology section above occur in both fire management units. Fire behavior as predicted by standard fuel models (Anderson 1981) is summarized in Table III-6.

Table III-6. Fuel Model Values for Estimating Fire Behavior in Vegetation Monitoring Types.

Fuel model	Monitoring type(s)	Total fuel load, < 3-in dead and live (tons/ac)	Dead fuel load, ¼-in (tons/ac)	Live fuel load, foliage (tons/ac)	Fuel bed depth (ft)	Rate of spread (chains/hr)	Flame length (ft)
1	mixed grasses with minor shrub-tree component	0.74	0.74	0	1.0	78	4
2	mixed grasses with minor shrub-tree component	4.0	2.0	0.5	1.0	35	6
5	manzanita shrub community	3.5 (5.42*)	1.0 (0.21*)	2.0 (20.04*)	2.0 (2.62*)	18	4
6	manzanita shrub community	6.0	1.5	0	2.5	32	6
8	mixed oaks	5.0 (3.66*)	1.5 (0.21*)	0 (2.49*)	0.2 (2.52*)	1.6	1.0
9	pine with mixed conifers and hardwoods	3.5 (6.3*)	2.9 (1.3*)	0	0.2 (0.125*)	7.5	2.6
10	pine with mixed conifers and hardwoods & mixed oaks	12.0	3.0	2.0	1.0	7.9	4.8

Model numbers and values come from Anderson (1982) or from fire effects monitoring plots at Chiricahua National Monument (*). Rate of spread and flame length for Anderson's models apply to situations where dead fuel moisture content is 8%, live fuel moisture content is 100%, and effective windspeed at midflame height is 5 mi/hr.

*NOTE: These Chiricahua numbers (Dennett 2001) for fuel models 5, 8, and 9 cannot be used with BEHAVE+ software to predict fire behavior characteristics listed above. Adjusted numbers are needed to derive rate of spread and flame length. Since these fuel models have not been fully tested through a large range of environmental conditions, they will not be used as a basis for making decisions. They will continue to be tested and adjusted until they can reasonably predict observed fire behavior.

Pine with Mixed Conifers and Hardwoods Community

Model 9: Forest with moderate litter and concentrations of dead-down woody materials. Little understory development in predomimantly pine stands. Litter is the primary carrier of fire.

Model 10: Forest with heavy dead-down material loading; live understory. Litter and grass are the primary carriers of fire. Shrubs and sapling trees act as ladder fuels.

Anticipated results (Dennett et al. 1998) from prescribed burning or wildland fire use in pines are:

1. Reduced live pole-sized tree density by 30 percent to 60 percent, five years post-burn.
2. Reduced dead and down fuel loadings (10, 100, 1,000 time lag fuel moisture size classes) by 40 percent to 60 percent, one year post-burn.
3. Reduced live overstory tree density by 5 percent to 20 percent, five years post-burn.
4. Reduced manzanita cover by more than 40 percent, five years post-burn.
5. Reduced litter fuel loadings by 40 percent to 60 percent, immediate post-burn.
6. Increased cover of native grasses and forbs by 10 percent to 30 percent, two years post-burn.

Mixed Oaks Community
Model 8: Forest with light litter and little understory. Litter and grass are primary carriers of fire.
Model 10: Forest with heavy dead-down material loads; live understory. Litter and grass are primary carriers of fire. Shrubs and sapling trees act as ladder fuels.

Anticipated results (Dennett et al. 1998) from prescribed burning or wildland fire use in mixed oak are:
1. Reduced live pole-sized (<6" DBH) tree density by 30 percent to 50 percent, five years post-burn.
2. Reduced live overstory (>6" DBH) tree density by 10 percent to 30 percent, five years post-burn.
3. Increased native perennial grass and forb cover by 10 percent to 30 percent, two years post-burn.
4. Reduced manzanita cover by more than 40 percent, five years post-burn.
5. Reduced dead and down fuel loadings (1, 10, 100, 1,000 time lag fuel moisture size classes) by 40 percent to 60 percent, immediate post-burn.
6. Maintained non-native plant species to less than 10 percent of cover composition, five years post-burn.
7. Reduced litter fuel loadings 10 percent to 50 percent, immediate post-burn.

Manzanita Shrub Community
Model 5: Younger green stands with little dead material; live understory, but sparse. Discontinuous fuel bed that hinders spread.
Model 6: Older shrubs with flammable foliage; moderate dead material and litter. Grass present between shrubs to create continuous fuel bed under optimum environmental conditions.

Anticipated results (Dennett et al. 1998) from prescribed burning or wildland fire use in manzanita are:
1. Reduced shrub cover by 30 percent to 50 percent, immediate post-burn.
2. Maintained shrub cover at less than 50 percent, five years post-burn.
3. Increased native grass and forb cover by 10 percent to 30 percent where they occur, five years post-burn.

Mixed Grasses with Minor Shrub-Tree Component Community
Model 1: Fine, curing or cured, herbaceous fuels; no overstory trees or shrubs.
Model 2: Fine herbaceous fuels, curing or dead, with sparse clumps of shrubs or trees.

Anticipated results (Dennett et al. 1998) from prescribed burning or wildland fire use in mixed grasses are:

1. Increased native grass and forb cover by 10 percent to 30 percent, two years post-burn.
2. Maintained non-native plant species at less than 10 percent of cover composition, five years post-burn.
3. Reduced density of woody invasive species by 10 percent to 30 percent, five years post-burn.

Dennett (2001) customized models (see Table III-6) for mixed oaks and manzanita shrub communities that cover most of the monument after existing models poorly predicted fire behavior. At CNM, discontinuous fuel beds and non-homogeneous fuels confound the models that were developed under conditions of uniformity. The presence of rocks throughout all fuel types at the monument slows spread and shortens flame lengths relative to predictions for uninterrupted stands of vegetation.

Fuel Challenges

The rugged terrain at CNM and wilderness designation of most of the monument limit access and fire management options in many areas. The monument's pinnacles are obstacles to humans but are not an effective barrier to fire spread under extreme conditions. Loose soils and rock further complicate operations on the ground. Added to these basic conditions are a number of fuel challenges:

- *Low live-fuel moisture:* Low live-fuel moisture in some oaks, pines, and manzanita encourages torching and extended runs in crowns.
- *Lehmann lovegrass:* Introduced Lehmann lovegrass burns with higher intensity, with longer flame lengths and with faster spread rates than native grasses. It inflicts three times the *Agave palmeri* mortality as compared to fires in predominantly native stands; the agave is a food plant for the endangered lesser long-nosed bat.
- *Ladder fuels:* Vertical fuels arrangement in oak woodlands aids spread of wildfire and facilitates transition from surface fire to crown fire.
- *Rolling sotols:* Sotol *(Dasylirion wheeleri)* stalks ignite, foliage burns, and the "head" detaches and rolls down hill, spreading fire. Sotols also have high residence time.
- *Brush fields:* It can be difficult to get through the brush to burning oaks and manzanita; both access and egress are problems. Waxy manzanita embers hold heat for a long time and increase spotting distance.

Fire Management Units

Figure III-3 is a map delineating the two fire management units and zone of cooperation. A very small FMU 1 ("Corridor") uses suppression and prescribed fire for protection of the developed area of the monument. The other FMU allows suppression, prescribed fire, and wildland fire use for resource benefits. FMU 2 ("Backcountry") encompasses the wilderness portion of the park, plus about 6 miles of non-wilderness road right-of-way. Thanks to good relationships with the Forest Service and neighboring private landowners, CNM can apply wildland fire use along the monument perimeter and allow fires to cross boundaries into the ZOC when appropriate. The ZOC is not designated as wilderness; the CNF Chiricahua Wilderness lies south of the monument and ZOC.

Descriptions of special treatment subunits appear at the end of the FMU descriptions. These areas are defined to ensure that sensitive species, cultural resources, and other unique features are protected from harm by fire program activities.

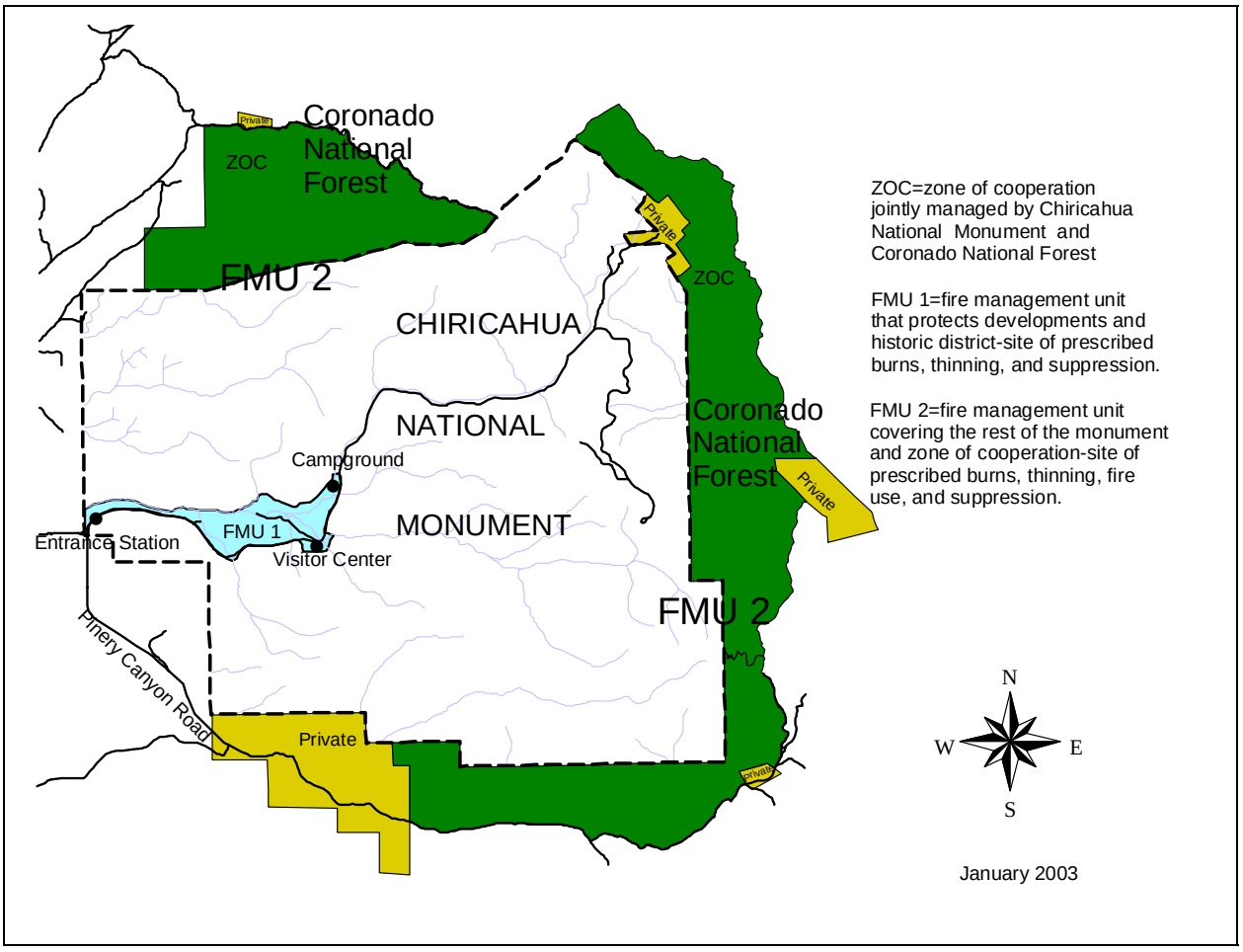

Figure III-3. Fire Management Units at Chiricahua National Monument.

FMU 1 (Corridor)

The FMU 1 boundary circumscribes a corridor (see Figure III-4) containing almost all park developed areas from the entrance station to the campground, including the Faraway Ranch Historic District (eligible for listing on the National Register of Historic Places), Headquarters area (Visitor Center, housing, and maintenance yard), and the new headquarters (former Superintendent's house). The western edge of the FMU abuts private land.

Boundaries

FMU 1 sits in the gently sloping bottom of Bonita Canyon; the western edge lies at 5140 ft elevation and the eastern at 5360 ft. As shown on Figure III-4, Bonita Creek forms the northern boundary of the corridor FMU from the western limit (Entrance Station) of the monument to the Superintendent's house. The FMU border then follows the contour line at 5360 ft to the northernmost point of the campground and turns south onto Bonita Canyon Drive. It loops

around the visitor center parking lot to the outside edge of the hazard fuel break around the housing area, then connects back into Bonita Canyon Drive (Figure V-2). The boundary continues along the road to the boneyard (maintenance storage yard), swings around the perimeter of the boneyard, and follows Bonita Canyon Drive down to the Entrance Station.

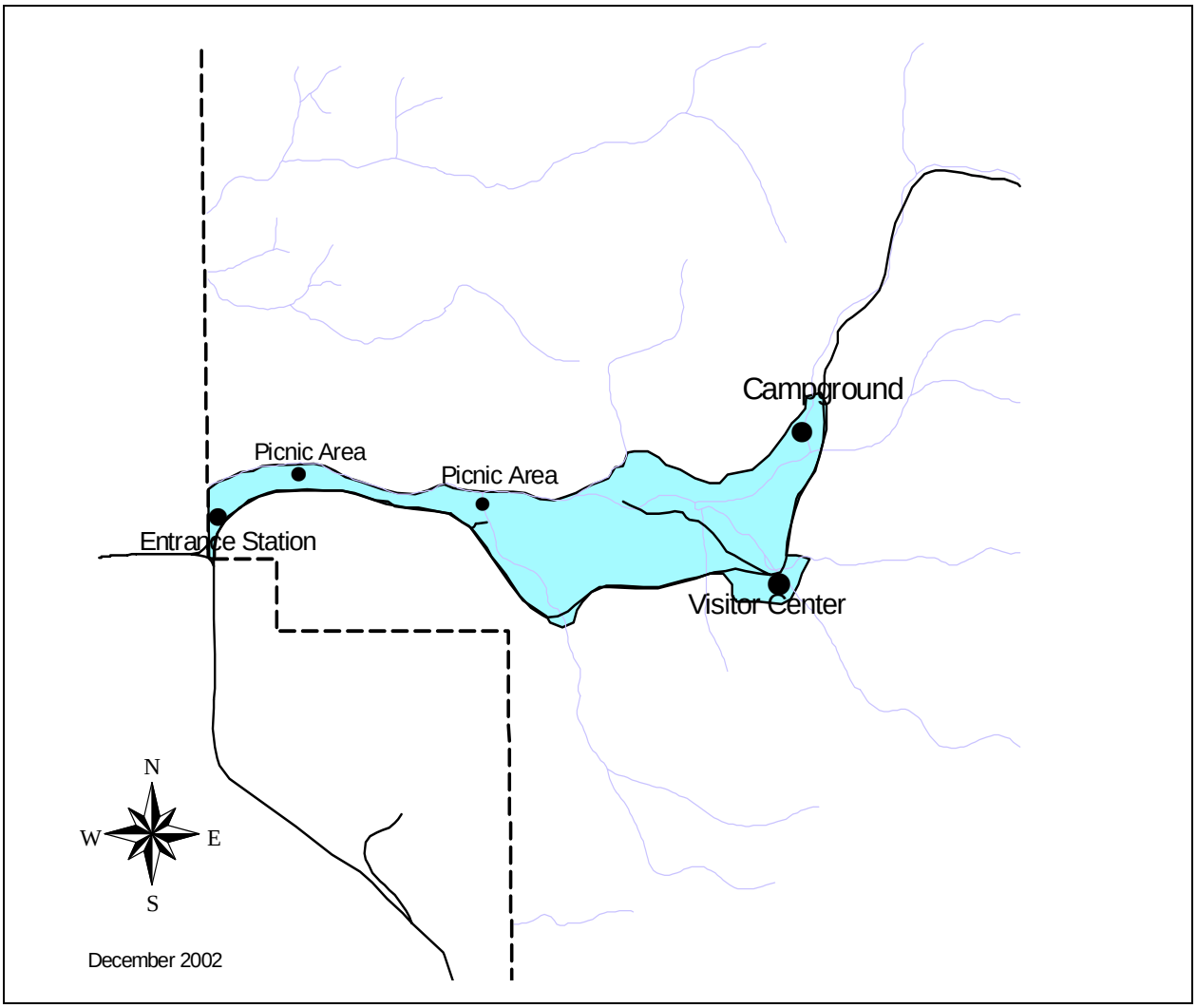

Figure III-4. Detailed View of FMU 1 (Corridor).

Access

The FMU 1 corridor allows easy access for fire operations in most areas due to the presence of Bonita Canyon Drive, parking lots, roads and open spaces in the Faraway Historic District, and roads to the new Headquarters building, housing area, and campground (see Figure III-4). Less accessible is the stretch between the new Headquarters building and the campground, which can be reached by trail. Gentle slopes ease all foot access in this FMU.

In addition to satisfying overall program goals and objectives defined at the beginning of this chapter, operations objectives in the corridor FMU are:

- Prevent wildland fires from spreading to adjacent private lands or sensitive cultural or natural resource areas.

- Conduct prescribed burns within the unit, following all federal, state, tribal, and local smoke management guidelines.
- Ensure that minimum required equipment and qualified staff for suppression are available and operable at all times during very high and extreme fire danger periods.
- Follow the 10 Standard Fire Orders and 18 Watch-Out Situations.
- Have an approved monument evacuation procedure in place.
- Ensure that staff is trained in wildland fire operations and understand current wildland fire policies.

Management Considerations:
This area of the monument contains key cultural and natural resources as well as structures and other developments. Fire operations in FMU 1 must first protect these values that are intrinsic to the existence and functioning of the monument.

Cultural resources requiring protection:
- the entire area of the Faraway Historic District including all structures and artifacts
- CCC camp area, chimneys, and artifacts at and in the immediate vicinity of Silver Spur meadow
- Bonita Campground and its CCC structures
- Historic road and trails

Natural resources requiring protection:
- Mexican spotted owl *(Strix occidentalis lucida)* foraging area within the Bonita Campground (federally listed as threatened)
- four populations of the orchid *Hexalectris warnockii* (Arizona "highly safeguarded" protected native plant)
- Silver Spur Meadow and Silver Spur Spring

Developments Requiring Protection:
- entrance station building
- air quality station just north of the entrance station
- new Headquarters building and outbuildings
- boneyard
- visitor center
- housing area with 10 residences, private vehicles, and personal property
- maintenance yard with buildings, equipment, and vehicles
- Bonita Campground

Constraints within FMU 1:
The following factors could affect fire operations in FMU 1:
- Class I airshed restrictions
- High visitor use
- Concerns of adjacent private and federal land holders
- Access and egress problems relative to the dead-end road, rough terrain, and dense vegetation
- Concerns about altering the cultural landscape

- Potential harm to Silver Spur Spring
- Negative public opinion relative to prescribed burns

Treatment subunits within FMU 1:
Faraway Ranch District. Cultural landscape restoration requires mechanical reduction of juniper in the east meadow. Fuels will be reduced around buildings to minimize potential for loss.

Lehmann Lovegrass Meadow. Eradicating Lehmann lovegrass is desirable, but research is needed into effective treatments. A goal for the mixed grass-shrub vegetation type is to restrict non-native plant species to less than 10% of cover composition, five years postburn. Manual, herbicidal, or mechanical removal will be used, if necessary, to achieve desired levels. Treatment of lehmann lovegrass in these manners is consistent with the monument's Resource Management Plan.

Fuel Breaks. Around the headquarters area and campground, 100% of manzanita within 4 chains will be removed. Crews will selectively thin pole-sized trees to reduce vertical and horizontal continuity.

Fire Regime Alteration (Condition Classes). All of FMU 1 has been evaluated as Condition Class 2, moderately out of line with the historic fire regime. Long-term plans for restoration of historically observed fire regime in the grass-shrub type will depend on the outcome of work on Lehmann lovegrass.

FMU 2 (Backcountry)
Fire Management Unit 2 (backcountry and Forest Service zone of cooperation) consists of all areas of the park not included in the FMU 1 canyon-bottom corridor (Figure III-5). The ZOC boundary with Forest Service on the north, east, and south sides and actual monument boundary on the west serve as the outside limit to FMU 2. Figure III-5 shows FMU 2 boundaries and topographic features. Elevation ranges from 5,140 to 7,825 ft. This backcountry FMU contains all the monument's wilderness. Canyons trend predominately east-west, with slopes ranging from zero to vertical cliffs.

Access
As shown on Figure III-5, Bonita Canyon Drive, the main monument road, cuts through FMU 2. The King of Lead Mine Road provides access to the northeast portion of the monument, West Whitetail Canyon Road serves the northwest corner, North Fork Road serves the east boundary, and Pinery Canyon Road is the south boundary of the ZOC. Otherwise, access is mainly by foot, either on the 18 miles of trail or cross-country (off trails).

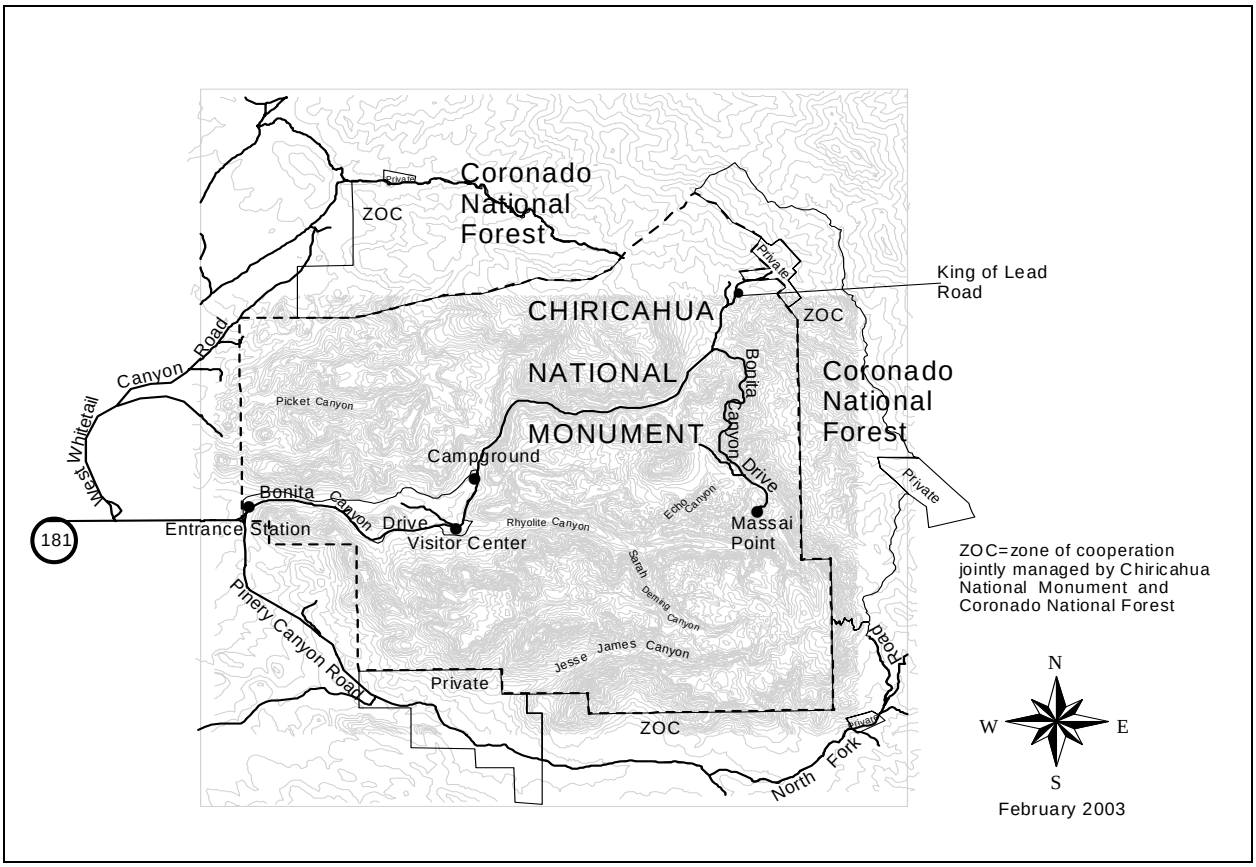

Figure III-5. FMU 2 Features.

FMU 2 Management Objectives and Strategies

In addition to satisfying overall program goals and objectives defined in Chapter II, fire operations in FMU 2 will:

- Prevent wildland fires from spreading to adjacent lands, FMU 1, or sensitive cultural or natural resource areas.
- Manage fires in accordance with the minimum-impact requirement of The Wilderness Act.
- Conduct prescribed burns within the unit, following all federal, state, tribal, and local smoke management guidelines.
- Ensure that minimum required equipment and qualified staff for suppression are available and operable at all times during very high and extreme fire danger periods.
- Follow the 10 Standard Fire Orders and 18 Watch-Out Situations.
- Have an approved monument evacuation procedure in place.

Management Considerations:

The backcountry FMU contains the bulk of the pinnacles which led to the creation of the monument as well as other notable cultural and natural resources requiring protection. Fewer developments are present than in FMU 1. The majority of this area is designated as wilderness.

Cultural resources requiring protection:

- Apache and pre-Apache work sites
- Apache pictograph rock shelters

- Speaker's Rock at Massai Point
- Old mining cabin just below King of Lead Mine
- Ammunition shed
- Historic road and trails
- Mary Bridger's grave
- Bonita Park Girl Scout camp
- Telephone poles
- Metal and clay water pipes
- CCC-era artifacts
- Unnamed mining camp in Bonita Park

Natural resources requiring protection:
- Mexican spotted owl habitat (2 protected activity centers [PACs])
- *Agave palmeri,* food source for federally listed (endangered) lesser long-nosed bat *(Leptonycteris curasoae yerbabuenae)*
- Chiricahua rock daisy *(Perityle cochisensis)* on moist, north-facing cliffs between 5,500 and 7,000 ft elevation
- Watershed integrity and features such as springs, including Shake and Headquarters springs
- Rock pinnacles

Zone of cooperation resources requiring protection:
The Coronado National Forest identifies no specific resources needing special consideration in the zone. Grazing permittees warrant maximum advance notice of prescribed burns and are required to let burn areas rest for two years. Hunters are in the area year round and also need to be notified of fire operations.

Constraints within FMU 2:
The following factors could affect fire operations in FMU 1:
- Class I Airshed restrictions.
- High visitor use.
- Concerns of adjacent private and federal landholders.
- Access and egress problems relative to the dead-end road.
- Concerns about altering the cultural landscape.
- Potential detrimental effects to Shake and Headquarters springs.
- Protection of relict stands of Arizona cypress *(Cupressus arizonica).*
- Negative public opinion relative to prescribed fire or letting fires burn within the monument.

Treatment subunits within FMU 2:
Backcountry treatment subunits are designed to look after the interests of the two federally listed species: (1) the threatened Mexican spotted owl and (2) the endangered lesser long-nosed bat.

MSO-PAC subtreatments. Two Mexican spotted owl (MSO) protected activity centers (PACs) totaling 1200 acres in size lie in the backcountry FMU. Two other PACs are located just beyond the zone of cooperation on Forest Service land.

Goals:

- Limit disturbance and risk to MSO and MSO PACs: (1) conduct low-intensity burning of surface fuels to reduce risk of catastrophic fire; (2) conduct treatments during the non-breeding season (September 1-February 28) when possible.
- Maintain and enhance habitat through use of prescribed fire: (1) vary management prescriptions to attempt to mimic natural disturbance patterns; (2) maintain all species of native vegetation in the landscape, including early seral species; (3) allow natural gap processes to occur, thus producing horizontal variation in stand structure; (4) retain large oaks and promote the growth of additional large oaks and pines.

Objectives:
- In 100-acre PAC core areas, retain overstory trees over 24-in diameter.
- In the 500 acre outside the PAC core area, thin overstory trees over 9-in diameter by 10-20%.
- Retain 50-80% downed logs greater than 16-inch midpoint diameter.
- Increase percent cover of grasses and forbs by 30-50% 1 year post-burn.
- Aim for other conditions for pine-oak forests described in the MSO Recovery Plan (USDI Fish and Wildlife Service 1995, volume 1 p. 55 to 56).

Strategies:
- Use small-scale ignition to minimize smoke impact to MSO.
- Ensure that transport winds are sufficient to maximize dispersion away from MSO PACs.
- Conduct operations under a prescription for a low-intensity burn.
- Prohibit aircraft flight over MSO PACs at under 500 ft AGL (FAA regulations) except in life-threatening emergencies.
-

Prescription for PACs:

Parameter	Range
Temperature	50-85º F
RH	20-48%
Wind	< 5 mph
1-hr TLFM	>5 %
10-hr TLFM	>6 %
100-hr TLFM	>10 %
1000-hr TLFM	>15 %
Live fuel moisture	100-200%

Monitoring:
- NPS Fire Monitoring Handbook (FMH) fire effects monitoring plots
- MSO microhabitat plots—vegetation
- MSO surveys on an annual basis in accordance with the MSO Recovery Plan
- Surveys of small mammals

Lesser Long-nosed Bat Foraging Area Subtreatments. Four main bat foraging areas have been identified: (1) 500 acres in the SW corner of monument, (2) 100 acres in the entrance station meadow, (3) 800 acres in the NW, (4) 800 acres at the mouths of Picket & Little Picket Canyon.

Goals:

- Reintroduce fire into the system via prescribed fire and fire use.
- Maintain or increase *Agave palmeri* populations in the monument, the primary late-season food source for the endangered lesser long-nosed bat.

Objectives:

- Limit mortality of *Agave palmeri* to less than 20% of populations existing within burn units.
- Limit postfire increase of non-native plants, especially Lehmann lovegrass, to less than 5 % of species composition.
- Reburn areas after at least 5 years.
- Burn outside the bolting season (July-August).
- Minimize handline construction through dense agave populations.
- Monitor postfire agave survival.

Prescription:

Parameter	Range
Temperature	60-90ºF
RH	15-50%
Wind	< 8 mph
1-hr TLFM	>3%
10-hr TLFM	>4 %
100-hr TLFM	>7 %
1000-hr TLFM	>10 %
Live fuel moisture	60-200%

Monitoring:

- Agave monitoring plots
- Bat surveys
- Recheck probable roost sites in and around the monument
- FMH fire effects monitoring plots

There is a transitory lesser long-nosed bat night roost just beyond the ZOC in the old Kasper Mine Tunnel (T16S, R30E, Sec. 33) approximately 1 mile east of monument-forest border, just beyond the ZOC. More than 1000 bats are known to use this roost. Recent monitoring by the Forest Service shows night use, though day use is also likely.

Fire Regime Alteration (Condition classes):
No data have been gathered to determine the condition classes of historic fire regime groups. In general, the monument plant communities are considered to be in Condition Class II, a moderate departure from historic regimes that may pose a moderate risk of loss of key components. More work needs to be completed on condition classes in the monument in accordance with the *Fire Regime Condition Class Handbook.*

Chapter IV
Wildland Fire Management Program Components

The strategies introduced in Chapter III each receive detailed treatment here—wildland fire suppression, wildland fire use, prescribed fire, and non-fire treatments. The fire management goals and objectives presented in Chapter III guide employment of these strategies at Chiricahua National Monument; protection of life and property remains the highest priority through all activities.

Over the long term, the monument intends to continue suppression, prescribed fire, and non-fire treatments in FMU 1 because of cultural resource and visitor protection concerns. It is hoped that after several decades of an active prescribed fire program, FMU 2 should be ready for only wildland fire use to maintain vegetation. Such a shift toward a natural fire regime relies on a political climate that allows fires to freely cross jurisdictional boundaries.

General Implementation Procedures

The NPS is transitioning from fire control toward fire management. As stated in RM-18, Chapter 9 (Exhibit 5):

> The objective of putting a fire 'dead-out' by a certain time has been replaced by the need to make unique decisions for each fire start, to consider the land and resource objectives, and to decide the appropriate management response and tactics which result in minimum costs and resource damage. Preplanned decisions based on historical fire behavior drive management of ignitions in the monument.

A *Wildland Fire Implementation Plan* (WFIP) will be initiated for all wildland fires. The Chief of Resources Management/Fire Management Officer will complete the *Stage I: Initial Fire Assessment* that guides selection of the appropriate management response. Operational management decisions are described in the WFIP. Specific WFIP requirements are outlined in Chapter 4 of the Wildland and Prescribed Fire Management Policy Implementation Procedures Reference Guide.

The Stage 1 Initial Fire Assessment includes the Fire Situation and the Decision Criteria Checklist. Programmatic decision criteria for each FMU are listed in Chapter III. In FMU 1, where suppression is the only appropriate response, the requirement for a decision checklist as part of the Stage I analysis is considered to be met. In FMU 2, where the full range of responses is available, a Decision Criteria Checklist must be completed. The Stage 1 analysis documents the current and predicted situation plus all appropriate administrative information, and aids managers by providing them with criteria for making the initial decision whether to manage a fire for resource benefits or suppress with appropriate management action. Preplanned decisions based on historical fire behavior indices should be considered to most efficiently aid in Stage I decisions requiring appropriate management response.

Wildland Fire Suppression

Automatic suppression applies to fires in the corridor FMU (1), human-caused fires, or natural ignitions failing to qualify for wildland fire use. These fires will receive prompt, safe suppression

actions that minimize resource damage and suppression costs. Under an appropriate management response, changes in fire perimeter may be allowed to protect firefighter safety and take advantage of natural barriers or other advantageous site conditions.

Range of Potential Fire Behavior
Potential fire behavior in Chiricahua NM can range from a creeping surface fire, with flame lengths of less than half a foot and spread rates of .1 chains/hour, to a sustained crown fire, with flame lengths in excess of 100 feet and spread rates of 400 chains/hour, depending on fuel type. Fire behavior is directly influenced by season, weather, fuel characteristics, and topography; fires burning during the monsoon rains tend to burn more slowly and with less intensity than fires burning before the monsoon season or in the late Fall. Seasonal curing as related to fuel moisture and fuel arrangement play critical roles in determining potential fire behavior in all vegetation types.

Preparedness Actions
The *Fire Preparedness Plan* is the master guide to annual fire management activities. CNM fire staff puts together the document each year before the fire season begins, which details the operations introduced in this plan. Table IV-1 lists the contents of the 2005 Fire Preparedness Plan. Preparedness actions include fire prevention activities, community education, the annual training needs assessment, fire readiness, fire weather and fire danger assessments, index-trend monitoring, step-up staffing, and pre-attack planning.

Table IV-1. Annual Preparedness Plan Contents. The 2005 plan contained the elements below.

Permanent and seasonal staffing; Fire org. chart	Guidelines for evacuations and closures
Southwest Area preparedness levels	Readiness checklist
Step-up Plan	Conversion to wildland fire procedures
Cache management	Accident reporting procedures
Equipment needs and replacement schedule	Pre-attack planning
Training and qualifications	Red tag system for unsafe/damaged equipment
Pre-season risk analysis	Lookout protocol
Fire weather procedures	Delegation of authority (form)
Dispatch plan	Detection procedures
Initial attack procedures	Agreements with other agencies
Maps—ICP/Base-camp and staging areas, roads and trails, utilities, communications, sanitary facilities, maintenance facilities, helispot/helibase locations, water sources, control line locations, natural barriers, safety zones, hazard locations, sensitive species locations, cultural resources locations, special visitor use areas	

Prevention Activities and Community Education
Prevention is a monument-wide responsibility carried out by all divisions and personnel. The prevention program consists of a combination of public education, regulations enforcement, safety inspections, hazard fuel reduction, and related maintenance activities. Since the possibility of a fire spreading onto the monument from surrounding lands exists (and vice versa), close cooperation with Coronado National Forest and private landowners will be an integral part of the prevention effort.

Table IV-2 lists prevention actions to be taken by park staff. The Superintendent will authorize any needed restrictions; restriction information will be posted prominently and sent out in press releases, when necessary.

Table IV-2. Prevention Tasks and Responsibilities.

Task	Responsibility
Use and update the visitor center and entrance station fire danger indicators on a daily basis.	Interpretive and Entrance Station Rangers
Include a fire prevention message in all evening programs.	Interpretive Ranger
During periods of very high to extreme danger, employees communicate directly with individual park visitors regarding the fire danger at the entrance station, visitor center, and campground.	Entrance Station Ranger, Interpretive Ranger, and Campground Hosts
Conduct fire prevention patrols to ensure compliance with restrictions and regulations.	fire crew
Post fire warning signs at all trailheads during periods of very high to extreme fire danger.	fire crew
Post NO FIREWORKS signs at the entrance station July 1-6.	fire crew
Prepare news releases for local media during extended periods of very high to extreme fire danger.	Interpretive Ranger
Empty campground fire grills and ash buckets weekly between April 1 and October 15.	Maintenance
Plan and implement hazard fuel reduction program; maintain and strengthen fuel reduction zones around structures.	Chief of Resources Management/Fire Management Officer + fire crew
Conduct annual fire safety inspections for all structures.	fire crew
Equip all government vehicles with a fire extinguisher; during the fire season, equip designated vehicles with fire tools.	fire crew
Impose emergency restrictions on campground fires and backcountry trail use during periods of extreme fire danger, if necessary.	Chief Resources Management/Fire Management Officer
Design interpretive display for the visitor center that emphasizes fire prevention activities	Interpretive Ranger
Conduct community outreach concerning fire prevention when necessary. Speak at schools and community centers in southeast Arizona.	Interpretive Ranger

Lookouts

Sugarloaf Lookout is staffed during periods of high or greater fire danger (Table IV-3; class III) 7 days/week, 10 hours/day. It sits at 7,310 ft elevation and affords a good view of the monument and surrounding Forest Service, private, and BLM lands, though there are blind spots behind ridges. Sugarloaf Lookout is also staffed during and after lightning activity periods. Parts of the

monument are also visible from two Forest Service lookouts. Barfoot Lookout is located closest to the monument and has adequate to good visibility of most of CNM. At present Forest Service funding levels, it operates with volunteer staffing. The Monte Vista Lookout is further south with marginal visibility of the monument. Present funding levels provide staffing at least five days per week during the fire season. All three lookouts work collaboratively to pinpoint fires starting in the northern Chiricahuas.

Table IV-3(a,b,c). Step-up Plan. Levels of preparedness are progressive and include actions established at the lower levels. Fire danger indices are calculated, and using an Adjective Rating Matrix with ERC, BI, and Ignition Component as inputs, a fire danger rating adjective is generated and communicated daily to the Entrance Station and Visitor Center rangers. Appropriate prevention activities take place in accordance with the current fire danger level.

Table IV-3(a) BI-Fire Danger Relationship
Table is based on 1995-2003 data (that reflect drought conditions).

Staffing Class/BI/ERC					
1 BI=0-10 ERC=0-4	Low	Low	Low	Moderate	Moderate
2 BI=11-24 ERC=5-11	Low	Moderate	Moderate	Moderate	High
3 BI=25-42 ERC=12-21	Moderate	Moderate	High	High	Very High
4 BI=43-51 ERC=22-24	Moderate	High	Very High	Very High	Extreme
5 BI=52+ ERC=25+	High	Very High	Very High	Extreme	Extreme
Ignition Component	0-19	20-38	39-76	77-87	88+

Table IV-3(b) Step-Up Plan
Note: Next higher class adds to previous class' actions.

Class I, BI 0-10 ERC 0-4 (*Funding source*: Park's preparedness account 8620-P11)	1. Two initial attack personnel available. 2. Normal tours of duty 0800-1700. 3. Engine available for out of monument response.
Class II, BI 11-24 ERC 5-11 (*Funding source*: Park's preparedness account 8620-P11)	1. Two initial attack personnel available. 2. Normal tours of duty 0800 to 1700. 3. Engine inspected weekly and available for out of monument response. 4. Initiate weekly sampling of live and dead fine fuel moistures.
Class III, BI 25-42 ERC 12-21 (*Funding source*: Park's preparedness account 8620-P11)	1. Three initial attack personnel available, in personal protective equipment, and ready for a 5-minute response time. 2. Normal tours of duty, except they may be extended if lightning activity level (LAL) reaches 4 or above. 3. The lookout will be staffed by volunteers 7 days/week, 10 hours/day. 4. Engine available for local initial attack only.
Class IV, BI 43-51 ERC 22-24 (*Funding source*: Firepro Emergency Preparedness account 8620-E11)	1. Four initial attack personnel available. 2. Tours of duty for designated fire personnel will be 0800 to 1900 hrs, 7 days/week. 3. Fire danger signs will be placed key locations throughout the monument. 4. Fire prevention patrols will be increased. 5. Emergency firefighters may be hired. 6. When LAL of 4-6 occurs, automatically go to Class IV for readiness. 7. Engine available for in-monument attack or attack reachable within half an hour.
Class V, BI 52+ ERC 25+ (*Funding source*: Firepro Emergency Preparedness account 8620-E11)	1. Fire restrictions may be implemented. 2. Firefighter lieu days and annual leave may be canceled when necessary to provide required coverage.

Table IV-3(c) Southwest Area Preparedness Levels. National and regional Preparedness Level requirements may require the Area Preparedness Levels to be raised.

Level	Description
I	Optimum conditions for normal prescribed fire operations. Wildfire activity within the Southwest Area is light, and large fires are of short duration. There is little or no commitment of Southwest Area and/or National Resources.
II	Zone and Area resources are adequate to manage all wildfires and prescribed fires. Numerous Class A, B, and C fires are occurring and a potential exists for escapes of larger fires for more than one burning period. Potential exists for frequent mobilization of additional resources from other zones.
III	There is a potential for two or more zones to experience incidents requiring a major commitment of Area/National resources. High potential exists of fires becoming Class D or larger. Zones may be requesting resource priorities from SWCC.
IV	Class D and larger fires are common and have the potential to exhaust Southwest Area and National resources. Competition exists for Area/National resources.
V	Several zones are experiencing major fires, and National resources are exhausted. Military resources have been committed within the Southwest Area.

Annual Training and Readiness Activities

Annual training needs as well as equipment, supplies, and readiness tasks are determined in each year's Fire Preparedness Plan. Annual training includes the safety refresher, qualifications and needs assessment, engine and lookout training, hazmat training and any other specialized training deemed necessary and appropriate. The monument completes the following tasks annually to prepare for the fire season. Many tasks also apply to wildland fire use and prescribed fire, but it is useful to show them here as part of an integrated annual activities list. The annual Readiness Review is an inspection conducted by a cooperating agency by April of each year. A knowledgeable individual from another local agency usually carries out the review of staffing and equipment.

November 1: Prepare fire training plan for permanent employees (Chief of Resources Management/Fire Management Officer).

November 30: Fall prescribed fire activities; winterize fire engine and hydrant gate valves (Chief of Resources Management/Fire Management Officer).

December 1: Prepare prescribed burn plans for the coming year and submit to the Superintendent (Chief of Resources Management/Fire Management Officer).

December 15: End of fire season. Permanent employees return fire gear to cache. Switch to out-of-season fire weather operations; end daily fire situation reporting; inventory fire cache for repair and replacement needs (Chief of Resources Management/Fire Management Officer).

February 1: Complete annual review and revision of the fire management plan and submit to the Superintendent (Chief of Resources Management/Fire Management Officer).

March 1: Have fire weather station operational and initiate daily NFDRS reporting using WIMS. Start earlier depending on weather conditions. Begin monitoring live and dead fuel moisture. Complete semi-annual servicing of the fire engine. Prepare pre-season risk analysis. Review interagency agreements for saliency (Chief of Resources Management/Fire Management Officer).

April 1: Update fire training and experience records for each permanent fire employee and complete pack tests. Complete readiness review and submit summary to Regional FMO. Review and update Fire Preparedness Plan (Chief of Resources Management/Fire Management Officer).

April 15: Issue Red Cards to qualified permanent employees. Issue initial attack gear to selected employees. Begin daily fire situation reporting—start earlier depending on weather conditions. Begin fire coordination with the Forest Service and the Bureau of Land Management. Follow pre-attack procedures outlined in NPS-18 (Preparedness) and Fire Preparedness Plan—up-to-date maps in emergency vehicles, firefighting tools in vehicles, initial attack packs to permanent red-carded firefighters, hydrants and hose box checks begin (Chief of Resources Management/Fire Management Officer).

May 10: Hire, train, and test (pack test) seasonal firefighters. Issue red cards and initial attack gear to seasonal employees (Chief of Resources Management/Fire Management Officer). Maintain fire cache and all equipment in serviceable condition and in constant readiness throughout the fire season; test fire hydrants and hose; open the fire lookout for operation (fire crew). Complete semi-annual servicing of the fire engine (fire crew).

May 15: Conduct annual wildland fire safety training for all red card employees (Chief of Resources Management/Fire Management Officer).

September 1: Submit ADEQ smoke permit requests (Chief of Resources Management/Fire Management Officer).

September 30: End of normal FIREPRO funding; terminate seasonal fire employees: return gear to fire cache (Chief of Resources Management/Fire Management Officer).

Fire Weather, Fire Danger, and Fire Season
Chapter III discusses the April through October fire season with ignitions peaking in July over the monument's period of record. Burning Indices are derived from a NFDRS computer analysis of data from the monument's manual and RAWS weather stations (Chiricahua National Monument; Headquarters manual weather station no. 021664 and Headquarters RAWS no. 021409; elevation 5,407 feet; fuel models C and F; slope class 2; climate class 2; grass type perennial). The fire season for Chiricahua—May through September—is based on FIREPRO analyses that evaluate a 10-year history of fire occurrence.

National Fire Danger Rating System
Energy Release Component (ERC) and Burning Index (BI) (see graphs in Appendix C) from the 1995-2002 fire seasons (March 1-October 31) were used to determine fire danger thresholds as listed in the Step-up Plan (Table IV-3). Two indices were chosen to better represent the effect of

wind (BI) and the effect of fuel moisture (ERC) on fire danger. Both indices need not be within the ranges as described for each Staffing Class to implement those management actions; the highest level Staffing Class will be chosen. These thresholds describe the full range of fire management activities as they relate to prevention, initial response, large fire actions, and prescribed fire activities. The thresholds, determined with FIREFAMILY + software, were established using NFDRS fuel model C which most closely describes the fuel characteristics, carrying fuels, and locality of critical fire danger areas in the park. However, these techniques can be applied to other fuel models as necessary through FIREFAMILY + software. Fire danger levels are determined when either the BI or the ERC are within their respective ranges as related to Ignition Component.

As shown in Appendix C, the average BI is around 45 on April 1. Then it fluctuates between 35 and 60 (75^{th} to 90^{th} percentile) from April 1^{st} to around July 1^{st}, when the monsoon rains begin. During the monsoon season, the BI then fluctuates between 15 and 35 until mid September, where it begins to rise again as fuels dry out and wind speed increases.

Step-up Staffing
As the fire danger increases, the level of preparedness must increase to ensure readiness for wildland fire use management or suppression. The Step-up Plan (Table IV-3(a-c)) applies to both types of wildland fire at Chiricahua National Monument. The plan is tied to the NFDRS program; the BI for fuel model C is used to indicate fire danger since grass fuels are the most flammable fuel type. Ongoing wildland fire use may trigger staffing at Class IV or V based on fire conditions and the Fire Situation Analysis.

Pre-attack Plan
The pre-attack plan is detailed in the annual *Fire Preparedness Plan*. The pre-attack plan compiles essential fire management information that must be available in the fire management and/or dispatch offices. The plan guides decision making and allocation of resources. It is also a source of information on outside help such as hospital locations, local/regional law enforcement contacts, merchants, and equipment suppliers. The pre-attack plan complies with those elements as detailed in RM-18, Chapter 7.

Initial Attack
Initial attack is an aggressive suppression action consistent with firefighter and public safety and values to be protected. This strategy is applied as either the only available response, when fire management plans have not been completed, or as the result of a Stage 1 analysis under the appropriate management response process.

<u>Information Used to Set Initial Attack Priorities</u>
Information sources for setting suppression priorities include:
- GIS map of monument, depicting urban interface areas, areas of high visitor use, and trail and road system
- Vegetation map (GIS and paper copy)
- GIS map of Mexican spotted owl PACs
- Maps of archeological and cultural resource sites
- Smoke modeling data

- Maps of sensitive natural resource areas (riparian area, springs, orchid habitat)
- Preplanned dispatch strategies for Faraway Ranch and Bonita Campground

Keeping firefighter and public safety as paramount, the following are initial attack priorities for the monument:

- Fires burning into wildland urban interface areas—HQ and housing areas, Faraway Ranch—where fire effects would not be desirable or beneficial, or where public and firefighter safety would be jeopardized
- Fires starting at the mouth of Bonita Canyon with the potential to rapidly spread upcanyon into the HQ area
- Vegetation types with potential for rapid rates of spread into areas where fire is not desirable for public and firefighter safety reasons
- Fires threatening to burn through Mexican spotted owl habitat, where fire effects would not be desirable or beneficial
- Apache archeological sites where cultural fabric will be destroyed by fire
- Fires that produce smoke detrimentally affecting sensitive receptor sites within and outside the monument
- Fires producing undesirable fire effects in sensitive natural resource areas—riparian corridors, remnant pine and cypress forests, sensitive or rare plant habitats

Preplanned dispatch strategies are included in the Fire Preparedness Plan and are updated based on current staff and expertise. Table IV-4 lists response times by resource type and season.

Table IV-4. Typical Fire Response Times on Unit by Resource Type and Time of Year of Fire Danger.

Resource Type	Response Time	Fire Danger/Time of Year
Type 6 Engine—CHIR	15 minutes	May 1-Sept. 30
Type 6 Engine—CHIR	20 minutes	Oct. 1-April 31
Type 6 Engine—FOBO	1 hour	All year
FFT2 squad (5 people)	20 minutes	May 1-Sept. 30
FFT2 squad (5 people)	1 hour	Oct. 1-April 31
Overhead	15 minutes	May 1-Sept. 30
Overhead	30 minutes	Oct. 1-April 31

Criteria for Appropriate Initial Attack Response

Criteria for the appropriate initial attack response are consistent with GMP/RMP objectives. Initial attack response will be appropriate based on conditions, values at risk, and short- and long-term effects on these values; the intensity of the response warranted will be based on these factors.

Factors include:

- *Firefighter and public safety*—response will not jeopardize firefighter and public safety. Aggressive, but safe, initial attack will take place in areas where public safety will most be threatened—Visitor Center, Bonita campground, and Faraway Ranch. The public will be evacuated as a precautionary measure should fire be any threat to the public; season and fire

conditions play a role in determining evacuations. Due to the small monument staff, all efforts may go to evacuation of the public rather than initial attack of the fire should the fire behavior and intensity exceed the monument's ability to safely conduct initial attack.

- *Historic districts and historic resources*—response will not irreparably damage historic resources, unless cumulative impacts of letting fire burn through historic resources pose a significant loss of historic fabric.
- *Mexican spotted owl habitat and protected activity centers*—response will not result in long-term or irreparable damage to habitat/habitat characteristics, unless direct fire effects would result in more damage than suppression actions. All actions will be in accordance with the Mexican spotted owl Recovery Plan (1995) and in consultation with the USFWS.
- *Official wilderness*—response will be in accordance with the Wilderness Act (using the Minimum Requirement Decision Analysis) and MIST (Minimum Impact Suppression Tactics) will be utilized in wilderness areas. Mechanized equipment on and over wilderness may be used only with Superintendent approval and a memo to the file.
- *Sensitive resources and resource areas*—response will utilize MIST for initial attack. Sensitive resources and resource areas are listed in the Fire Preparedness Plan.
- *Steep canyons*—response will, in most cases, be a confinement strategy due to firefighter safety issues. Due to steep, inaccessible, rocky terrain, the canyon sideslopes covered with manzanita will not be initial attacked by ground personnel. Instead, a confinement strategy utilizing aerial attack resources may be implemented.

Confinement as an Initial Attack Suppression Strategy

A confinement strategy may be implemented as an initial attack option as long as it is not used primarily to meet resource objectives. Confinement is applied in lieu of wildland fire use to maximize firefighter safety, minimize suppression costs, minimize loss in specific resource areas, and to maximize availability of critical suppression and management resources during periods of high fire danger associated with fire in highly valued resource areas.

Confinement can also be a strategic selection through the WFSA process when the fire is expected to exceed initial attack capability or planned management capability. When confinement is selected as the initial action, the same management process applies as for wildland fire use decisions. A long-term implementation plan is needed to guide the implementation of the confinement strategy. The WFIP meets this requirement.

Restrictions and Special Concerns by Management Area

In concert with all laws, policies, and guidelines, the following lists restrictions and special concerns by management area or by policy-designated units:

Official wilderness—

1. No mechanized equipment without Superintendent approval.
2. Aircraft overflight permitted without restrictions over all non-Mexican spotted owl protected activity center areas with Superintendent approval.
3. Aircraft landing only in established helispots. New helispot construction subject to Superintendent approval.
4. Fugitive fire retardant only; chemical retardant not permitted.
5. No dozers, plows, backhoes or similar equipment permitted.

6. Vehicles permitted only on established roads (paved and dirt).
7. No tree cutting or line construction without approval from Chief of Resources Management/Fire Management Officer.
8. Backcountry spike camps not permitted.

Mexican spotted owl PACs—
1. Aircraft above MSO PACs permitted only at 500 feet AGL.
2. No tree cutting, line construction, or retardant line without approval from Chief of Resources Management/Fire Management Officer.

In addition, monument staff will use the guidelines as listed in the Red Book, Chapter 10 for determining the appropriate management response for wildland fires.

Sensitive Resources and Local Economic Concerns

Chapter III introduces sensitive resources and developments in each fire management unit. Of particular concern are wooden historic buildings, *Agave palmeri* (food source of endangered lesser long-nosed bat), and Mexican spotted owl habitat. Compliance documents prepared for the approval of this plan cover these concerns, and they are also addressed in Chapter IX of this plan. Chapter IX also contains the cultural resources matrix that identifies sensitive cultural resource types and describes fire-related actions they tolerate, those to avoid, and mitigation measures. The EIS (approved 2005) for this FMP also discusses how suppression actions affect visitors and the local community. Visitors have multiple local alternative destinations in the general area. During monument fire activities, every effort is made to buy and hire locally; however the small towns within 40 miles of the monument cannot adequately provide for the needs of the park, and therefore resources may be procured from beyond the local area.

Extended Attack and Large Fire Suppression

Due to the limited number of monument personnel, extended attack resources must be ordered from outside the monument via the USFS Southeast Zone Interagency Dispatch Office in Tucson, AZ. Closest extended attack resources (handcrew and engines) are from the USFS/ Coronado National Forest, Douglas District, with approximately a 1-hour response time. The Forest Service also has a Type 3 helicopter with helitack crew available from April 15 to July 15; this helicopter has a 20 minute response time. All other ground resources have a 2 hour response time and are from Ft. Grant, Safford, Tucson, or San Carlos Indian Reservation. Overhead for extended attack will come primarily from the USFS/Coronado National Forest. Extended attack needs will be determined on a case-by-case basis. Extended attack action requires a Wildland Fire Situation Analysis (WFSA) to guide the reevaluation of suppression strategies. The Superintendent will approve the WFSA and any revisions. The Wildland Fire Use Implementation Guide, and WFSA User's Guide will be the guides for completing WFSAs and WFIPs. All fires that exceed the scope of the existing WFIP will require a WFSA. Conditions that cause an existing WFIP to be exceeded include:

- inability to control wildland fires during the initial suppression response action
- unsuccessful management response
- unsuccessful prescribed fire or failure to attain desired fire effects
- failure to meet every element of the decision criteria checklist

- projection that fire will leave NPS jurisdiction of the ZOC and the adjacent jurisdiction will not or cannot accept management of the fire.
- no WFIP approval by the Superintendent
- regional or national conditions outweigh potential local benefits of the fire per the regional FMO, and appropriate suppression action is warranted.

Complexity Decision Process for Incident Management Transition

Criteria for the need to transition from initial attack to extended attack include situations where:

- the fire cannot be contained with initial attack resources within 2 operational periods of fire detection
- fire behavior exceeds capability of initial attack resources to contain the fire
- the fire threatens any monument or non-monument natural or cultural resource for which there may be public interest.

Criteria for the need to transition from extended attack to Type 1 or Type 2 incident management include situations where:

- fire behavior exceeds the capability of extended attack resources to contain the fire due to weather, topography, fuels, etc.
- the fire threatens any monument or non-monument natural or cultural resource for which there may be public interest or concern
- firefighter and public safety has the potential to be significantly compromised.

Appendix D contains the monument's format for Delegation of Authority.

Minimum Impact Management

Monument staff will manage wildland fire use and suppression in ways that minimize unnecessary impacts to resources and convey the importance of this strategy to all fire management forces. Minimum impact management strives to minimize landscape alteration and disturbance to natural and cultural resources while safeguarding human lives and property and accomplishing resource-related objectives. Without compromising safety, lines will be located where they do the least damage, and use natural firebreaks when possible. Staging areas and helispots will be placed where damage to natural and cultural resources is minimized. Agency resource advisors will be consulted prior to implementing management tactics.

Appendix E lists full guidelines for Minimum Impact Suppression Tactics.

Rehabilitation Guidelines

Despite the best intentions of minimum impact management, wildland fire actions often create the need for short-term or long-term rehabilitation. Staff will consult with specialists (archeologists, hydrologists, plant ecologists, wildlife biologists) to determine short- and long-term needs and to write rehabilitation plans for each fire, then will implement and monitor the plans. Common rehabilitation recommendations include flush cutting stumps, brushing in handlines, removing all trash, installing erosion control devices, and falling hazardous trees in human-use areas. Reseeding or revegetation after wildfires requires the prior written approval of the Regional Director.

Permanent Project Record
The centerpiece of the permanent record is the DI-1202, Individual Fire Report. The full record retained at the monument (and staff responsible) will include:

- DI-1202 (Chief of Resources Management/Fire Management Officer)
- All narratives (Chief of Resources Management/Fire Management Officer)
- WFIP (Chief of Resources Management/Fire Management Officer)
- Daily and spot weather forecasts (Chief of Resources Management/Fire Management Officer)
- Smoke monitoring and permits (Chief of Resources Management/Fire Management Officer)
- Map showing daily acreage burned (Chief of Resources Management/Fire Management Officer)
- Total cost summary (Chief of Resources Management/Fire Management Officer)
- Monitoring data (Chief of Resources Management/Fire Management Officer)
- ICS 209s (unit logs) (positions that are crew boss or higher in qualifications)

Wildland Fire Use
When a wildland fire meets the conditions of a predetermined prescription for fuel reduction or ecological improvement, it becomes a candidate for fire use. The Superintendent and Chief of Resources Management/Fire Management Officer must be present in the monument or available for consultation at the time of ignition to consider wildland fire use unless equivalent staff from another unit or agency are brought in to replace an absent team member. Procedures are guided by instructions found in RM-18, Chapter 9, the *Wildland and Prescribed Fire Policy Implementation Procedures Reference Guide* (IPRG), and the *Wildland Fire Use Implementation Procedures Reference Guide* (2005).

Objectives
Wildland fire use works toward restoring natural fire regimes in the monument. Fuel buildups that are the legacy of the full suppression era dictate that great caution is still required when considering letting natural ignitions burn. Wildland fire use must be soundly based on management objectives—public and firefighter safety, natural and cultural resources benefits, interagency collaboration—and may include the full range of fire management strategies on a fire's entire perimeter.

Decision-Making Criteria and Fire Management Criteria
Table IV-5 outlines initial and daily wildland fire use decision-making criteria; the Chief of Resources Management/Fire Management Officer is responsible for executing the decision-making process and completing a Stage I WFIP within 8 hours of first fire detection and strategic fire size-up. Table IV-5 incorporates the main parameters listed on the Decision Criteria Checklist for the Stage I WFIP as well as Forest Service parameters considered. Table IV-6 contains wildland fire use prescriptions that may be modified with wildland fire use experience. Ongoing fire use that does not meet predetermined prescriptive elements or fails to meet resource management objectives will be suppressed using an appropriate management response. If all criteria are met, the Chief of Resources Management/Fire Management Officer will solicit a final Go/No-Go decision from the fire committee. The Superintendent and Chief of Resources Management/Fire Management Officer constitute the fire committee; the Superintendent has final approval with additional input from the Fire Use Manager when assigned to the incident. Forest Service representation on the fire committee will facilitate Go/No-Go decisions for

wildland fires within the zone of cooperation outside the monument boundaries. After the decision is made to manage the fire for fire use, a Fire Use Management Team will be ordered to manage the fire. Park staff will play a support role in the implementation of WFIPs. Components of a WFIP Stage I include: strategic fire size-up, decision criteria checklist, management actions, and periodic fire assessment.

Table IV-5. Wildland Fire Use Decision-making Criteria/Daily Review.

Factor	Criteria *Wildland fire use will be designated only:*
Number of Fires	if there are no more than two other wildland fires of any type currently burning within the monument, or if any other fire activity does not preclude successful management of this fire
Risk Analysis	if relative risk indicators or risk assessment results are acceptable to agency administrators (ERC, BI, drought indices)*
Ignition Location	for ignitions in FMU 2, or for ignitions in FMU 1 that have potential to safely move into FMU 2 or for ignitions on Forest Service land outside FMU 2 that move into the ZOC
Ignition Cause	for natural ignitions (lightning)
Safety	if the threat to firefighters, staff, visitors, residents, neighbors, associated property and infrastructure can be minimized
Fire Behavior	if the current and forecasted (next 24 hours) fire behavior will not cause fire to leave the ZOC, or if ZOC boundaries are threatened, that the USFS is consulted and agrees to manage fire outside of the ZOC
Fire Weather	if the current and forecasted weather conditions do not indicate that a red flag watch or warning will be issued for southeast Arizona or that other fire weather factors are likely to cause the risk indicators to be unacceptable within the next three days**
Smoke Management	if there are no requests from the Arizona Department of Environmental Quality for the curtailment of smoke production
Resource Availability	if local, regional, or national resources are available to support actions
Preparedness Level	if new fires are allowed at Levels IV and V with regional/national approval and suppression of ongoing fires at Level III (Southwest Area Mobilization Guide) is authorized (definitely suppress at Level IV)***
Management Objectives	if management objectives will be met and potential effects on natural and cultural resources are within the acceptable range of effects and variability
	*ERC and BI will be decision-making parameters because they can be used to interpret fire behavior. The prescribed ERC and BI indices are the average 90th percentile values over a ten-year record period. The 90th percentile ERC and BI indices are considered the point at which very high fire danger is present. **The primary manual station monitored is Chiricahua National Monument (#021664). CNM also monitors a RAWS (#021409). A USFS RAWS, located in Rucker Canyon approximately 18 mi to the south, may provide additional information. ***At national preparedness level V, concurrence of the national FMO is required.

Table IV-6. Wildland Fire Use Prescriptions.

Season	Temp (ºF)	Relative Humidity (%)	Wind Speed (mph)	Wind Direction	1-hr TLFM	10-hr TLFM	100-hr TLFM	1000-hr TLFM
March-June *Pre-Monsoon*	60-85	18-50	<8	Any	4	5	7	10
July-September *Monsoon*	60-95	10-50	<15	Any	3	4	6	8
Oct-Feb *Winter*	50-85	10-50	<15	Any	3	4	6	8

A Stage II WFIP will be initiated for any fire use that persists in growth to the point of requiring mitigation, holding, or other implementation action. This must be completed within 48 hours of indication of its need in a Planning Needs Assessment and includes short-term risk assessment, objectives, fire situation, management actions, estimated costs, periodic fire assessment, complexity analysis and a Stage III Needs Assessment Chart.

A Stage III WFIP will be initiated when a Periodic Fire Assessment indicates the need for one, as in response to an escalating fire situation, potential long duration, and increased need for management activity. This will include maximum manageable area (MMA) determination, a long-term risk assessment, and development of long-term implementation actions. A Stage III WFIP must be completed within 7 days of indication of its need in a Planning Needs Assessment. Holding actions may be undertaken to confine fire use fires to certain areas. They may be fully described in the WFIP and are subject to all the constraints on suppression tactics as related to Minimum Impact Suppression Tactics. If holding actions cannot prevent a fire use fire from escaping predetermined limits as defined in the Wildland Fire Assessment, the fire use fire will be declared an unwanted fire and will be suppressed. Any fire use fire that is declared an unwanted fire cannot later be declared a fire use fire a second time; it must continue to be managed in an appropriate suppression strategy.

Minimum Impact Suppression Tactics
Holding actions may be undertaken to confine wildland fire use to certain areas. They must be fully described in the WFIP and are subject to all of the constraints of suppression tactics.

Preplanned Wildland Fire Use Implementation Procedures
The Chief of Resources Management/Fire Management Officer will conduct an annual interdisciplinary meeting to update the park's wildland pre-attack plan and Fire Preparedness Plan. A Pre-attack Plan for wildland fire use should minimally consist of a WFIP Stages I, II, and III completed for typical scenarios of lightning ignitions in FMU 2. The primary consideration in all pre-attack plans will be firefighter and public safety. Preplanned actions will follow the guidelines set forth in the IPRG.

Preplanned MMAs are based on the prescribed burn complexes shown in Figure IV-1. Major blocks—Northwest, Whitetail, South, and Highlands—are naturally bounded areas for the

purposes of fire and lie in FMU 2 where wildland fire use is permitted. Faraway and Headquarters lie partially in FMU 1 where wildland fires will be suppressed unless ignitions are near the margins of the unit and conditions are such that fires would head immediately into FMU 2; in this case, portions of the fire perimeter may be managed with a suppression strategy while other portions may be managed for fire use.

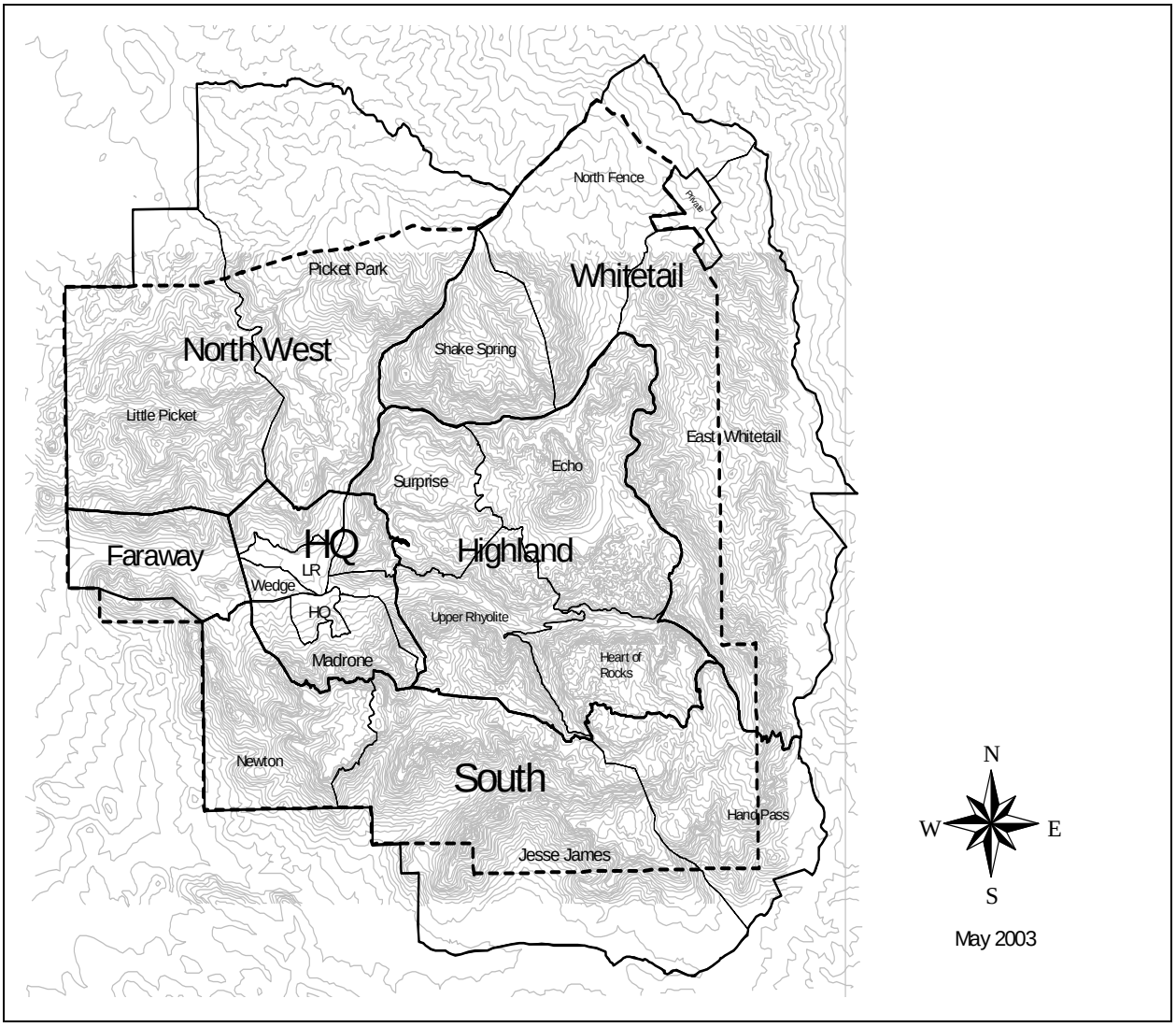

Figure IV-1. Prescribed Burn Complexes and Units.

Unplanned Wildland Fire Use Implementation Procedures
The most current version of the *Wildland and Prescribed Fire Management Policy Implementation Procedures Reference Guide* (IPRG) will be the basis for completion of WFIPs. Until declared out, any fire use fire will be periodically assessed (daily or more frequently) and this assessment documented by the Superintendent on the Periodic Fire Assessment form found in the IPRG.

Staffing
Due to the small staff at Chiricahua NM, a Fire Use Management Team will be ordered when the decision to manage the fire as a fire use fire is made. Staff members will play a support role in the formulation and implementation of the WFIP.

See the Step-Up Plan (Table IV-3) for staff positions responsible for initiating and implementing steps in the decision process necessary to support the appropriate management response. Staffing levels 4 and 5 dictate that regional and national approval, respectively, be sought before implementing a wildland fire use scenario.

Impacts of Plan Implementation and Mitigation
The environmental impact statement prepared for this plan addresses the impacts of wildland fire use and mitigation measures. The strategy is justified by the need to return fire to fire-adapted systems (see Chapter III), but implementation requires acceptance of short-term losses in exchange for long-term ecological benefits. Criteria that allow wildland fire use are strict, and at the time this plan was prepared, not a single fire had qualified as fire used for resource benefits due to spatial constraints of the old FMP. The Chief of Resources Management/Fire Management Officer will use WFSA/WFIP to determine potential impacts of wildland fire use in the event that strategy is applied.

Public Information and Interpretation Actions
A Fire Information Officer designated by the Superintendent or Fire Use Management Team will generate information and interpretation to communicate wildland fire use to the public; this program will include "step-up" activities that address needs when fire activities escalate. The Visitor Center plays an integral part in the dissemination of information by presenting displays and talks as well as generating press releases. The Fire Use Management Team normally comes with a qualified Information Officer; this person will coordinate with park interpretive staff to ensure accurate and timely dissemination of information.

Key agency, state, and local contacts for public information include:
- Coronado National Forest, Douglas, AZ, Public Information Officer
- Arizona Range News, Willcox, AZ
- Arizona State Land Department, Phoenix, Arizona, Fire Management Officer
- Pearce/Sunsites (AZ) Volunteer Fire Department, Fire Chief
- Portal, AZ Volunteer Fire Department, Fire Chief
- National Park Service, Intermountain Region, Denver, CO, Information Officer

Permanent Project Record
Table IV-7 compiles the routine records and reports that the fire program must maintain. The Chief of Resources Management/Fire Management Officer is ultimately responsible for this collection of documents, but the work is completed through delegation and individual assignments.

Costs associated with wildland fire use will be relayed to the regional Fire Management Officer on a schedule agreed upon by the monument. If the wildland fire use exceeds prescription and

needs to be suppressed, new fire cost account code will be assigned. Acres burned prior to status change will be counted as wildland fire use; after the change they become wildfire acres.

Table IV-7. Fire Program Records, Reports and Plans.

Record, Report, or Plan	Revision or Preparation Frequency	Responsibility	Distribution
DI-1202 with map	per incident	Chief of Resources Management/ Fire Management Officer	CHIR, NIFC (through Fire Web Reporting System)
WFSA, WFIP	per incident	Fire Committee	CHIR
Fire Atlas	annual	Chief of Resources Management/ Fire Management Officer	CHIR
Fire Danger	daily (season)	Chief of Resources Management/ Fire Management Officer	CHIR, SEZ (through Firefamily +)
Fire Situation	daily (season)	Chief of Resources Management/ Fire Management Officer	CHIR, SEZ
Fire Weather	daily (season)	fire crew	CHIR, WIMS
FirePro Submission	annual	Chief of Resources Management/ Fire Management Officer	IMRO, NIFC (through NFPORS and WFMI)
FMP Revision	every 10 years	Chief of Resources Management/ Fire Management Officer	CHIR
FMP Update	annual	Chief of Resources Mgmt/ Fire Mgmt Officer & Superintendent	CHIR, IMRO
Fuel Moisture	weekly (season)	Chief of Resources Mgmt/ Fire Mgmt Officer, Biol. Science Tech	CHIR
Fuels Project Submissions	annual	Chief of Resources Management/ Fire Management Officer	CHIR, NIFC, IMRO (through NFPORS)
Job Task Books	per training experience	Trainee	Trainee, IQCS
Wildland Fire Use Decision Record	daily during fire use	Superintendent	CHIR
Prescribed Fire Plan, NPS Complexity Analysis	per fire	Prescribed Burn Boss, Chief of Resources Mgmt/Fire Mgmt Ofcr	CHIR
Readiness Reviews	annual	Chief of Resources Management/ Fire Management Officer	CHIR, IMRO
Red Card	annual	Chief of Resources Management/ Fire Management Officer	per firefighter, IQCS
Monitoring Report (level 1)	per incident	Chief of Resources Management/ Fire Management Officer	CHIR
Monitoring Report (level 2)	annual	Chief of Resources Management/ Fire Management Officer	CHIR, IMRO
Fire Preparedness Plan	annual	Chief of Resources Management/ Fire Management Officer	CHIR
Cost Accounting and Project Updates	per incident	Chief of Resources Management/ Fire Management Officer	CHIR, IMRO (through NFPORS)

IMRO = Intermountain Regional Office NIFC = National Interagency Fire Center
NFPORS = National Fire Plan Operations and Reporting System SEZ = Southeast Zone
WFMI = Wildland Fire Management Information System IQCS=Incident Qualification Certification System

Prescribed Fire

Prescribed burning allows the meeting of resource management and safety objectives on a predictable timetable. Chiricahua National Monument has been conducting prescribed burns since 1976. (See Chapter III, Table III-4 for records.) The prescribed burn program is both a means and an end; prescribed burning pre-treats the landscape to prepare for the return of fire as a natural process, and it also becomes the process when lack of ignitions and restrictive conditions keep wildland fire use from taking place. Prescribed fire compensates for ignitions outside the monument that might naturally move into the monument but are instead suppressed. An approved fire management plan is a prerequisite for prescribed fire in all parks. All prescribed fire must meet the requirements of the interagency *Wildland and Prescribed Fire Management Policy Implementation Procedures Reference Guide*.

Program Scope

Prescribed fire as a resource management tool falls under a vegetation management program. The Natural and Cultural Resources Management Plan (1996) contains many directives that are compatible with such a prescribed burning program:

- Analyze Vegetation Changes and Trends (CHIR-N-002)
- Develop the Fire Management Program (CHIR-I-602)
- Develop the Vegetation Management Program (CHIR-I-005)
- Conduct an Inventory and Assessment of Vegetation (CHIR-N-001)
- Examine Fire Effects Ecology Study on Flora (CHIR-N-600)
- Restore Faraway Historic Landscape (CHIR-C-412)

The vegetation management goals include:

- Restore fire as a natural ecosystem process.
- Maximize restoration of historical fire regimes to all vegetation types.
- Create a mosaic of burned and unburned areas throughout the monument.
- Improve wildlife habitat.
- Rejuvenate fire-dependent and fire-adapted plant communities and species.
- Prevent excessive buildup of hazardous fuels and other unnatural conditions.
- Limit area occupied and/or eliminate non-native species from the monument.
- Using best available science, specify desired conditions that mimic presettlement structure, composition, and extent of vegetation types; use fire to manage toward these conditions.

Prescribed fire is the major tool available for managing towards the vegetation goals. Achieving these goals is likely to require multiple entry burns over many years as shown on Tables IV-8 and IV-9.

Table IV-8. Prescribed Burns through 2003 at Chiricahua National Monument.
Vegetation type abbreviations are as follows: G = mixed grasses with minor shrub-tree component; O = mixed oaks; P = pine with mixed conifers and hardwoods; M = manzanita shrub community.

Complex	Burn Unit	Veg Types	Acres Burned	Year
Faraway	Faraway I	G	2	1975
Faraway	Faraway	G	4	1975
NW	Picket Park #1	O, P	10	1980
HQ	Rhyolite	O, P	15	1980
NW	Picket #2	O, P	10	1981
HQ	Rhyolite #2	O,P	65	1981
HQ	Rhyolite #3	O,P	80	1982
Highlands	Inspiration Point	O, P	150	1983
HQ	Meadow Woods	O,P	50	1984
NW	NW Corner	G, M	200	1986
HQ	Rhyolite T	M, O,P	10	1986
HQ	Meadow Woods #2	O,P	8	1987
Faraway	West Faraway #1	G	10	1987
HQ	Massai	O, P	10	1990
Faraway	West Faraway	G	9.2	1990
HQ	Powerline I	P, O	5	1991
HQ	Rhyolite I	O, P	20	1992
HQ	Silveredge	P, O	13.2	1992
HQ	Rhyolite	P, O	2	1992
HQ	Residence HQ #2	P, O	5	1992
HQ	Silver Spur	G	4	1993
HQ	HQ/Rhyolite #4	P, O	8	1993
Highlands	Sugarloaf	G, M	15	1993
Faraway	Faraway #3	G	4	1993
Faraway	West Faraway #4a	G	6	1993
HQ	HQ/Wedge	P, O, M	2	1995
Highlands	Echo #1	P	69	1996
Whitetail	Bonita #1	P, O	10	1997
HQ	Wedge	M	5	1998
HQ	Headquarters (reburn)	O	5	1998
South	Newton	G, M, O	800	1998
NW	Little Niagara	O, M, G	540	1999
HQ	Wedge	M	2	1999
HQ	Powerline II (reburn)	P, O	25	1999
HQ	Headquarters	O	10	1999
South	Newton	G, M, O	125	1999
HQ	Silver Spur	G	5	2001
NW	Picket Park	O, P	500	2002
HQ	Wedge	M	35	2002
NW	Little Picket	M, G, O	782	2003
HQ	Madrone	M, O	299	2003

Table IV-9. Proposed Prescribed Fire Projects 2004-2012. Complexes and burn units are shown on Figure IV-1.

Complex	Burn Unit	Veg Types	Fire Regime	Condition Class	Acres Burned (proposed)	Year	Purpose of Project
HQ	Madrone	O, M	II	2	(450) 150 left to burn	2004	reduce fuels to protect canyon-bottom developments
Whitetail	Massai Saddle	P, O, M	II	2	(300)	2006	conduct first burn in area with long (unknown) interval since last fire
South	Hand's Pass	M, P	I	2	(1000)	2005	restore historical frequent fire interval to pines in drainage; interagency burn
HQ	Lower Rhyolite	O, P	I	2	(30)	2009	reduce fuels to protect canyon-bottom developments; thin overstocked oak stands
Whitetail	East Whitetail	M, O	I	2	(800)	2007	interagency project with Forest Service for restoring historical frequent fire interval to pines in drainage
Highlands	Echo Park	P	I	2	(30)	2005	conduct pile burning for MSO PAC maintenance
Whitetail	Shake Spring	M, P, O	I	2	(400)	2008	conduct low-intensity burn for MSO PAC maintenance
Faraway	South Slope	G, M	II	2	(100)	2008	reduce fuels to protect canyon-bottom developments and historic structures
Highlands	Upper Rhyolite	P, O	I	2	(200)	2009	restore historical frequent fire interval; thin overstocked oaks
South	Jesse James	P, O, M	I	2	(500)	2009	open up thick vegetation that in the past likely had frequent fires brought in by valley bottom grasslands
HQ	Rhyolite # 5	O, P	I	2	(50)	2005	reduce fuels to protect canyon-bottom developments; thin overstocked oak stands
Highlands	Inspiration Point	P, O	I	2	(150)	2010	reburn for restoring historical frequent fire regime
Highlands	Echo Park	P	I	2	(30)	2007	conduct pile burning for MSO PAC maintenance
South	Little Jesse James	P, O, M	I	2	(500)	2011	open up thick vegetation that in the past likely had frequent fires brought in by valley bottom grasslands
Faraway	North Slope	G, M	I	2	(50)	2012	research burn to look at Lehmann lovegrass response

Planning, Reporting, and Documentation
The Chief of Resources Management/Fire Management Officer is the primary planner for prescribed fire. A table (Table IV-9) was developed that covers future prescribed burns, and Figure IV-1, a map showing burn complexes (larger divisions) and individual burn units listed in the table was made. Prescribed fire accomplishments are reported to the Intermountain Region (IMRO) through NFPORS. Escaped fires are reported immediately to IMRO. The 10-year fuels treatment plan spreadsheet submitted during summer 2002 is contained in Appendix F.

Annual Activities
In addition to making long-term plans, the Chief of Resources Management/Fire Management Officer oversees the following annual planning activities:

Monthly: Submit prescribed fire/fuels reduction accomplishments to NFPORS within a week of completion or by the 23rd of the month

April 1: Set prescribed burn priorities and prepare NFPORS request for next fiscal year's prescribed burns. Initiate seasonal collaboration with partners.

September 1: Submit burn schedule to Arizona Department of Environmental Quality.

November 1: Receive notice of budget approval from IMRO.

Ongoing: Collaborate with interagency contacts; conduct interagency planning.

Staffing
Table IV-10 describes general staff responsibilities for prescribed fire. The *Adequate Holding Resources Worksheet* specifies numbers and types of personnel required for each fire and is an attachment to each burn plan. Personnel and other resource requirements vary with fuel conditions, season, weather, and burn duration. As monument staff members change, assignments and responsibilities may shift to other qualified personnel as needed, possibly in another NPS office or at a different level in the organization.

Monitoring
Behavior and effects for all fires will be monitored in accordance with the Fire Monitoring Handbook (see Chapter VI for more details); Appendix G is the Fire Monitoring Plan dictated by RM-18 Chapter 11 describing four monitoring levels—environmental planning, fire observations, immediate postfire effects, and long-term change. Along with the overall program, monitoring program components are also evaluated annually:

- Gathering and processing data
- Evaluating results
- Analyzing and interpreting data
- Responding to an identified trend
- Documenting results

Table VI-1 (in Chapter VI) also summarizes monitoring protocols.

During a prescribed fire, weather observations are recorded every half hour by a qualified fire effects monitor: temperature, relative humidity, wind direction, wind speed, cloud cover, and

dew point. Fire behavior observations are collected hourly or more frequently if circumstances dictate: rate of spread, flame length, residence time, and flame zone depth. Fuel moisture (10-hour TLFM) is measured at least twice during a burn and more frequently if possible. Smoke data are collected every hour, and minimally include smoke column height and direction; more intense smoke monitoring occurs for burns in close proximity to heavy visitor use areas.

Monitoring objectives are measurable, and include short- and long-term analysis of program effectiveness. Monitoring type descriptions are on file in the Resources Management office and include monitoring objectives for each monitoring type. These descriptions are reviewed on an annual basis for validity and changed as needed. Concerns related to this FMH protocol include the time needed to evaluate program effectiveness and the appropriateness of these protocols to unique vegetation types.

Table IV-10. Prescribed Fire Responsibilities Based on 2005 Staffing.

Staff Member	Responsibility
Planning	
Chief of Resources Management/Fire Management Officer	Assures NEPA, NHPA, ESA compliance; approves burn plan, obtains funding for burn, writes burn plan, prepares documentation, obtains smoke permit
Superintendent	Approves burn plan
Chief Ranger	Reviews burn plan for safety concerns
Fee Collection Ranger	Informs neighbors and other affected local parties of pending action.
USFS FMO	Provides burn plan peer review
Execution	
Chief of Resources Management/Fire Management Officer	Acts as resource advisor and agency liaison, organizes logistics, orders equipment and resources, acts as/arranges burn boss, tracks costs, oversees monitoring
Superintendent	Acts as alternate agency liaison
Chief Ranger	Oversees safety and security of public and firefighters
Interpretive Ranger	Informs visitors about action.

Documentation

Prescribed fire plan. A burn-boss trainee (RXB2) or higher level staff will prepare a prescribed fire plan preceding any burn. Sample contents from RM-18 Chapter 10 Exhibit 15 are detailed in Table IV-11. All prescribed fire plans will fully address contingency measures should a prescribed fire escape. The plan must be approved by the Superintendent prior to the ignition of prescribed fires and must satisfy NEPA and NHPA requirements. It also requires technical review by a party outside the monument. The Superintendent or burn boss may cancel an approved fire at any time. The burn boss must initial and date any modifications or amendments to an approved plan in advance of ignition.

A single generic fire plan will be prepared annually to cover burning of debris—fuel materials resulting from maintenance activities, hazard tree removal, or construction. Such burning will follow procedures in RM-18 Chapter 10; where burns cannot be conducted in a non-wildland-fuel environment (parking lot or gravel pit, for example), they will be treated as prescribed burns. Staff will obtain an air quality permit from the Arizona Department of Environmental Quality for such burning.

Table IV-11. Prescribed Burn Plan Contents.

Section	Title	Section	Title
A	Signature page	K	Ignition and holding actions
B	Executive summary	L	Wildland fire transition plan
C	Description of prescribed fire area	M	Protection of sensitive resources
D	Goals and objectives	N	Public and personnel safety
E	Project complexity	O	Smoke management and air quality
F	Organization	P	Interagency coordination and public notification
G	Cost	Q	Monitoring
H	Scheduling	R	Post fire rehabilitation
I	Pre-burn considerations	S	Post fire reports
J	Prescription	T	Appendices*
*Vicinity map, project map, prescribed fire complexity rating worksheet (w/ and w/out aerial ignition), adequate holding resources worksheet (w/ and w/out aerial ignition and partial operation), agency administrator go/no-go pre-ignition approval, prescribed fire operational go/no-go checklist, pre-burn prescribed fire checklist, ADEQ prescribed fire burn plan form, hazard rating guide, smoke plume map, delegation of authority, briefing guide, notification checklist, MMA map, BEHAVE+ runs, SASEM run, ignition map, job hazard analysis, technical review, archeological clearance report, fuels map, prescribed fire risk analysis worksheet, prescribed fire risk mitigation table, reviewer comments, post project evaluation.			

Prescribed Fire Documentation
A minimum of the documents listed in Table IV-12 will be maintained in files for each fire.

Risk Management Documentation
The prescribed burn boss or preparer of the prescribed burn plan analyzes risks and documents risk management procedures. The burn plan must include the Hazard Rating Guide, Prescribed Fire Risk Analysis Worksheet, Prescribed Fire Mitigation Table, and Prescribed Fire Complexity Rating Worksheet. A logical, continuous, five-step process guides prescribed fire risk management:

- Assess hazards to determine risks.
- Implement controls that eliminate or reduce hazards.
- Decide how to proceed and communicate decision clearly.
- Evaluate effectiveness of mitigations and controls.
- Communicate and document risk decisions.

Table IV-12. Required Prescribed Fire Documentation.

Original signed prescribed fire plan	Agency administrator go/no-go approval
Checklist of pre-burn activities	Operational go/no-go checklist
All reviewer comments	Incident action plan(s)
All maps	Unit logs, daily validation, other unit leader documentation
Notification checklist	Press releases, public comments, complaints
All permits (burn, smoke, others)	Smoke dispersal information
Monitoring data	Post-fire analysis
Weather forecasts	DI-1202 (must also be reported in SACS and NFPORS)
	Photographs

Prescribed Fire Project Critiques

Prescribed Fire Project Critiques may be conducted as needed. Like wildland fires, prescribed fires have three levels of evaluation and review: park, regional, and national. The level of review depends on complexity and severity of the fire. In most cases, a park-level review is all that is warranted, and involves an in-park review that is sent to the Regional FMO. It is the Superintendent's responsibility to call for the review, request technical support if necessary, ensure the review's timely completion, and implement the recommended actions. RM-18 Chapter 13, Evaluation and Review, details all level reviews for prescribed wildland fire.

Exceeding the Burn Plan Prescription

If a prescribed fire exceeds prescriptions to the point where on-scene resources are incapable of controlling it, the fire will be declared a wildfire and staff will develop a Wildland Fire Situation Analysis. In these situations, staff will follow procedures as outlined in RM-18 Chapter 9, in addition to specific guidelines listed in the Prescribed Burn Plan.

Air Quality and Smoke Management

Chiricahua National Monument is classified as a Class 1 airshed and must register and obtain approval for all planned burn projects, including areas for potential prescribed natural fires. Burn plans shall be submitted annually detailing all planned prescribed burns. Each planned year extends from August 1 of the registration year to July 31 of the following year; the resource manager may amend a registration at any time. The Chief of Resources Management/Fire Management Officer will submit documentation listed below to both AQD and ADEQ.

Annual Air Quality and Smoke Management Activities

- *September 1*: Annual prescribed burn registration form
- *September 1*: Smoke modeling runs using Simple Approach Smoke Estimation Model (SASEM) that calculates fuel consumption, particulate emissions, and dispersion of particulate matter produced by prescribed burning.
- *At least 14 days prior to ignition*: ADEQ burn plan
- *By 2 pm the day prior to ignition*: Smoke dispersion map, with location of burn relative to locations of smoke-sensitive areas, Class I areas, or non-attainment areas within 15 miles in any direction of the project.

- *Every day ignition is planned*: Daily Burn Request (cannot submit one request for entire burn duration). Separate requests for Saturday, Sunday, and Monday may be sent via fax to AQD at one time, but are separate pieces of paper. AQD will either post approval on their website, call with approval, or fax it to the park on the same business day as the Burn Request submittal. All smoke permit approvals are also posted on the USDA Forest Service Southwest Area Fire website. A "no reply" from AQD is an approval to burn. Only a statement of disapproval can prevent or stop an ignition.
- *By 2 pm on the day following an approved ignition*: Daily Burn Accomplishment form. Include successive acreage covered and Best Management Practices (BMP) used.

BMP are applied when possible; ignition will not occur if all prescriptions are not met. See Chapter VI, Monitoring and Evaluation, for more information. Pre-identified smoke sensitive areas are the Visitor Center area and the community of Whitetail, bordering the east boundary.

Non-fire Fuel Treatment Applications

Mechanical, chemical, biological, and manual treatments complement prescribed burning to reduce fuels that might sustain large-scale, high-intensity fires. Such treatment requires a NEPA, NHPA, and Superintendent-approved plan that becomes a project statement in the RMP. Table IV-13 contains minimum plan contents from RM-18 Chapter 10.

There are three non-fire fuel treatment units in the park: Headquarters, Faraway Ranch, and Bonita Campground. All three units lay directly downcanyon of developed areas that experience moderate-to-high visitor use throughout the year as well as contain the major cultural resources in the park. These three areas were also identified as Wildland Urban Interface project areas and therefore have been mechanically treated from 1992 to present. The Headquarters unit has also been broadcast burned several times in the 1990s. Priorities regarding these units include completion of the Bonita Campground fuel reduction and maintenance of all three units using either prescribed fire, recutting sprouts, or chemical application. In addition, the grass is mowed annually in the seasonal housing area and around structures at Faraway Ranch.

Table IV-13. Non-fire Treatment Plan Contents.

Section	Title	Section	Title
A	Introduction (objectives and issues)	E	Long-term monitoring plan
B	Non-fire treatment assessment	F	Compliance strategies
C	Management alternatives	G	Public information and involvement
D	Research review and needs	H	Roles and responsibilities

Mechanical Treatment and Other Applications

Annual activities to prepare for and implement the program:

- Determine fuel break maintenance needs or additional units to be treated
- Ensure that approved burn/implementation plans are on file
- Ensure that all NEPA, NHPA and ESA compliance is completed
- Obtain smoke permits if piles will be burned
- Contract mechanical treatment projects with non-government organizations when feasible
- Monitor mechanical treatment units for ecological effects and program effectiveness.

Equipment and seasonal use restrictions:

- No chainsaws in MSO PACs during breeding season (March 1-August 31)
- No chainsaws in designated wilderness
- Restrict chainsaw use around campground. Use manual methods if possible, and use chainsaws only when necessary and only from 11 am to 4 pm to reduce camper disruption.
- Restrict chainsaw use at Faraway Ranch to non-tour hours only.

Monitoring:
Monitoring of mechanical treatment units will follow the National Park Service Fire Monitoring Handbook; plots will be installed according to these protocols and read on the established monitoring schedule. Objectives can then be quantitatively measured to determine whether they have been met for each treatment unit. If after the initial treatment the unit is determined to require additional treatment to meet objectives, or if the objectives have changed after initial treatment, monitoring will continue on the established schedule.

Critiques of Mechanical Treatment Projects:
Critique of mechanical treatment projects will follow the guidelines of critiques for prescribed fire projects. In addition, in-park critiques will occur, taking into consideration both monitoring data and a visual assessment of fuels as related to potential fire behavior. Objectives may be changed at any time if original objectives are not met or if the visual assessment results in additional treatment of the unit.

Cost Acounting:
Cost accounting will follow guidelines similar to that for prescribed fire. Planning, implementation, contracting, and equipment/supply costs will all be tracked throughout the treatment to determine cost/acre for each unit.

Reporting and Documentation requirements:
At the completion of the mechanical treatment project, a DI-1202 Fire Report will be completed and entered into Wildland Fire Management Information System (WFMI). Report of completion, cost/acre, and other relevant information will be entered into NFPORS. Documentation requirements will follow that for prescribed fire projects.

Annual Planned Project List:
All mechanical treatment units identified through the Wildland Urban Interface protocols have been treated. From this point, these units will be maintained through either additional mechanical treatment to eliminate resprouts or by prescribed burns in the units.

Emergency Rehabilitation and Restoration
Planning and implementation of post-fire emergency rehabilitation and restoration will follow guidelines set forth in the Interagency Burned Area Emergency Stabilization and Rehabilitation (BAER) Handbook as well as RM-18 Chapter 12 Burned Area Emergency Rehabilitation. “No year” funding is available to allow parks to take immediate or short-term actions to prevent unacceptable resource damage and to minimize threats to life and property resulting from a wildland fire.

BAER plans and requests for funding must be submitted to the IMRO within five days of fire control. IMRO will review the plan and requests within 7 days of receipt and may transfer these documents to the Fire Management Program Center for review, depending on cost.

Chiricahua NM will use the least intrusive BAER actions to mitigate actual or potential damage caused by wildland fire. The preferred action will be natural recovery of native plant species, except in rare circumstances. BAER actions for fire use and prescribed fires are inappropriate and will not be utilized.

Chapter V
Organization and Responsibility

This chapter defines park personnel responsibilities.

Fire Organization
Figure V-1 (organization chart) shows the staffing structure for the entire monument. The fire organization is the shaded part of the chart. Job mnemonics in parentheses are target qualifications for each position and do not imply full performance level upon entering duty.

The *Superintendent* has ultimate authority and responsibility for all activities and will make final decisions regarding fire program, based upon advice from appropriate staff. The Superintendent:

- Administers the overall fire program.
- Approves the fire management plan after regional review and advice.
- Delegates authority to the Incident Commander to manage fire suppression operations.
- Approves prescribed burn plans and ensures that projects comply with established procedures, FIREWISE standards, safe practices, agency direction and policy, and the FMP.
- Ensures that escaped prescribed fires that damage resources or property are reviewed and investigated in a timely manner.
- Chairs the fire committee.
- Serves as formal park representative in SE Zone matters and joint agreements.
- Approves an annual review and update of the FMP to ensure it continues to conform with laws, objectives, strategies, and procedures.
- Signs off on a periodic assessment that continued management of wildland fire use is acceptable. This responsibility may be delegated to another organizational level.
- Authorizes annual verification of fuels treatment schedule.

The *Chief of Resources Management/Fire Management Officer* functions as the Fire Management Officer (FMO) and has responsibility for daily fire program management, including detailed burn plan preparation, actual burn operations, and scientific management of the burn program and data management. This person also has responsibility to plan, oversee, and implement the total fire management program. The Chief of Resources Management/Fire Management Officer:

- Coordinates review and update of the fire management plan.
- Serves as Incident Commander (ICT4) as qualified.
- Serves as agency representative (LOFR).

- Serves as onsite program coordinator.
- Completes environmental and archeological/historical compliance.
- Coordinates burn compliance with USFWS.
- Writes and/or reviews prescribed fire plans to ensure compliance with the park's resource management goals and objectives as well as NPS and USFS policy and direction.
- Determines resource management objectives for prescribed fires.
- Plans, conducts, and coordinates all burn operations (RXB2).
- Serves as Burn Boss as qualified (RXB2), or assigns a qualified Prescribed Burn Boss, based on complexity, to all prescribed fires.
- Serves as Wildland Fire Use Manager as qualified (for FMU 2).
- Assures readiness including training and equipment condition (CRWB/ENGB).
- Supervises fire staff and assigns tasks according to qualifications and demonstrated abilities.
- Seeks FIREPRO funding and manages budget.
- Manages fire effects and other data programs (FEMO).
- Ensures that all activities and plans reflect a commitment to safety.
- Assures annual refresher and pack testing for all participants.
- Oversees technical review of prescribed fire plans prior to plan approval.
- Assigns a qualified Wildland Fire Use Manager to all wildland fire use events.

The *Park Interpreter* (Information Officer) keeps the public informed about the fire program. The interpreter:

- Prepares new releases regarding prescribed burns, special fire danger situations, closures, and other actions.
- Serves as Information Officer during burn events and works closely with other Information Officers as appropriate (IOF3).
- Supervises other staff in dissemination of information.
- Works closely with other Information Officers in the area.
- Supervises development of interpretive programs and site bulletins.

The *Park Curator* and the *Preservation Specialist* oversee protection of cultural resources. The people in these positions:

- Serve as Cultural Resource Advisors (READ).
- Provide cultural resource information for prescribed burn plans.
- Assist with obtaining archeological clearances, postburn discovery, and coordinating with visiting cultural specialists.

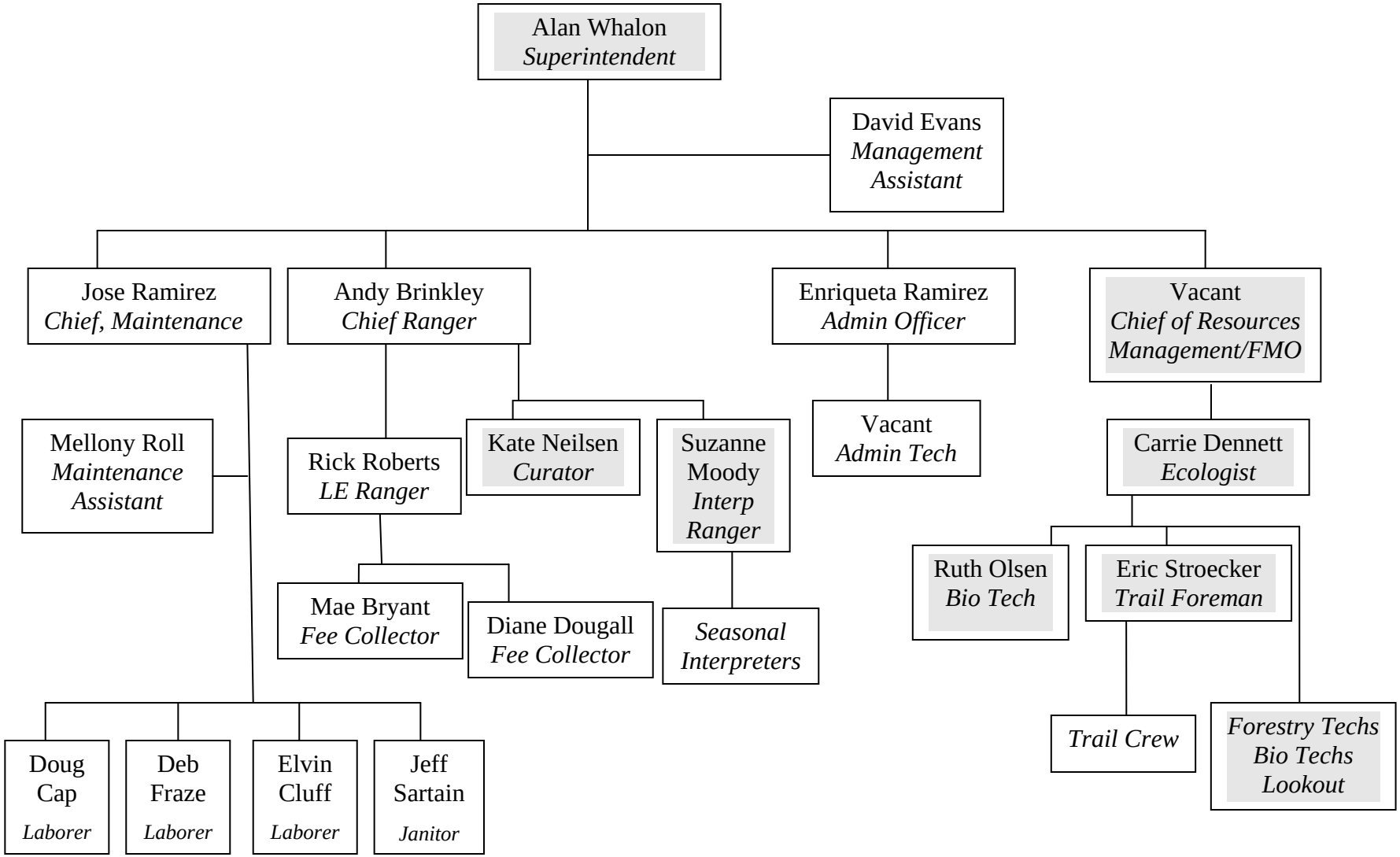

Figure V-1. Organization Chart for Chiricahua National Monument. Staff with fire duties are highlighted.

The *Chief Ranger* oversees safety and security of public and firefighters.

- Prepares and updates evacuation plan.
- Enforces fire restriction stipulations and closures.
- Provides emergency medical services.
- Acts as Safety Officer for prescribed and wildland fires.

Other Staff Positions and Duties:

- Seasonal Fire Crew:
    - Ensures personal and equipment readiness.
    - Acts as initial attack crew for fires in monument and on surrounding lands.
    - Implements prescribed fire prep work, including line construction, plot installation, and scouting.
    - Acts as prescribed fire crew on prescribed fires.
- Lookout
    - Ensures timely detection of all fires in monument and on surrounding lands.

Fire Management Committee

The Superintendent and Chief of Resources Management/Fire Management Officer comprise the Fire Management Committee, which guides the decision-making process to manage wildland fires. They shall meet at least annually to evaluate the implementation of the overall program to ensure predetermined resource objectives are met. Other division chiefs are invited to attend as needed.

FIPREPRO Funding

The Seasonal Fire Crew (3 GS-462-04's) is funded from FIREPRO. All other monument employees work collateral fire duty covered by ONPS funds.

Interagency Coordination

The Chief of Resources Management/Fire Management Officer is the primary liaison with adjacent land management agencies on fire management issues. The park is a member of the Southeastern Arizona Interagency Zone, as are other federal and state fire management agencies in the region. All members attend semi-annual meetings to coordinate activities. All interagency resource requests and dispatches go through the Southeast Arizona Zone Dispatch, operated primarily by the Coronado National Forest in Tucson, AZ. The Saguaro National Park Fire Management Officer may be requested to represent the park in actions involving the SE Zone.

Interagency Contacts

Chiricahua National Monument and Douglas Ranger District (Coronado National Forest) staffs cooperate and provide mutual assistance on wildland and prescribed fires. The Fire Program Analysis system will facilitate this cooperation between agencies in initial attack for FY08, with other programs (extended attack, large complex fires, prescribed fires, fire use) to follow in the future. The goal is to improve fire management on federal lands to minimize resource damage and reduce suppression costs. Forest Service and other agency contacts include:

Coronado National Forest, Douglas Ranger District
District Ranger and Fire Management Officer 520-364-3468

Bureau of Land Management, Safford Field Office
District Manager and Fire Management Officer 928-348-4400

Arizona State Lands
District Forester/Fire Management Officer 520-628-5847

Arizona Department of Environmental Quality
Air Quality Division 602-771-2277

Agreement with Coronado National Forest
This fire plan provides for joint National Park Service and Forest Service management of a 5,300-acre zone of cooperation on Forest Service land north, east, and south of the monument boundary. The Annual Operating Plan covering this joint management appears in Appendix A. Each agency agrees to notify the other immediately of fires in the ZOC, assist with burn projects, be available for assignment on suppression teams/crews, and review the other's plans. A Fire Use committee will convene to approve any Fire Use fires within the ZOC and/or fires that may influence the other agency's lands. The Fire Use committee for the ZOC will consist of two NPS staff (Superintendent and Chief of Resources Management/Fire Management Officer), and one member of the Forest Service staff (FMO, Wildlife Biologist, or District Ranger).

Chapter VI
Monitoring and Evaluation

Chiricahua National Monument has implemented a short- and long-term monitoring program to assess accomplishments and to determine effects of management activities on cultural and natural resources. Most of the monitoring at the monument directly relates to the prescribed fire program. Vegetation monitoring is carried out according to FMH protocols; USFWS dictates monitoring for Mexican spotted owl, lesser long-nosed bat, and Palmer's agave *(Agave palmeri)*, an important bat food source; monument staff takes daily weather and weekly air quality readings as described below.

FMH Vegetation Plots
Fire effects monitoring began in 1988 in the four designated vegetation types. The NPS Fire Monitoring Handbook is the source document providing monitoring procedures that meet NPS needs. Plots have been installed up to two years prior to prescribed burns in pine, mixed oaks, manzanita, and grass/shrub communities. Table VI-1 generally describes data collected on the plots; details are contained in the Monitoring Type Description Sheets (Dennett et al. 1998). Once plots are established and burned, staff read them annually. The analysis of these data yields fuel loads by size class and canopy location (tons/acre), species lists, species composition (percent of each species by number of individual plants), and percent cover of grass and brush. The Chief of Resources Management/Fire Management Officer analyzes and interprets data and suggests changes to the prescriptions and objectives based on results as well as determines whether specific objectives have been achieved. This monitoring, in conjunction with fuel moisture and weather data, has clarified relationships between relative humidity and fuel

moisture in different vegetation types and helped optimize timing of prescribed burns. These vegetation plots also track invasive plant species in the monument. Analyses of these fire effects monitoring plots may be found in the Resource Management Office at the monument. Appendix G is the Fire Monitoring Plan as required by RM-18 Chapter 11.

Routine Monitoring

The Chief of Resources Management/Fire Management Officer and Biological Science Technician collect daily weather and weekly air quality and fuel moisture readings. These data allow for correlation of precipitation and fuel moisture levels and reveal the time lags between precipitation events and moisture uptake in different vegetation types. The data are critical to determining whether prescribed burns can proceed or wildland fire use is feasible. Staff monitors moisture content of beargrass *(Nolina microcarpa)*, pointleaf manzanita *(Arctostaphylos pungens)*, alligator juniper *(Juniperus deppeana)* or Arizona cypress *(Cupressus arizonica)*, oaks (any of the *Quercus* species) and litter and duff by collecting samples and measuring the difference between fresh and dry weights. A moisture probe is used to get readings on 100-hr (1-3 in) and 1000-hr (3-8 in) fuels.

Monitoring of weather and fire behavior during prescribed burns is discussed in Chapter IV under Prescribed Fire.

Compliance Monitoring

Three monitoring projects that follow recovery plan protocols (USFWS 1995) help protect threatened Mexican spotted owls:

- Annual owl censuses are conducted during the March through August breeding season. Surveyors use vocalizations to attract birds.
- Staff measures vegetation structure characteristics on owl PAC microhabitat plots annually or post-burn. Data characterize forest structure for comparison with recovery plan habitat specifications: tree species, tree dbh, brush density by species, dead and down component composition by size class.
- Small mammal surveys are conducted within the MSO PACs preburn and postburn to determine effects of fire on MSO prey species. Rodent censusing began in the summer of 2002 near the microhabitat plots as a way to assess owl food supply. Live trapping is timed for before and after birthing season (pre-monsoon and late summer, respectively).

Annual bat surveys and Palmer's agave plot readings support protection of the endangered lesser long-nosed bat. A week-long mist-netting session censuses all bat species twice a year, once around April (dry season) and once around August (wet season). Monument resource and fire staff set up 10 2x30 m belt transects in 1998 and 3 more in 1999 to determine effects of prescribed burns on Palmer's agave. Plots will be read for at least five years to assess whether the burn program meets the 20% agave mortality limit set by USFWS. Data collected include number of agaves by size class, number of flowering agaves, number killed by non-fire events, recruitment, and presence/location of exotic Lehmann lovegrass.

Cultural Resources Monitoring

For prescribed burns archeological surveys will be conducted preburn on areas designated for handline construction. Archeologists will discuss changes to line location with the Chief of

Resources Management/Fire Management Officer if cultural resources will be impacted by the current line location. Postburn surveys may be conducted as necessary. For wildland fires, an archeologist may be requested to advise on line location and other operations that may impact cultural resources.

Air Quality and Smoke Management

As required, monument weather and air quality before and during a prescribed fire are tracked. Chiricahua National Monument records data using: (1) the National Trends Network (NTN) monitor, which measures particulate matter, acid precipitation and ozone, and takes meteorological data such as wind, temperature, and relative humidity; (2) the Interagency Monitoring of Protected Visual Environments (IMPROVE), which measures fine particulates, and (3) the dioxin monitor. All this equipment can detect smoke, which aids in the monitoring process for fire management.

Table VI-1. FMH Monitoring Plot Data Collection.
Vegetation type abbreviations: P = Pine with mixed conifers and hardwoods; O = Mixed oaks; M = Manzanita shrub community; G = Mixed grasses with minor shrub-tree component

Feature	Plot Size	Data Collected	Vegetation Type
overstory	50x20 m	species ID, dbh, live/dead; canopy location, damage	P, O
pole-sized	25x10 m	species ID, dbh, height, live/dead	P, O
brush	50x2 m	species ID, seedling/mature/resprout, live/dead	P, O, M, G
herbs	50-m point intercept	species ID, height, live/dead	P, O, M, G
dead and down	4 50-ft line intercept	tons/acre litter, duff, all sizes of woody material; 1, 10, 100, 1000-TLFM classes	P, O
seedling	5x10 m	species ID, height, live/dead	P, O
photos	8 photo points		P, O
photos	2 photo points		M, G

Preburn baseline:

- Collect weather data at 1300 hours daily for 30 days prior to ignition.
- Collect weather data every 2 hours from 8 am to 6 pm for 5 days prior to ignition, if feasible.
- Collect air quality data on Tuesdays at the Air Quality Monitoring Station.
- Release pilot balloons at the burn site the day of ignition to verify wind speed, direction, stability, and transport winds.

During burns, monitors will record and report hourly observations of plume height, direction of smoke travel, and visibility every 15 to 30 minutes.

Chiricahua National Monument is designated as a Class 1 airshed and will comply with all the requirements of the Clean Air Act. Identified smoke sensitive areas include the headquarters area and the community of Whitetail. Adverse smoke events will be minimized by conducting small-scale ignitions to reduce particulate amounts during a burn period and ensuring favorable

transport winds to disperse smoke away from sensitive areas. In addition, as many of the smoke mitigation measures as listed on the smoke permit form from ADEQ/AQD will be implemented.

To date, smoke has not been a concern at Chiricahua National Monument. Prescribed fires are often small in size and maintain rapid smoke dispersal. The monument's location in a rural county and at a higher elevation than much of the surrounding territory makes smoke management an easier task than in some other areas. Additionally, the prevailing southwesterly winds during the summer months tend to disperse smoke into the sparsely populated San Simon Valley to the north and east.

A good working relationship between the NPS and interstate, state, and local air quality officials and neighboring land management agencies helps assure that both air quality control and fire management objectives are met with the least amount of conflict. When notified by the state that an air pollution violation has occurred, resource managers work with the state and provide them with a compliance plan and schedule. The regional office air quality coordinator will be notified, and the AQD will be contacted if and when technical assistance is required.

Chapter VII
Fire Research

Chapter III summarizes the fire history studies conducted at the monument and elsewhere in the Chiricahua Mountains in recent years (Swetnam et al. 1989; Barton 1996; Kaib et al. 1996; Seklecki et al. 1996; Baisan and Morino 1999). This research documented frequent fire in the area before settlers arrived to stay in the late 1800s.

Current Research

Work continues at the monument to document vegetation changes over time. Alan Taylor and students from the University of Pennsylvania (Taylor 2002) have been using historical aerial photos to measure shifts in cover types that may be partly explainable by decades of fire suppression (Table VII-1). Results show marked decreases in open-canopy woodland and chaparral and increases in closed-canopy woodland and chaparral.

Monument staff have set up fire effects plots in the Sierra los Ajos just south of the border in Sonora where fire suppression has historically been minimal. Results from the Chiricahua and Sierra los Ajos plots allow comparison of forest structure under the two regimes (20^{th}-century suppression versus frequent fire). Generally, forests have more open canopies with more fine fuels in the understory on the Sierra los Ajos plots.

Bret Pasch and John Koprowski of the University of Arizona began a study of fire effects on the Chiricahua fox squirrel *(Sciurus nayaritensis chiricahuae)* in the spring of 2002. Tree squirrels are model organisms for studying the effects of fire due to their dependence on mature forests for food and nest sites. The investigators are radiotracking squirrels across a continuum of historical fire regimes that include fire-suppressed canyon bottoms, plots of prescribed burns, and remnants of an 80-ha wildfire. At this writing, animals outside fire-impacted areas had greatly inflated ranges (males = 24.7 ha, females = 12.0 ha) relative to conspecifics within areas of prescribed

fire. Squirrels did not use the area impacted by the wildfire. Squirrels appear to respond to condition-dependent characteristics of fire regimes and may respond best to prescribed fires; such fires may burn cooler and maintain edible seed banks and fungi or cover that better meet the requirements of Chiricahua fox squirrels**.** Squirrel use of fire-impacted areas will enable managers to assess the impact of fire on a mature forest specialist and develop informed conservation strategies.

Matt Goode of the University of Arizona began a study of fire effects on the banded rock rattlesnake *(Crotalus lepidus klauberi)* in the fall of 2002 and is in the preliminary stages of the research. This project may expand to examine fire effects on other terrestrial species, including mammals.

Fire Program Research Needs

The monument intends to pursue or continue pursuing the following investigations in order to refine and properly implement the fire management program:

- Study effects of the non-native Lehmann lovegrass *(Eragrostis lehmanniana)* on native plant populations and the natural fire regime.
- Continue the comparative study of fire ecology in the Ajos-Bavispe Forest Reserve in Mexico (without a history of suppression) with the monument.
- Document changes in hydrology caused by fire suppression.
- Conduct a monument-wide archeological inventory.
- Update the vegetation map (scheduled for 2003-2004).
- Continue to monitor both monument PACs for the presence of Mexican spotted owls, survey additional areas where prescribed burning will occur, survey the two PACs on USFS land nearby, and conduct surveys on other USFS lands as needed.
- Continue to study the effects of prescribed fire on Palmer's agave (*Agave palmeri*).

Table VII-1. Changes in Cover Types from 1935 to 1993 from Taylor (2000).

Type	Coverage in 1935	Coverage in 1993	Change (% of total park acres)
grassland	4.8%	3.9%	–0.9%
savanna	4.9%	4.2%	–0.7%
savanna/rocky	0.2%	0.1%	–0.1%
open woodland	18.1%	10.7%	–7.4%
open woodland/rocky	2.3%	1.8%	–0.5%
closed woodland	43.2%	52.9%	+9.7%
open chaparral	14.6%	10.6%	–4.0%
closed chaparral	11.5%	15.6%	+4.1%
residential	< 0.1%	< 0.1%	--
barren	0.4%	0.3%	–0.1%

Chapter VIII
Public Safety, Information and Education

Keeping people safe and informed is a critical component of any fire operation at Chiricahua National Monument. Public safety and information rely on clear, directed, and frequent communications and relate directly to a number of FMP goals and objectives:

Goal 1: Make firefighter and public safety the highest priority of every fire management activity. Protect life, property, and resources from the unacceptable effects of unwanted wildfires and from fire management activities by providing for safe, aggressive suppression of wildfires.

Objectives:

- Provide for the safety of visitors, monument employees, and the firefighting team as the first priority through thorough planning and implementation of all fire activities.
- Ensure that fire personnel are appropriately qualified for the position they will hold, and ensure that these personnel promote the safe and skillful application of fire management strategies and techniques.
- Ensure that all personnel receive a safety briefing that covers all aspects of fire hazards, mitigation measures, goals and objectives, strategies and tactics, and fire weather and behavior.
- Assign a resource advisor to any fire with the potential to adversely affect sensitive resources.
- Minimize unacceptable effects of wildland fire suppression and burned area rehabilitation on natural and cultural resources by employing Minimum Impact Suppression Tactics and ensuring thorough planning and implementation of suppression tactics.
- Develop burn prescriptions and objectives that minimize unacceptable effects of prescribed fire on natural and cultural resources.
- Ensure that park staff, visitors and neighbors are informed of all planned and unplanned fire management activites that may affect them.
- Manage all wildland fire incidents in the most cost effective manner possible commensurate with values at risk.
- Assure safe, rapid response to wildland fires with trained and qualified personnel and equipment.
- Complete annual and regular preparedness reviews to assure program readiness.
- Ensure staff responsible for fire operations understands wildland fire standards, guidelines and policy.
- Maintain an effective fire prevention program that eliminates human-caused fires and minimizes threats to life and property.

Goal 5: Integrate fire program management into activities of all monument divisions.
Objectives:

- Openly communicate about fire activities with all monument divisions.
- Incorporate fire management tasks into all monument divisions.
- Keep the public informed about monument fire operations.
- Meet annually with monument division chiefs to discuss fire program management.

Goal 6: Manage fire cooperatively with adjacent land management agencies and private landowners.

Objectives:

- Keep interagency and cooperative agreements current and continue to collaborate on joint fire-management projects.
- Keep neighbors and the interested public informed about monument fire operations.

Public and Employee Safety

Public and employee safety is a primary management concern. The rugged topography, limited surface water, single access road, and confined developed area combine to create hazardous situations under extreme fire behavior. The highest risk area is the headquarters/visitor center/housing complex at the confluence of the Bonita Canyon and Rhyolite Canyon drainages. Entrapment is possible, especially when a fire starts near the entrance of the monument and blocks safe passage on the road. Vehicles may be cut off from exiting the monument or exposed to heat while trying to escape the canyon. Early evacuation of the public, employees and others from the canyon may be necessary under conditions of extreme fire behavior below the headquarters area. When the monument is fully staffed, the Superintendent will make the decision to evacuate, with the Chief Ranger supervising necessary actions.

Backcountry visitor safety during high to extreme fire danger is also a concern. Some of the trails are in canyon bottoms which are dangerous because of thick vegetation and steep slopes preventing acceptable escape routes. Alerting hikers of possible impending hazardous situations during wildfire incidents is critical to ensuring visitor safety. This operation requires careful coordination to ensure that all trails and sites are covered. The Chief of Resources Management/Fire Management Officer will make the decisions about restrictions, interpreters and rangers will inform the public, and the fire crew will take necessary implementation actions.

Visitors sometimes ignore warnings or are complacent about potential fire hazards and may wander through burned areas. Division staff members will inform visitors and employees of potential dangers, closures, and regulations in the course of daily contact. Resource managers and interpreters will design and display signs on monument trails and roads to provide current fire safety information to the public and redirect visitors to areas where the monument's resources can be enjoyed without the threat of fire danger, with assistance from law enforcement staff, if necessary.

Consistent, accurate monitoring and evaluation of fire behavior shall be the basis of developing contingency plans, contacts, and briefings that ensure public and personnel safety. All fires will be routinely monitored and evaluated for safety as conditions change. Field observers and the Chief of Resources Management/Fire Management Officer will monitor and evaluate low-complexity fires; fire behavior analysts will monitor high-complexity fires. If necessary, areas may be closed due to hazardous conditions. The Burn Boss will ensure that closure and informational signs on all prescribed fires are properly posted, and the Chief Ranger will enforce closures.

Public Information and Education

The focus for public education activities at Chiricahua NM is to provide information on (1) fire behavior and the danger imposed by fire, (2) the role of fire in fire-dependent ecosystems, (3) the goals and rationale for fire management in the monument, and (4) current and proposed fire activity within the monument. Interpretation helps generate public awareness and support for fire management at Chiricahua NM. The monument's efforts to inform and involve the public in fire management illustrate the recognition that public involvement is critical to program success.

One vehicle for dissemination of messages about fire is monument interpretive media. Informational handouts, brochures, exhibits, signs, news releases, and ranger-led discussions and presentations are all important tools for notifying and educating the local public and visitors about fire management at Chiricahua NM.

Monument staff will carry out the following public information and education tasks:

- The Chief of Resources Management/Fire Management Officer will daily inform the Visitor Center Interpreter about the status of fire(s) and management actions taken.
- The Visitor Center Interpreter will prepare and distribute news releases to local newspapers and radio stations during ongoing fires.
- The Visitor Center Interpreter will notify neighbors within 3 miles of the upcoming prescribed fires and provide relevant information during fire activity.
- Campground hosts will distribute informational handouts explaining up-coming prescribed fires to campground guests 48 hours prior to ignition.
- The fire crew will post signs at the park entrance informing the public about wildfires or prescribed fires. A more detailed informational display will be provided at the visitor center, with timely updates on fire status.
- Staff throughout the park will provide interpretive and safety-related information to visitors.
- The Superintendent, Chief of Resources Management/Fire Management Officer, and park rangers will discuss the wildland fire program during formal and informal contacts with other agencies, groups, and individuals.
- All employees will be made aware of and, as appropriate, become involved in the fire program in order to better understand and interpret it.
- The fire crew will inform the Visitor Center Ranger and the Entrance Station Ranger of the current fire danger rating. The Visitor Center and Entrance Station will post this fire danger rating.
- The fire management program and underlying ecological concepts will be incorporated into interpretive media. Particular attention will be given to these activities when fires and smoke are in view from visitor areas.

Local private landowners, neighboring land management agencies, and other stakeholders all play a role in fire management program success at Chiricahua NM. The following agencies and individuals will be notified when wildfires or prescribed fires are being planned or are in progress. The telephone numbers are on file at the monument:

- Forest Service, Coronado National Forest, Douglas District, Douglas
- Forest Service, Coronado National Forest, Supervisor's Office, Tucson (southeast Arizona zone dispatch)

- Bureau of Land Management, Safford District Office, Safford
- Southern Arizona Group Office, NPS, Phoenix
- NPS Southern Arizona Group FMO, Tucson
- NPS Intermountain Regional Office, Denver, CO
- Air Quality Division, Arizona Department of Environmental Quality, Phoenix
- Arizona State Land Department FMO, Phoenix
- Pearce/Sunsites Volunteer Fire Department
- Jim Riggs, Riggs Settlement, El Dorado
- Norma Lee Riggs, Riggs Settlement, El Dorado
- Billy Riggs, Oak Ranch
- Steve Amalong Ranch
- Ralph Pursley Ranch
- Chris Roll Ranch
- Ellerby Riggs Ranch
- Robin Riggs
- Wes Reeves
- The Range News, Willcox

Chapter IX
Protection of Sensitive Resources

Natural and cultural resources that may be particularly sensitive to fire program activities are either known to be directly affected by fire, or they are rare, have close ties with the identity of the monument, or are controversial in nature such that the fire program must address potential impacts on them. Documents prepared along with this FMP that deal with these issues include (1) the environmental impact statement, (2) a Biological Assessment prepared for USFWS that covers the Aplomado falcon, jaguar, lesser long-nosed bat, Mexican gray wolf, and Mexican spotted owl, and (3) a Cultural Resources Component for NHPA/sec 106 compliance.

This chapter reviews sensitive species and cultural resources individually. Resources discussed here cover Forest Service concerns for the zone of cooperation. The U.S. Fish and Wildlife Service, Arizona Department of Game and Fish, and Coronado National Forest contributed to the list of the plants and animals compiled in Table IX-1 and discussed below as possibly sensitive to fire management at Chiricahua National Monument. The SOAR archeologist assisted with the cultural resources analysis and compliance procedures. The monument consulted on this plan with four affiliated tribes.

Sensitive Plants

Apacheria chiricahuensis (Crossosomataceae)
Chiricahua rock flower inhabits crevices, ledges, and outcrops of mostly north-facing rhyolite and limestone cliffs (Bennett et al. 1996; Carter 1998). It occurs in widely scattered populations in southwestern New Mexico and in the Chiricahuas (Carter 1998). Bennett et al. (1996) list the plant from Picket Canyon, Hunt Canyon, and the Heart of Rocks trail in the monument. “The

cliffside habitats of this rare shrub offer considerable protection from human impacts" (Carter 1998). The plant is a recent discovery; Mason (1975) first described the monotypic genus.

Fire considerations: This plant should be minimally susceptible to fire because of its preference for rocky areas. Populations will be documented as discovered. Populations within burn units will be evaluated for maximum protection from fire.

Astragalus cobrensis var. *maguirei* (Fabaceae)
Coppermine milk-vetch occurs in "[s]hady canyons (near stream bottoms) and lower ledges both in full sun (often on rocky soils) and in the shade (found on more organic soils composed of leaf litter)" (Arizona Game and Fish Dept. 1999). The plant is found in pinyon pine/alligator juniper, alligator juniper/mixed oak, Apache pine/ponderosa pine, and transition communities. The canyon-bottom habitat makes it susceptible to human and natural disturbances. Bennett et al. (1996) report it from Bonita, East Whitetail, and Pinery canyons within and just outside the monument; type locality is Whitetail Canyon. Coppermine milk-vetch also occurs in the Peloncillo Mountains and possibly the Pinalenos.

Fire considerations: This plant's habitat benefits from fire. Care should be taken to survey prior to burns and make sure sufficient numbers can persist outside the burn areas. If the plant were present in the same habitats before the fire suppression era, it likely survived the low-intensity, mosaic-pattern burns assumed to characterize the earlier fire regime. Fire effects monitoring will detect population changes if plots contain coppermine milk-vetch.

Echinocereus ledingii (Cactaceae)
Pinaleno hedgehog cactus occurs in the mountains of southeastern Arizona between 4,000 and 7,400 ft elevation. It lives in cracks and crevices of rocks or in decomposed rock at the base of outcrops on 20-50º slopes, among boulders (Arizona Game and Fish Department 1998). It occupies openings in grassland, woodland, and chaparral habitats (Bennett et al. 1996). In the Chiricahua Mountains the cactus has been found in West Whitetail and Wood canyons.

Fire considerations: This plant should be minimally susceptible to fire because of its preference for rocky areas. Populations will be documented as discovered. Populations within burn units will be evaluated for maximum protection from fire.

Graptopetalum bartramii (Crassulaceae)
Bartram stonecrop grows in cracks on rocky outcrops along arroyos and canyons between 3,650 and 6,700 ft elevation (Arizona Rare Plant Committee 2001). Habitat is shrub live oak-grassland or in litter and shade in Madrean evergreen woodland (Arizona Game and Fish Department 2001). The succulent rosettes form small clusters; these perennial plants reproduce both via a flowering stalk and vegetatively. The plant is recorded from Coronado National Forest about one mile east of the monument boundary, near the ZOC.

Fire considerations: The plant's preference for rocky places should protect it from fire. Illegal collecting is the main management issue (Arizona Game and Fish Department 2001). Populations will be documented as discovered. Populations within burn units will be evaluated for maximum protection from fire.

Table IX-1. Rare and Protected Species at Chiricahua National Monument.

Species	ESA	USFS	BLM	WSCA	NPL
Accipiter gentiles Northern goshawk	SC	S		WC	
Apacheria chiricahuensis Chiricahua rock flower					SR
Astragalus cobrensis var. *Maguirei* Coppermine milk-vetch	SC	S			SR
Canis lupis baileyi Mexican wolf	E				
Choeronycteris mexicana Mexican long-tongued bat	SC	S		WC	
Echinocereus ledingii Pinaleno hedgehog cactus					SR
Empidonax fulvifrons Buff-breasted flycatcher	SC			WC	
Falco femoralis septentrionalis Northern aplomado falcon	E				
Falco peregrinus anatum American peregrine falcon	SC	S		WC	
Graptopetalum bartramii Bartram stonecrop	SC	S	S		SR
Hedeoma dentatum Mock-pennyroyal		S			
Hexalectris spicata Crested coral root		S			SR
Hexalectris warnockii Texas purple spike	SC	S	S		HS
Idionycteris phyllotis Allen's big-eared bat	SC	S			
Lasiurus blossevillii Western red bat				WC	
Leptonycteris curasoae yerbabuenae Lesser long-nosed bat	E				
Myotis ciliolabrum Western small-footed myotis	SC	S			
Myotis thysanodes Fringed myotis	SC	S			
Myotis velifer Cave myotis	SC	S			
Myotis volans Long-legged myotis	SC	S			
Panthera onca Jaguar	E				
Perityle cochisensis Chiricahua rock daisy		S			SR
Sciurus nayaritensis chiricahuae Chiricahua fox squirrel	SC		S		
Sigmodon ochrognathus Yellow-nosed cotton rat	SC				
Strix occidentalis lucida Mexican spotted owl	T			WC	

Federal ESA (Endangered Species Act)	BLM
E=listed endangered	S=sensitive (state office designation)
T=listed threatened	WSCA (Wildlife of Special Concern in Arizona)
SC=species of concern (unofficial status)	WC=wildlife of concern
USFS (Forest Service)	NPL (Arizona Native Plant Law)
S=sensitive (regional forester designation)	HS=highly safeguarded
	SR=salvage restricted

Hedeoma dentatum (Lamiaceae)
Mock-pennyroyal occurs in southeastern Arizona and northern Sonora, Mexico primarily in oaks, pine-oak woodland, and pines, but also semi-desert grassland (Arizona Game and Fish Department 2000). It is uncommon in sunny woodland clearings and wooded canyons on well-drained soils; at Chiricahua NM it is known to exist in Little Jesse James, Bonita, and Echo canyons (Bennett et al. 1996).

Fire considerations: This plant's habitat benefits from fire. Care should be taken to survey prior to burns and make sure sufficient numbers can persist outside the burn areas. If the plant was present in the same habitats before the fire suppression era, it likely survived the low-intensity, mosaic-pattern burns assumed to characterize the earlier fire regime. Fire effects monitoring will detect population changes if plots contain mock-pennyroyal.

Hexalectris spicata (Orchidaceae)
Crested coral root occurs in southeastern Arizona, southern New Mexico, Texas, and Coahuila, Mexico (Todsen and Spellenberg 1999). Bennett et al. (1996) call it a "saprophytic geophyte," while Todsen and Spellenberg (1999) describe its habitat as "…heavy leaf litter in oak, pine, or juniper woodlands over limestone." Bennett et al. (1996) place it in Jesse James Canyon "1/3 mi. south of the Chiricahua Nat. Mon. boundary." Two varieties (*spicata* and *arizonica*) of *Hexalectris spicata* occur in the monument (Coleman 2002).

Fire considerations: This plant's habitat benefits from fire. Care should be taken to survey prior to burns and make sure sufficient numbers can persist outside the burn areas. If the plant was present in the same habitats before the fire suppression era, it likely survived the low-intensity, mosaic-pattern burns assumed to characterize the earlier fire regime. Fire effects monitoring will detect population changes if plots contain crested coral root.

Hexalectris warnockii (Orchidaceae)
Texas purple spike is known from west Texas, southern New Mexico, southeastern Arizona, and Baja California, Mexico (Arizona Game and Fish Department 2001). For a long time, Rhyolite Canyon in the monument was its only known location in Arizona, but it has also been found in the Huachuca and Mule mountains (Arizona Game and Fish Department 2001). Bennett et al. (1996) state: "Population near Chiricahua National Monument headquarters in Rhyolite Canyon was apparently destroyed by past construction activities. A population nearby has apparently survived but is uncollected."

Fire considerations: While this plant's oak woodland habitat benefits from fire, Texas purple spike is known from one location near park headquarters and a second location about ¼ mi to the east, in areas that would be protected from fire under any fire management alternative.

Perityle cochisensis (Asteraceae)
Chiricahua rock daisy, apparently endemic to the Chiricahuas and Dos Cabezas mountains, lives on moist, north-facing cliffs between 5,500 and 7,000 ft elevation (Arizona Rare Plant Committee 2001). It occurs among oaks and cypresses and is known from the Organ Pipe and Echo Canyon Trail areas (Bennett et al. 1996).

Fire considerations: This plant should be minimally susceptible to fire because of its preference for rocky areas. Populations will be documented as discovered. Populations within burn units will be evaluated for maximum protection from fire.

Sensitive Animals

Accipiter gentilis

Northern goshawk is known to nest in pine-oak habitat in southeastern Arizona (Arizona Game and Fish Department 1996). It is listed as rare resident on Chiricahua bird list. Loss of nesting habitat—large, mature trees—is a concern of the Arizona Game and Fish Department.

Fire considerations: Prescribed burns and other fuels treatments should prevent high-intensity fires that might threaten large, mature trees. Low- or moderate-intensity fires should renew habitat for prey species. Mammal surveys getting underway in 2002 will test this hypothesis.

Canis lupis baileyi

Mexican gray wolves were eliminated from southwestern U.S. by around 1950 as a result of predator control programs. Historically the subspecies occurred in southeastern Arizona, southwestern New Mexico, southwestern Texas, and through the Sierra Madre of Mexico. Wolves inhabit oak and pine/juniper savannas in the foothills and mixed-conifer woodlands above 4,000 ft (USFWS 2001). The Mexican gray wolf was listed as endangered without critical habitat. An experimental population was introduced into the Blue River Primitive Area, located on the Apache-Sitgreaves and Gila National Forests, in the hopes of re-establishing the species.

Fire considerations: The wolves are not known to occur in the monument, but should any travel through the area, fire is not likely to directly affect them due to their great mobility. Indirectly, fire could reduce their cover in travel areas or corridors and locally reduce small mammal prey species in the short term.

Falco femoralis septentrionalis

The northern aplomado falcon was not seen in the U.S. between 1952 and 1997. It formerly occurred in Cochise County. Habitat is open grassland between 3,500 and 9,000 ft elevation. Conversion of grassland habitat to shrublands, overcollecting of the aplomado falcon, and DDT-induced reproductive failure explain its severe decline. A reintroduction program was initiated in south Texas beginning in 1993. “A small population has been confirmed in northern Chihuahua and Tamaulipas, Mexico, and several confirmed sightings have been made in New Mexico and Texas, but not Arizona, since 1995” (USFWS 2001). In 2002, at least one nesting pair is known to occur on a ranch in New Mexico.

Fire considerations: While Chihuahuan Desert grassland is potentially suitable habitat for this bird, the small (less than 1,000 acres total) of Lehmann lovegrass-dominated grassland patches in the canyon bottom or on hillsides are not likely to be used by any falcon that might fly to the monument, especially with more suitable Sulphur Springs Valley grasslands (about 900,000 ac) directly adjacent to the monument.

Falco peregrinus anatum

The American peregrine falcon was delisted in 1999 after recovering from a precipitous, post-World War II decline. DDT and other persistent organochlorines caused high rates of reproductive failure in the falcon that led to its listing as endangered in 1970. In the years prior to delisting, population target numbers were exceeded two-fold in Arizona (Federal Register 8-25-1999). It is currently considered a rare resident of Chiricahua National Monument (Fischer

2002); the falcon was resident in Bonita Canyon in 1979, upper Rhyolite in 1986, and Ancient Stream Bed in 1993. Peregrines feed on birds and occasionally bats hunted from the air. Ledges on cliffs are traditional nesting habitat, but since the 1980s, birds have nested on equivalent man-made structures in urban areas.

Fire considerations: Prescribed burns and other fuels treatments should prevent high-intensity fires in areas used by peregrines. Traditional nesting sites are relatively safe from fire. Low- or moderate-intensity fires should renew habitat for prey species.

Leptonycteris curasoae yerbabuenae
The lesser long-nosed bat is a federally listed endangered species that ranges from central Arizona and southwest New Mexico through Mexico to El Salvador. It feeds on nectar, pollen, and fruit of paniculate agaves and columnar cacti. Palmer's agave *(Agave palmeri)* in the monument is a locally important food plant. Its modern and historic ranges are equivalent; however, numbers of occupied roosts and individuals per roost have dropped dramatically (USFWS 2001). Roosts have not been found in the CNM. A transitory night roost has been identified in the old Kasper Mine Tunnel (T16S, R30E, Sec. 33) approximately 1 mile east of CNM/CNF border, just beyond the ZOC. More than 1000 bats are known to use this roost. Recent monitoring by the Forest Service has been limited and shows night use, though day use is also likely. This location is along the eastern flank of the Chiricahua Mountains, and it is likely that bats forage to the east where lower elevation grasslands and agave plants are nearer and more numerous. An unnamed mine shaft (part of Hilltop Complex) exists 1.5 miles east of monument-forest border; its use as a spring and summer migratory day roost dates back to at least the late-1960s.

There is another large colony roost seven miles east of the monument at lower elevation on private land, and a smaller colony roost site six miles north at the very northern end of the Chiricahua Mountains. There are no caves other than very small alcoves within the monument or these burn units. There are no roosts found in the abandoned mines in the area (King of Lead Mine, T16S, R30E, Sec. 18). Lesser long-nosed bats have been seen in small numbers at hummingbird feeders within the monument. It is probable that these individuals travel from the known roosts, or more distant sites, for nighttime foraging.

Fire considerations: Fire is not likely to directly affect any bats that may occur in the monument due to their mobility and active prevention of fire at cave and mine sites. Fire can indirectly affect the bats by destroying Palmer's agave (*Agave palmeri*). Where hot-burning, non-native Lehmann lovegrass is the dominant grass surrounding them, fire puts agaves at higher risk for destruction. Lower intensity burning, such as would occur in a grassland of native species, would not necessarily consume the plant. The monument has committed to the U.S. Fish and Wildlife Service to keep agave mortality from prescribed fire at less than 20% of the plants in any given location (see Chapter V, Lesser long-nosed bat foraging area subtreatments, under the [backcountry] FMU 2 description).

Panthera onca
The jaguar was listed as endangered in the United States in March 1972. Shooting, predator control, and habitat loss are thought to have reduced populations historically in the Southwest

(USFWS 2000). Individual jaguars have been seen and photographed infrequently in southern Arizona during the last few decades. Observers have spotted the cats in Sonoran desertscrub up through subalpine conifer forest; there was a 1996 sighting in Cochise County. It is possible jaguars may travel in and through the monument.

Fire considerations: Fire is not likely to directly affect jaguars due to their mobility. Fire could indirectly hamper their travel and deplete foraging cover, and a localized change in deer patterns on the landscape may occur as forage burns and re-sprouts later in the growing seasons following a fire.

Strix occidentalis lucida
Mexican spotted owl is distributed from central Mexico through the mountains of Arizona, New Mexico, and west Texas, and into southern Utah and Colorado. Most of the literature portrays preferred habitat as mature montane forest and woodland and steep canyons, but there are areas in the Southwest with owls that have different features—like pinnacles at Chiricahua NM. The Mexican spotted owl, one of three subspecies, is listed as threatened by both the USFWS and the Arizona Game and Fish Department. Chiricahua National Monument is included in the critical habitat designation; monument records from December 1973 to 1994 include a total of 21 spotted owl visual sightings or vocalizations. All of these occurred within the area now designated as the Shake Spring protected activity center (PAC). The result of these surveys in the monument indicate the strong possibility of a single resident female that uses the two designated PACs (Shake Spring and Echo Canyon).

Fire considerations: Fire is not likely to directly affect Mexican spotted owls due to their mobility. Smoke, heat, loss of owl prey species (due to loss of prey species habitat), and noise could have indirect effects. Smoke will be managed according to Arizona Department of Environmental Quality's (ADEQ) permit requirements. Fire operations must proceed with helicopter flights over PACs of 500 ft AGL during the nesting season (March through August). By conducting low-intensity prescribed fire, and managing natural ignitions to meet the low-intensity objectives in the fire use plan, (including ǂ appropriate fire prescriptions), the monument will minimize heat effects to known owls and their habitat. Resource advisors with knowledge of Mexican spotted owls must be onsite during burning operations and will participate in decisions relating to escaped prescribed fire and suppression actions. Loss of prey species will likely occur in burned areas for the first growing season, post-burn. Monsoon rains will allow grasses and forbs to grow, with small mammals fully expected to return to pre-burn numbers. Canopy closure in the habitat is expected to remain statistically similar after burning. (See Chapter III, MSO-PAC subtreatments, under the [backcountry] FMU 2 description.)

Sensitive Cultural Resources
Tables IX-2 through IX-6 itemize cultural resources at risk from fire activities and measures to minimize disturbance. The tables are organized by historic context—groups of resources characterized by specific time periods and people.

This matrix describes the cultural resources that are sensitive to fire program activities, specifies the particular aspects at risk, reviews what fire program activities create the risk, defines

protection objectives for these resources, and suggests methods to minimize or mitigate impacts in order to achieve the objectives.

Definitions of terms:
Historic contexts are the historic and prehistoric themes under which various resources were created and used. Individual resources are best understood and evaluated by understanding the roles they played within specific historical frameworks. In Table IX-1, the Pre-Apache context covers resources dating from before the arrival of the Apache around 1500.

Resource types represent general function or morphology. The exact function may not be known, especially for prehistoric resources. In Table IX-2, caves are a specific resource type that is the setting for a number of different elements.

Elements are the specific physical characteristics of resource types. Identifying the elements allows definition of specific *elements or values at risk* from various fire management activities. In Table IX-2, four specific elements under the cave resource type are listed: pictographs, lithic scatter, textile fragments, and pottery.

Risk conditions or activities are the specific environmental conditions and/or fire management activities that place particular resources at risk. In Table IX-2, ground disturbance, erosion, and fuel accumulation are listed as putting lithic scatters at risk.

Fire management objectives guide actions in a way that protects the elements or values at risk. Table IX-2 recommends suppressing fires and avoiding disturbance where textile fragments might be present in caves.

Treatments or prescriptions are methods of attaining the objectives. In Table IX-2, for fire-proof manos and metates, no special treatments or prescriptions are necessary.

Chiricahua National Monument Cultural Resources at Risk from Fire
Generated by Carrie Dennett, Brooke Gebow, Bill Halvorson, Kate Neilsen, and Alan Whalon 12-01; reviewed by Trinkle Jones 6-02 and 8-02; modified by Gebow and Whalon 9-02

Table IX-2. Historic Context: Pre-Apache

Resource Type	Elements	Elements or Values at Risk	Risk Conditions or Activities	Fire Management Objective	Treatments or Prescriptions
Caves	pictographs	date contamination, feature integrity, interpretive value	heat, soot, combustible vegetative material (loss of screening), retardant drop	suppression, fuel reduction	construct line
	lithic scatter	date contamination, spatial arrangement	ground disturbance, erosion, fuel accumulation	allow low- to moderate intensity fire, avoid ground disturbance	thin fuels, restrict suppression activities
	textile fragments	feature integrity	heat, soot, ground disturbance	suppression, avoid disturbance	thin fuels, restrict suppression activities
	pottery	feature integrity	heat, soot, ground disturbance	suppression, avoid disturbance	thin fuels, restrict suppression activities
Pictographs	pictographs	date contamination, feature integrity, interpretive value	heat, soot, fuel accumulation	suppression, reduce fuels	thin fuels, construct line
Villages	mano & metate	none	none	allow to burn	none
	irrigation system	feature integrity	ground disturbance, erosion	allow low- to moderate intensity fire, avoid disturbance, reduce fuels	thin fuels, avoid line construction
	lithic scatter	date contamination, spatial arrangement	ground disturbance, erosion, fuel accumulation	allow low- to moderate intensity fire, avoid disturbance	thin fuels, restrict suppression activities
	rock mounds	spatial arrangement, interpretive value	ground disturbance, erosion, combustible vegetative material (burning roots)	allow low- to moderate intensity fire, avoid disturbance	thin fuels, restrict suppression activities
work sites	lithic scatter	date contamination, spatial arrangement	ground disturbance, erosion, fuel accumulation	allow low- to moderate intensity fire, avoid disturbance	thin fuels, restrict suppression activities

Table IX-3. Historical Context: Apache (1500–1887)

Resource Type	Elements	Elements or Values at Risk	Risk Conditions or Activities	Fire Management Objective	Treatments or Prescriptions
caves	baskets and other combustibles	radiocarbon date contamination, feature integrity, interpretive value	smoke and hazard fuels	avoid ground disturbance	restrict suppression activities in caves, mechanically reduce fuels around mouth
	pottery	radiocarbon date contamination, spatial arrangement	heat, soot, ground disturbance	avoid disturbance	restrict hand lines
	rock art	radiocarbon date contamination, feature integrity, interpretive value	smoke and hazard fuels	avoid ground disturbance	restrict suppression activities in caves, mechanically reduce fuels around mouth
	middens with perishable contents	radiocarbon date contamination, feature integrity, interpretive value	smoke and hazard fuels	avoid ground disturbance	restrict suppression activities in caves, mechanically reduce fuels around mouth
villages	combustibles	feature integrity, vegetative identification	combustible material	avoid ground disturbance	restrict line construction
	stone tools, sherds	feature integrity, dating	heat, soot, combustible material	suppression	line construction
work sites, limited activity sites	lithic scatter	date contamination, spatial arrangement	ground disturbance, erosion, fuel accumulation	allow low- to moderate intensity fire, avoid disturbance, protect from erosion	thin fuels, restrict suppression activities unless slopes > 15%
Springs	vegetation, hydrology	radiocarbon date contamination, spatial arrangement	ground disturbance, vegetation change	regular burning	none

Table IX-4. Historical Context: Early Anglo-Military-Mining (1845–1903).

Resource Type	Elements	Elements or Values at Risk	Risk Conditions or Activities	Fire Management Objective	Treatments or Prescriptions
Mines	adits/shafts	timbers	hot fires near timbers, otherwise little risk once mapped	fuel reduction if timbers at risk	thin fuels near entrance
	tailings	none unless contaminated with volatile elements	ground disturbance	allow fires	restrict ground disturbance
	rock foundations	feature integrity	ground disturbance	avoid disturbance	restrict suppression activities
	trails/roads	feature integrity	erosion	avoid ground disturbance until well-mapped and significant sample saved	restrict suppression activities
	wells	feature integrity	erosion	avoid disturbance	restrict suppression activities
	wood & metal mining tools	dating/information, interpretive value	fuel accumulation, combustible material	suppression	thinning, restrict suppression activities
Buffalo Soldier camp	stone/concrete monument base	feature integrity	ground disturbance, erosion, intense heat	suppression	restrict line construction
	stone sentry posts	feature integrity	soot, heat, ground disturbance	allow low-intensity fire	restrict suppression activities
	viewscape	historic viewscape	loss of vegetation, vegetative type conversion	control severity of fire	time prescribed burn for lower intensity seasons
	tree stumps	loss	combustible material	suppression	avoid disturbance
Stafford Cabin cultural landscape	bottles/cans (dump)	feature integrity	heat, soot	reduce fuels, suppress, avoid ground disturbance throughout site	protect whole area with a buffer and thinning, restrict ground disturbance
	irrigation ditches	feature integrity	ground disturbance, erosion		
	orchard	trees	loss or damage		
	cabin	historic structure	fire, heat, soot		
	well	feature integrity	erosion, ground disturbance		
	road	feature integrity	erosion		
	hot spring	feature integrity	soot, erosion		

Table IX-5. Historical Context: Faraway Ranch (1886–1979).

Resource Type	Elements	Resource at Risk	Risk Conditions or Activities	Fire Management Objective	Treatments or Prescriptions
Ranch	fences, corral	feature integrity, loss	fuel accumulation, flame, heat	reduce fuels, suppress, avoid ground disturbance throughout site	protect whole area with a buffer and thinning, restrict ground disturbance
	windmills	feature integrity, loss	fuel accumulation, fire		
	swimming pool	feature integrity	heat, erosion (deposition)		
	foundations	feature integrity	soot, ground disturbance		
	machinery/artifacts	feature integrity	fuel accumulation, heat, flames, ground disturbance		
	roads/trails	feature integrity	erosion	avoid ground disturbance	restrict suppression activities
	dump	feature integrity, loss	ground disturbance	avoid ground disturbance	restrict suppression activities
Landscape	orchard	loss of trees	fuel accumulation, heat, flames, ground disturbance	reduce fuels, avoid ground disturbance in these areas	protect whole area with a buffer and thinning, restrict ground disturbance; replace plantings as needed
	garden	loss	fuel accumulation, heat, flames, ground disturbance		
	ornamental plantings	loss	fuel accumulation, heat, flames, ground disturbance		

Table IX-6. Historical Context: Federal (1879–present).

Resource Type	Elements	Elements or Values at Risk	Risk Conditions or Activities	Fire Management Objective	Treatments or Prescriptions
Forest Service	boundary markers	feature integrity	ground disturbance	suppression	restrict ground disturbance
CCC Camp	trail/road	feature integrity	erosion from ground disturbance	allow low- to moderate intensity fire, avoid ground disturbance	restrict line construction, rehab for erosion
	foundation	feature integrity	ground disturbance	allow low- to moderate intensity fire, avoid ground disturbance	restrict ground disturbance
	dump/bottles & cans	feature integrity, loss	ground disturbance	allow low- to moderate intensity fire, avoid ground disturbance	restrict ground disturbance
	powder magazine building	feature integrity	ground disturbance, fire	suppression, avoid disturbance	thin fuels, use retardant
CCC works	buildings	feature integrity	fuel accumulation, flame, heat	suppression	thin fuels
	road	feature integrity	erosion from ground disturbance	allow low- to moderate intensity fire, avoid ground disturbance	thin fuels, restrict line construction, rehab for erosion
	trail system	feature integrity	erosion from ground disturbance	allow low- to moderate intensity fire, avoid ground disturbance	thin fuels, restrict line construction, rehab for erosion
	campground	integrity, viewscape	fuel accumulation	allow low- to moderate intensity fire, avoid ground disturbance	thin fuels, restrict line construction, rehab for erosion
Mission 66	houses	integrity	fuel accumulation, heat, flame	suppression	apply full suppression
	visitor center	integrity	fuel accumulation, heat, flame	suppression	apply full suppression
	natural bridge trail	feature integrity	erosion	suppression, avoid ground disturbance	thin fuels, restrict ground disturbance

Chapter X
Fire Critiques and Annual Plan Review

RM-18 Chapter 13 provides detailed instructions relative to fire critiques and the annual review of the FMP.

Incident Critiques

Table X-1 describes types of critiques. The Superintendent may call for reviews of wildland fires, fire-related incidents, and prescribed fires (as deemed appropriate) in order to:

- confirm or correct decisions
- identify improved procedures
- apply lessons learned to the fire management program
- improve prescriptions and burn objectives for prescribed and fire use fires
- understand anomalous incidents and deal with possible negligence.

All situations resulting in human entrapment, fatalities, or serious injuries (or had the potential to do so) require reviews. It is the intent of reviews to resolve operational issues, not impose punitive actions.

Program Reviews

Program-level reviews fine tune the monument's management of fire:

- to assure compliance with NPS standards (operations evaluations)
- after an unusual fire season (fire program review)
- for budgetary purposes (annual FIREPRO review)
- to assure continued preparedness (annual and periodic, in-depth preparedness reviews)

The monument will try to schedule fire program and periodic preparedness reviews concurrently such that a single team can most efficiently do both.

Table X-1. Types of Fire Critiques. See RM-18 Chapter 13 for more detailed instructions.

Critique/Review	When Conducted	Who Conducts/Convenes
Hotline review	during on-going fire incident	FMO or person with FMO responsibilities
Incident management team (IMT) closeout and review	after fire incident before release of IMT	Superintendent
Park level review	after fire incident	Superintendent
Regional level review	after controversial fire incident	Regional FMO
National level review	after fatal or nationally significant fire	National FMO
Entrapment and fire shelter deployment review	after entrapments and fire shelter deployments	Regional FMO

Chapter XI
Consultation and Coordination

The preparation of this fire management team and associated compliance documents (environmental impact statement, biological evaluation, cultural resources component) involved much interaction among many parties. Members of the inter-disciplinary team, in particular Carrie Dennett, Brooke Gebow, and Alan Whalon, met frequently between October 2001 and June 2004.

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Appendix A

ANNUAL OPERATING PLAN
Between
USDA FOREST SERVICE
REGION 3
CORONADO NATIONAL FOREST
DOUGLAS DISTRICT
And the
USDI NATIONAL PARK SERVICE
CHIRICAHUA NATIONAL MONUMENT

This WORK PLAN is hereby entered into by and between the USDA Forest Service/Coronado National Forest/Douglas District, hereinafter referred to as the Forest Service, and the USDI National Park Service, Chiricahua National Monument, hereinafter referred to as the PARK SERVICE under the provisions of the Protection Act of 1922 (16 U.S.C. § 594), Reciprocal Fire Protection Act of May 27, 1955 (69 Stat. 66; 42 U.S.C. § 1856A), Federal Land Policy and Management Act of 1976 (43 U.S.C. § 1702), the National Park Service Organic Act of August 1916 (16 U.S.C. § 1), and the Federal Wildland Fire Policy (2001).

A. INTRODUCTION:

The purpose of this Operating Plan is to facilitate the interagency management of wildfire suppression activities, wildland fire use planning/implementation, and presrcribed fire planning/implementation on PARK SERVICE land and adjacent FOREST SERVICE land in and around Chiricahua National Monument. This Operating Plan allows the sharing of resources for wildfires, wildland fire use fires, and prescribed fires as well as for planning for these activities in an interagency setting. Both the FOREST SERVICE and the PARK SERVICE have responsibility for fire management activities and for the suppression of wildfires at minimum cost consistent with land and resource management objectives within their respective agency. The Chiricahua Mountains include lands under Federal jurisdiction and both the FOREST SERVICE and the PARK SERVICE manage public lands adjacent to or in close proximity to each other, shown on the attached map as the Zone of Cooperation (ZOC). An Interagency Fire Management Plan has been written and will be the mechanism for the planning and implementation of fires in the ZOC. Federal fire management programs must lead to more productive cooperation and efficient operations on a geographical basis between these agencies.

B. PURPOSE:

This instrument is entered into for the purpose of documenting a framework of cooperation between the parties on all aspects of wildland fire management in the areas of mutual interest and to execute responsibilities and duties. Such cooperation will benefit lands under federal jurisdiction, the Agencies, local landowners and the public.

C. STATEMENT OF MUTUAL BENEFIT AND INTERESTS:

Both the FOREST SERVICE and PARK SERVICE are land management agencies responsible for public lands and are dedicated to the management, conservation, and protection of the Nation's natural resources. This Operating Plan will aid the PARK SERVICE and the FOREST SERVICE in the achievement of each Agency's land management objectives. The cooperation and coordination between the two agencies will hep provide for a more economical and efficient means of prescribed fire management planning, fire use, and fire suppression of the area.

In consideration of the above premises, the parties agree as follows:

D. FOREST SERVICE SHALL:

1. Notify the PARK SERVICE as soon as possible after detection of any wildfires occurring within the ZOC. Notification will be made via telephone or radio to the appropriate PARK SERVICE office. Upon declaring the fire out, the FOREST SERVICE will provide the appropriate PARK SERVICE office with all the pertinent information required for the PARK SERVICE fire report.

2. Keep the PARK SERVICE informed of any prescribed fires planned in the area that may involve lands within the ZOC.

3. Review, evaluate, and provide comments to PARK SERVICE prescribed fire plans in a timely fashion and provide input and resources as available and applicable.

4. Assist the FOREST SERVICE in prescribed burn projects when requested as appropriate and as resources are available.

E. PARK SERVICE SHALL:

1. Notify the FOREST SERVICE as soon as possible after detection of any wildfires occurring within the ZOC. Notification will be made via telephone or radio to the appropriate FOREST SERVICE office. Upon declaring the fire out, the PARK SERVICE will provide the appropriate FOREST SERVICE office with all the pertinent information required for the FOREST SERVICE fire report.

2. Keep the FOREST SERVICE informed of any prescribed fires planned in the area that may involve any lands within the ZOC.

3. Review, evaluate, and provide comments to FOREST SERVICE prescribed fire plans and evaluations in a timely fashion and provide input and resources as available and applicable.

4. Assist the FOREST SERVICE in prescribed burn projects when requested as appropriate and as resources are available.

F. STATEMENT OF WORK

1. Staffs from either organization will be available for assignment as members of fire suppression crews/teams on Forest Service or Park Service lands.
3. The Forest Service and the Park Service will take appropriate suppression action (based on area Fire Management Plans, RM-18 (Wildland Fire Management Guidelines), DO-18 (Wildland Fire Management Director's Order), Section 5100 of the Forest Service Manual, and existing conditions in the area of the fire) on all fires occurring within their jurisdictions and in the ZOC in a timely, but safe manner. When location is in doubt or when requested by the other agency, the suppression action will be made by the agency with the closest available forces.
4. All Incident Commanders will be fully qualified for the scope and/or level of complexity for each wildfire event. In the event that the scope and/or complexity of a wildfire exceed the capabilities of the Initial Attack Incident Commander, that person shall remain in charge of the fire until properly relieved by a fully qualified Incident Commander of the same level or higher. If the relieving Incident Commander is from a different agency than the fire location, the agency with jurisdictional authority will appoint an Agency Representative to make agency-related decisions/recommendations to the Incident Commander.
5. A unified command will be established for large fires which cross their common boundaries.
6. Fires originating on the lands of one agency and discovered by personnel from the other agency will be reported immediately to the Southeast Arizona Zone Coordination Center (SEZ). SEZ will notify appropriate personnel for action.
7. Daily fire weather will be made available as appropriate by both agencies. Weather stations will be in locations and numbers determined by individual agency needs. Weather data will be available on request from either agency. This data may be provided as a general weather forecast, fire weather forecast (normally broadcast daily by the Zone Coordination center), spot weather forecast, and general weather records. Requests will be made through dispatchers, incident commanders, prescribed burn bosses, fire behavior analysts, or those delegated by the preceding individuals.
8. The Forest Service and the Park Service will advise each other when aerial detection patrols are ordered for the Chiricahua Mountains.
9. Fire Use fires will be allowed on Forest Service and Park Service lands as specified in the Interagency Fire Management Plan, and that Fire Use fires that may burn onto the other agency's land be authorized by both agencies.
10. Fire Use fires within the 5300 acre ZOC will be managed by the Park Service with approval by the Forest Service.
11. A Fire Use committee will convene to approve any Fire Use fires within the ZOC and/or fires that may influence the other agency's lands. The Fire Use committee for the ZOC will consist of two members of the Park Service staff (Superintendent and Resource Management Chief), and once member of the Forest Service staff (FMO, Wildlife Biologist, or District Ranger).

12. The Forest Service and the Park Service will make available personnel and equipment to assist with training and execution of prescribed burning projects on each other's lands, provided such resources are available.

G. IT IS MUTUALLY AGREED AND UNDERSTOOD BY ALL PARTIES THAT:

1. MODIFICATION. Modifications within the scope of the instrument shall be made by mutual consent of the parties, by the issuance of a written modification, signed and dated by all parties, prior to any changes being performed. Modifications may be made as needed; annual review of this Work Plan will be completed by March 1 of each year to determine currency and relevance.

2. TERMINATION. Any of the parties, in writing, may terminate the instrument in whole, or in part, at any time before the date of expiration.

3. PRINCIPAL CONTACTS. The principal contacts for this instrument are:

FOREST SERVICE Project Contact	PARK SERVICE Project Contact
Douglas D. Hardy, District Ranger	Alan Whalon, Superintendent
Douglas Ranger District	Chiricahua National Monument
3081 N. Leslie Canyon Road	13063 E. Bonita Canyon Road
Douglas, AZ 85607	Willcox, Az 85643
Phone: (520) 364-3468	Phone: (520) 824-3560 x202
FAX: (520) 364-6667	FAX: (520) 824-3421
E-Mail: dhardy@fs.fed.us	E-Mail: Alan_Whalon@nps.gov

4. COMMENCEMENT/EXPIRATION DATE. The instrument is executed as of the date of the last signature and is effective through **September 30, 2015,** at which time it will expire unless extended.

5. Each agency shall make direct settlement from its own funds for all liabilities it incurs under this Agreement.

6. Parties to this Agreement are not obligated to make expenditures of funds under terms of this Agreement unless such funds are appropriated for the purpose by the Congress of the United States, or are otherwise legitimately available under the annual Appropriations Acts. If some extraordinary emergency or unusual circumstance arises that could not be anticipated and that could involve expenditures in excess of available funds for the protection of life or property, the affected agency or agencies shall immediately seek

supplemental appropriations or permission for reprogramming to meet their respective shares of such emergency obligations.

IN WITNESS WHEREOF, the parties hereto have executed this WORK PLAN as of the last written date below.

USDI NATIONAL PARK SERVICE CHIRICAHUA NATIONAL MONUMENT	USDA FOREST SERVICE CORONADO NATIONAL FOREST
_____	_____
ALAN WHALON Superintendent	**DOUGLAS HARDY** District Ranger
_____	_____
DATE	DATE

Appendix B
Fire Effects on Vegetation at Chiricahua National Monument

Table 1. Pine with Mixed Conifer and Hardwoods: Fire Ecology of Species. FEIS is the Fire Effects Information System maintained by the USDA Forest Service that contains literature reviews: http://www.fs.fed.us/database/feis/. Asterisk (*) denotes observation by Chiricahua National Monument Staff.

Species	Fire Ecology/Adaptations	Source
Dominant trees (at least 20% of the overstory dominant stands or mixtures of these species)		
Pinus englemannii	Mature Apache pine endure most fires and become dominant when fire-susceptible species are eliminated. Species debarks.*	FEIS
Pinus leiophylla var. chihuahuana	Chihuahua pine endures and regenerates after fire due to thick bark, abundant seed production, delayed seed release from semi- serotinous cones, and sprouting potential, even in mature trees. When pine-oak woodland is burned, fire-enduring species such as Chihuahua pine survive to become dominant since the less tolerant species are eliminated.	Barton 1999; FEIS
Pinus arizonica	Debarks; has semi-serotinous cones.*	
Associated trees		
Arbutus arizonica	Arizona madrone's thin bark suggests the tree is damaged by fire; however, 8 fire scars were observed on a tree seen in the Chiricahuas. Madrone colonizes fire sites with seed from off-site. Resprouts.*	FEIS
Pinus discolor	Mexican pinyon seedlings and young trees are killed by low intensity fire. Mature trees are killed by high intensity fire. Plant reestablishes by seed cached by birds and rodents.	FEIS
Pinus edulis	Colorado pinyon is generally very susceptible to fire damage depending on stand structure and understory; it is absent from post-fire early successional stages. Seedlings establish primarily via the postburn food caches of birds and rodents; successful establishment requires a nurse plant.	FEIS
Pseudotsuga menziesii	Mature Rocky Mountain Douglas-fir is generally more fire resistant than spruces and true firs and equally or slightly less fire resistant than ponderosa pine. Mature trees can survive moderately severe surface fires because thick, corky bark insulates the cambium from heat damage. Where fire is frequent young trees don't survive. Low growing branches and flammable foliage make trees susceptible to crowning.	FEIS
Quercus arizonica	Arizona white oak sprouts from the root crown or stump following fire.	FEIS
Quercus emoryi	Emory oak is adapted to recurrent fires. It sprouts from the root crown or stump and grows vigorously following fire	FEIS

Species	Fire Ecology/Adaptations	Source
Quercus hypoleucoides	Silverleaf oak sprouts after fire; where fires are frequent and/or intense, above ground biomass is less than where fires are infrequent or not intense.	Barton 1999
Quercus rugosa	Netleaf oak resprouts after fire; top-survival was zero in a study of 4 oak species (survival of 5 cm dbh stems of *Q. hypoleucoides, Q. arizonica, Q. emoryi was* 20-60%).	Barton 1999
Shrub layer		
Arctostaphylos pungens	Pointleaf manzanita is an obligate seeder following fire, and prolific seed crops may be stored in the soil for decades. Seeds readily germinate following heat scarification. Layering observed.*	FEIS
Garrya wrightii	Wright silktassel sprouts from the root crown following top-kill by fire.	FEIS
Grasses		
Muhlenbergia emersleyi	Bull muhly coverage and frequency were reduced on 3-year-old burns but not significantly different on 6-7-year-old burns when compared with unburned partner sites.	Ahlstrand 1982
Piptochaetium fimbriatum	Susceptible to moderate to high intensity fire. Difficult to ignite due to high fuel moisture, but when ignited, usually kills plant. *	

Table 2. Mixed Oak: Fire Ecology of Species. Asterisk (*) denotes observation by Chiricahua National Monument Staff.

Species	Fire Ecology/Adaptations	Source
Dominants (at least 60% of the overstory)		
Quercus arizonica	Arizona white oak sprouts from the root crown or stump following fire.	FEIS
Quercus emoryi	Emory oak is adapted to recurrent fires. It sprouts from the root crown or stump and grows vigorously following fire.	FEIS
Quercus hypoleucoides	Silverleaf oak sprouts after fire; where fires are frequent and/or intense, above ground biomass is less than where fires are infrequent or not intense.	Barton 1999
Other species		
Cupressus arizonica	Low-intensity surface fires are lethal to Arizona cypress with stem diameters less than 4 inches (10 cm). Larger trees are also not very resistant to fire. Surface fires kill all seeds in cones on the forest floor. Leaves don't burn when dead.*	FEIS
Juniperus deppeana	Alligator juniper canopies are often high enough so that fires scorch but do not severely damage the crown. Bark also provides protection from fire. It is generally capable of prolific sprouting after aboveground vegetation is consumed by fire, particularly if the "resprouting zone" is covered by soil.	FEIS
Species	**Fire Ecology/Adaptations**	**Source**
Pinus	Mature Apache pine endure most fires and become dominant	FEIS

englemannii	when fire- susceptible species are eliminated.	
Pinus leiophylla var. *chihuahuana*	Chihuahua pine endures and regenerates after fire due to thick bark, abundant seed production, delayed seed release from semi-serotinous cones, and sprouting potential, even in mature trees. When pine-oak woodland is burned, fire-enduring species such as Chihuahua pine survive to become dominant since the less tolerant species are eliminated.	Barton 1999; FEIS
Quercus rugosa	Netleaf oak resprouts after fire; top-survival was zero in a study of 4 oak species (survival of 5 cm dbh stems of *Q. hypoleucoides, Q. arizonica, Q. emoryi was* 20-60%).	Barton 1999
Quercus turbinella	This oak typically resprouts vigorously from the root crown and rhizomes in response to fire or other disturbance. Postfire establishment by seed also occurs.	FEIS
Quercus gambelii	Gambel oak is a fire-adapted species. It responds to fire by vegetative sprouting from the lignotuber and rhizomes. Tree forms may survive low-severity fire	FEIS
Shrubs		
Arctostaphylos pungens	Pointleaf manzanita is an obligate seeder following fire, and prolific seed crops may be stored in the soil for decades. Seeds readily germinate following heat scarification.	FEIS
Acacia greggii	Catclaw acacia is fire-tolerant and can rapidly recover by sprouting even after repeated burns.	FEIS
Garrya wrightii	Wright silktassel sprouts from the root crown following top-kill by fire.	FEIS
Rhamnus californica ssp. *ursina*	Following fires which kill aerial stems, California coffeeberry sprouts vigorously from dormant buds located on the rootcrown, enabling it to rapidly reoccupy the initial postburn environment.	FEIS
Rhus spp.	Most species of sumac are very tolerant of fire due to a capacity for sprouting.	FEIS

Table 3. Manzanita Shrub Community: Fire Ecology of Species.

Species	Fire Ecology/Adaptations	Source
Predominant species		
Arctostaphylos pungens	Pointleaf manzanita is an obligate seeder following fire, and prolific seed crops may be stored in the soil for decades. Seeds readily germinate following heat scarification.	FEIS
Grasses		
Muhlenbergia emersleyi	Bull muhly coverage and frequency were reduced on 3-year-old burns but not significantly different on 6-7-year-old burns when compared with unburned partner sites.	Ahlstrand 1982

Table 4. Mixed Grasses with Minor Shrub/Tree Component: Fire Ecology of Species.

Species	Fire Ecology/Adaptations	Source
Grasses		
Bouteloua gracilis	When warm-season grasses such as blue grama are burned while dormant, living plant parts are often unaffected. Reestablishment occurs through rhizomes, which may be unaffected or even stimulated by fire, and by germination of wind-dispersed, water-dispersed, or animal-dispersed seed	FEIS
Bouteloua curtipendula	Response to fire depends on growth form, climatic conditions, season of burn, and severity of fire. Reestablishment occurs through seed and/or rhizomes. Recovery time is variable, but 2 to 3 years may be required	FEIS
Bouteloua hirsuta	Hairy grama cover was positively correlated with fire frequency in Minnesota; most studies conclude it is undamaged by fire following a season or two of depressed production.	FEIS
Bouteloua radicosa	Response to fire depends on growth form, climatic conditions, season of burn, and severity of fire. Reestablishment occurs through seed and/or rhizomes.	FEIS
Bouteloua repens	Response to fire depends on growth form, climatic conditions, season of burn, and severity of fire. Reestablishment occurs through seed and/or rhizomes.	FEIS
Eragrostis lehmanniana	Non-native Lehmann lovegrass seeds stored in the soil germinate abundantly post-fire, even after hot fires kill mature plants. Surviving plants frequently resprout. Post-fire densities can be higher than pre-fire. Recovery from fall burning slower than other seasons. Burns hot enough to kill shrubs.	FEIS
Shrubs (less than 40% cover)		
Acacia greggii	Catclaw acacia is fire-tolerant and can rapidly recover by sprouting even after repeated burns.	FEIS
Garrya wrightii	Wright silktassel sprouts from the root crown following top-kill by fire	FEIS
Ericameria	Turpentine bush showed little recovery two growing seasons after	Cable

laricifoloia	fire.	1973
Prosopis glandulosa	Honey mesquite plants are very tolerant of intense fires by the time they are 3.5 years of age. Mature plants contain numerous, dormant buds on an underground stem, generally located just below the soil surface, where they are sufficiently insulated from the heat of most fires. Following top-kill by fire, numerous sprouts arise from the underground buds.	FEIS

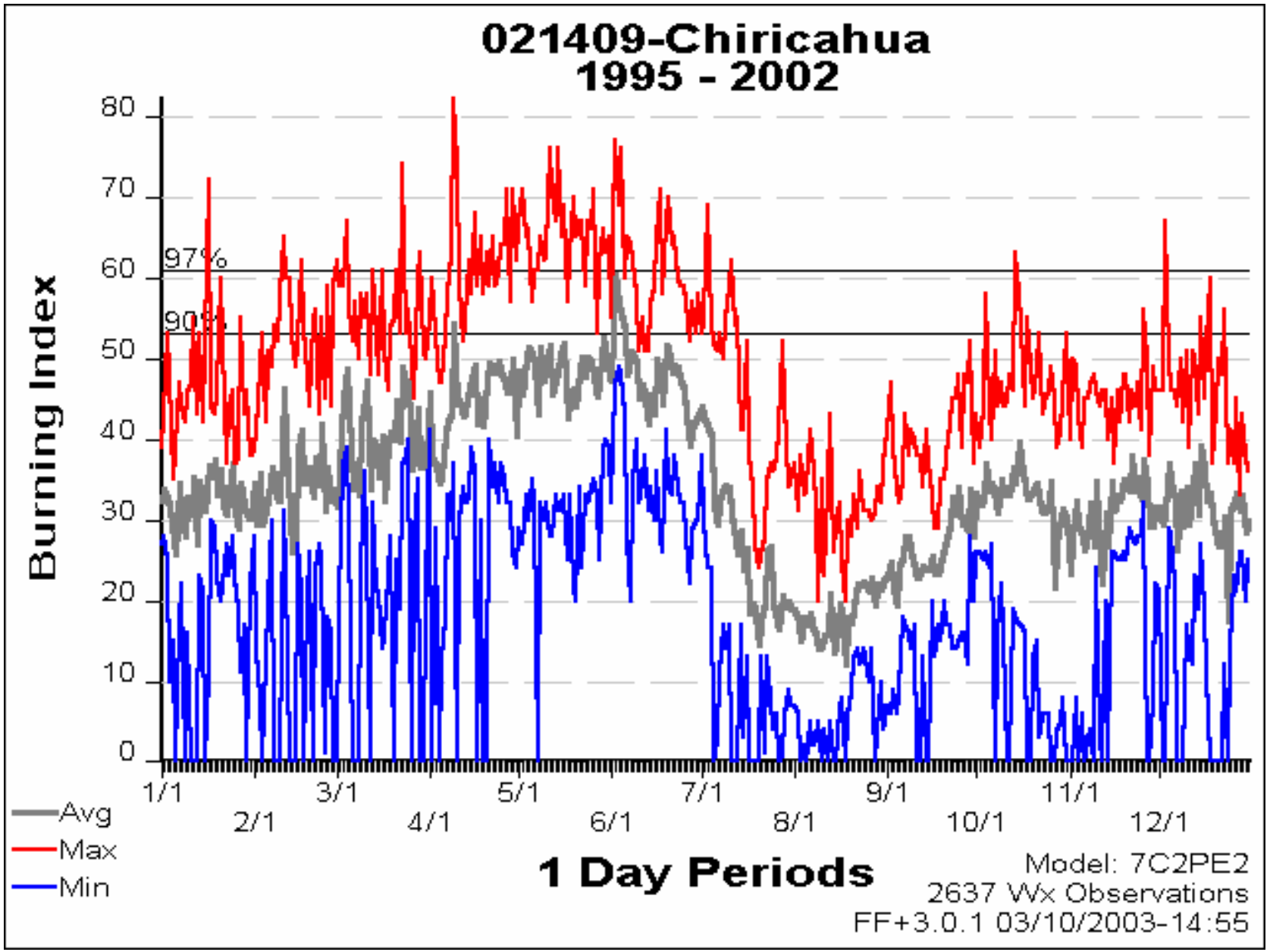
Appendix B References in addition to Fire Effects Information System:

Ahlstrand, G. M. 1982. Response of Chihuahuan Desert mountain shrub vegetation to burning. J. Range Manaegment 35:62–65.

Barton, A. M. 1999. Pines versus oaks: effects of fire on the composition of Madrean forests in Arizona. Forest Ecology and Management 120:143–156.

Cable, D. R. 1973. Fire effects in Southwestern semidesert grass-shrub communities. Proceedings of the Tall Timbers Fire Ecology Conference 12:109–127.

Appendix C
Burn Index and Energy Release Component


021409-Chiricahua
1995 - 2002
Burning Index
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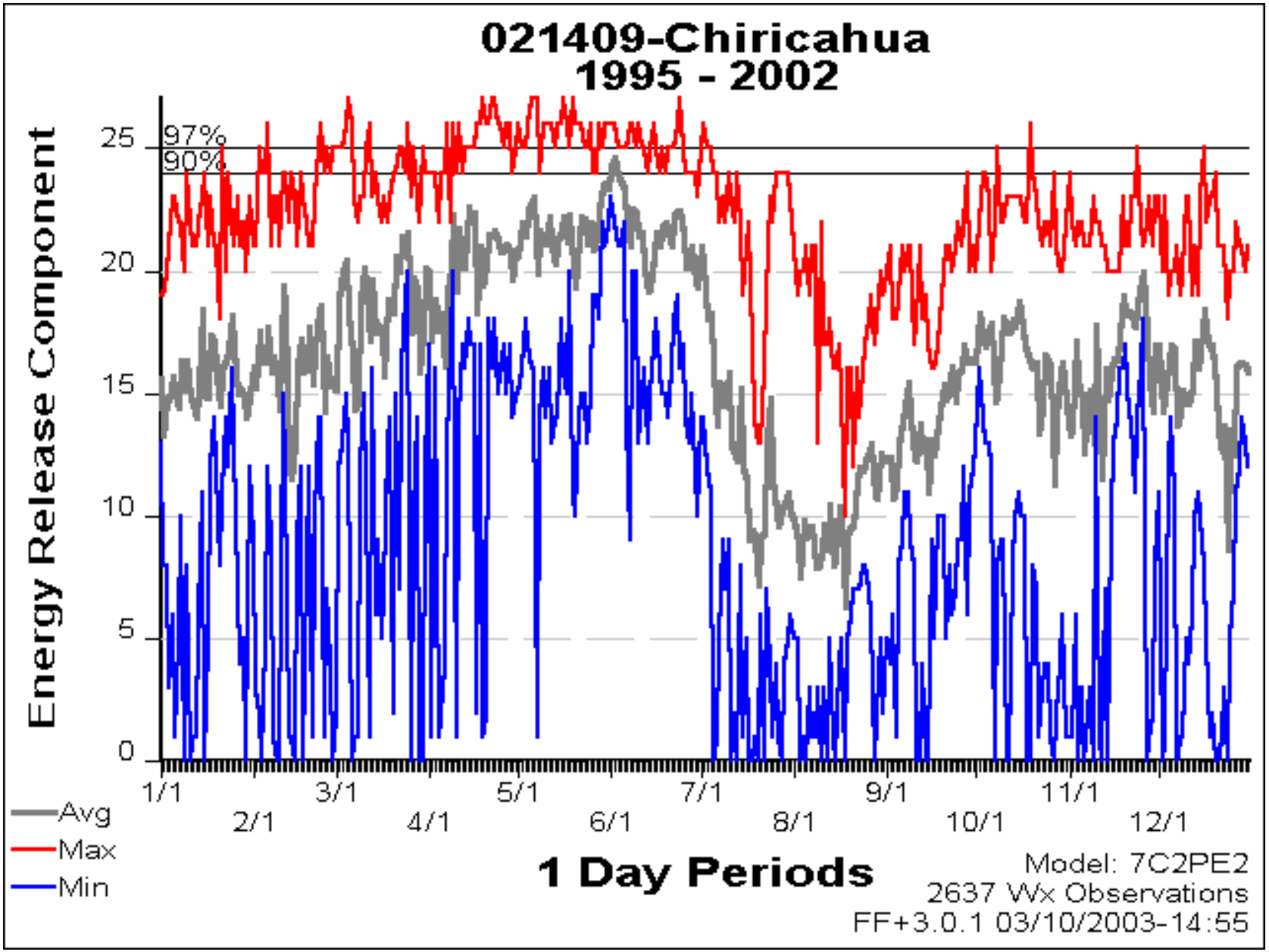
70
60
50
40
30
20
10
0
97%
90%
1/1
2/1
3/1
4/1
5/1
6/1
7/1
8/1
9/1
10/1
11/1
12/1
Avg
Max
Min
1 Day Periods
Model: 7C2PE2
2637 Wx Observations
FF+3.0.1 03/10/2003-14:55


021409-Chiricahua
1995 - 2002
Energy Release Component
97%
90%
25
20
15
10
5
0
1/1
2/1
3/1
4/1
5/1
6/1
7/1
8/1
9/1
10/1
11/1
12/1
Avg
Max
Min
1 Day Periods
Model: 7C2PE2
2637 Wx Observations
FF+3.0.1 03/10/2003-14:55

United States Department of the Interior
NATIONAL PARK SERVICE
Chiricahua National Monument
Fort Bowie National Historic Site
13063 E. Bonita Canyon Road
Willcox, Arizona 85643

Appendix D

Delegation of Authority

As of _____ I have delegated authority to manage the _____ Incident, number _____, Chiricahua National Monument/Fort Bowie National Historic Site, to Incident Commander _____ and his/her Incident Management Team.

My considerations for management of this incident are:

- Provide for firefighter safety
- Manage incident with appropriate suppression response actions that cause minimal resource damage
- Manage the fire cost-effectively for the values at risk
- Provide training opportunities for the park personnel and other cooperators to strengthen organizational capabilities
- Provide for minimum disruption of visitor access, consistent with public safety
- Key cultural features requiring protection are: **Faraway Ranch Historic District, Headquarters developed area, Bonita Campground, pictographs, cemetery, Geology Exhibit building, Sugarloaf Lookout**
- Key resource considerations are: **Mexican spotted owl habitat, riparian corridors, *Agave palmeri, Juncus balticus, Eleocharis rostellatus* species and their habitat, and avoiding wildlife entrapment situations**
- Restrictions for suppression actions are: **minimal or no tree cutting in Mexican spotted owl PAC, no dozers in park, no mechanized equipment in official wilderness except with Superintendent approval, use of fugitive retardant, flight restrictions to over 500 feet AGL over MSO PACs**

- Tools approved for use are: **handtools, chainsaws (only with Superintendent approval), helicopter with bucket capability (restricted to over 500 ft AGL over MSO PACs), air tanker, ignition devices**

- My Agency Advisor is the Chief of Resources Management/Fire Management Officer

_____ _____

Superintendent, CHIR/FOBO Date

Appendix E

Minimum Impact Suppression Tactics

General Discussion
Suppression tactics will affect the landscape, but following Minimum Impact Suppression Tactics (MIST) guidelines below can reduce the long-term impacts. Decision makers need to very carefully weigh long-term impacts against fire suppression safety issues. The following are MIST standards that will be used at Chiricahua National Monument.

Also refer to RM-18, Chapter 9, Exhibit 5.

General Tactical Standards
- Use procedures, tools, and equipment minimize effects on the environment. Resource advisors, operations chief, and logistics chief should be cognizant of any equipment being moved from a non-wilderness fire to a wilderness fire and make attempts to remove noxious weed seeds prior to use in the wilderness.
- If hose coming from a local unit's cache is contaminated with weed seeds, order fresh hose from the regional cache.
- Limb along the fireline only as essential for suppression and for safety.
- Clearing and scraping will be minimized.
- Snags or trees will be felled only when essential for control of the fire or for safety of personnel.
- Where possible, obtain on-site archeological clearance prior to line construction.

Firelining
- Consider using water as a fireline tactic.
- Fireline construction will be minimized by taking advantage of natural barriers, rock outcrops, trails, roads, streams, and other existing fuel breaks.
- Firelines will be the minimum width necessary to halt the spread of the fire and will be placed to avoid impacts to natural and cultural resources vulnerable to the effects of fire and fire suppression activities.
- Unburned material may be left within the final line.

In light fuels:
- Use cold trail line (constantly recheck).
- Allow fire to burn to natural barriers.
- Burn out and swatter.
- Construct minimum-depth and width fireline that checks fire spread.

In medium and heavy fuels:
- Use natural barriers and cold-trailing.
- Cool with dirt and water and cold-trail.
- Constructing minimum-depth and width fireline that checks fire spread.

- Minimizing bucking to establish fireline. Preferably move or roll material out of the fireline area and if not possible or if the downed log is already on fire, build line around the log and let it be consumed.

In aerial fuels, brush, trees, and snags:

- Minimize cutting of trees and snags. Consider allowing trees and snags to burn themselves out but also communicate safety consequences of such decisions to all affected.
- Avoid cutting live trees unless they will cause fire to cross fireline or endanger workers. If cutting is necessary, cut flush with the ground and camouflage the cut surface with soil or brush.
- Identify hazard trees with an observer, flagging, and/or glow-sticks.

When using indirect attack:

- Outside the fireline, fell snags only when they are an obvious safety hazard to crews working nearby.
- On the burn-out side of the line, fell only those snags that would reach the fireline should they burn and fall over. Consider alternative means to felling such as fireline explosives or bucket drops.

Terminating the Fire

- The route to the fire from the nearest trail or road will be flagged. Flagging will be removed by last person to leave the area.
- All equipment and debris will be removed from the area for proper disposal.
- Before leaving the fire, rehabilitation will be completed to eliminate impacts from suppression effort.

Mop-up/Restoration of Fire Area

- Consider infrared detection devices along perimeter.
- Slant saw cuts away from line of sight.
- Backfill cup trenches and scarify wide firelines.
- Place absorbent cloth under pumps to avoid spilling fuel on the ground.
- Minimize spading; restrict to hot areas near fire line or potential reburn areas only.
- Construct waterbars to prevent erosion.
- Use gravity socks in streams and /or a combination of water blivits and folda-tanks to minimize impacts to streams.
- Avoid use of materials with potential for spreading invasive exotics as sediment traps in streams.
- Place “boneyards” in a natural or random arrangement.
- Position cut ends of logs so as to be inconspicuous to visitors and camouflage where possible.
- Flush cut stumps, camouflage with soil and moss.
- Avoid use of rehabilitated areas as travel corridors.

Aircraft Helicopters

- Minimize use.
- Have the resource advisor monitor helispot construction.

- If helicopters are only needed to deliver and retrieve supplies or gear, consider using a long line remote hook in lieu of constructing a helispot.
- Use the minimum size helicopter needed for crew shuttling (that will still meet suppression objectives).
- Use natural openings for helispots. If some tree falling or cribbing is necessary, avoid high visitor use locations, feather the opening for a more natural look, and rehabilitate.
- Wherever possible, locate helibases in weed-free areas to prevent transport of invasive exotics into wilderness.
- Restore helispots.

Retardant Aircraft

- Retardant drops require Superintendent's approval.
- Use water drops where practical.
- Minimize number of drops to what is essential for control of fire.

Appendix F

10-year Fuels Treatment Spreadsheet

Fiscal Year	Project Name	Activity Type	Treatment Type	Fire Regime	Condition Class	NEPA	Target Acres	Notes
FY04	Hand's Pass	Planning	Fire	I	2	Within FMP NEPA	1,000	Interagency burn planning with USFS
FY04	Hand's Pass	Preparation	Fire	I	2	Within FMP NEPA	10	
FY05	Hand's Pass	Treatment	Fire	I	2	Within FMP NEPA	1,000	
FY05	Hand's Pass	Monitoring	Fire	I	2	Within FMP NEPA		FMH plots/MSO surveys
FY03	Echo Park	Planning	Fire	I	2	Within FMP NEPA	110	Within MSO PAC
FY03	Echo Park	Preparation	Mechanical	I	2	Within FMP NEPA	30	Mechanical reduction of ladder fuels in 30 acres
FY04	Echo Park	Treatment	Fire	I	2	Within FMP NEPA	30	Pile burning during winter months
FY04	Echo Park	Monitoring	Fire	I	2	Within FMP NEPA		MSO microhabitat monitoring, small mammal surveys
FY05	Echo Park	Treatment	Fire	I	2	Within FMP NEPA	30	Pile burn during winter months
FY07	Echo Park	Monitoring	Fire	I	2	Within FMP NEPA		MSO microhabitat monitoring, small mammal surveys, FMH plots
FY07	Echo Park	Treatment	Fire	I	2	Within FMP NEPA	30	Pile burn, in season or fall
FY09	Lower Rhyolite	Planning	Fire	I	2	Within FMP NEPA	30	Reburn
FY09	Lower Rhyolite	Preparation	Fire	I	2	Within FMP NEPA	1	
FY09	Lower Rhyolite	Treatment	Fire	I	2	Within FMP NEPA	30	
FY09	Lower Rhyolite	Monitoring	Fire	I	2	Within FMP NEPA		FMH plots
FY05	Massai Saddle	Planning	Fire	II	2	Within FMP NEPA	200	Interagency burn with USFS
FY05	Massai Saddle	Preparation	Fire	II	2	Within FMP NEPA	2	
FY06	Massai Saddle	Treatment	Fire	II	2	Within FMP NEPA	200	
FY06	Massai Saddle	Monitoring	Fire	II	2	Within FMP NEPA		
FY06	East Whitetail	Planning	Fire	I	2	Within FMP NEPA	800	Interagency burn with USFS
FY06	East Whitetail	Preparation	Fire	I	2	Within FMP NEPA	5	
FY07	East Whitetail	Treatment	Fire	I	2	Within FMP NEPA	800	
FY07	East Whitetail	Monitoring	Fire	I	2	Within FMP NEPA		FMH plots
FY08	Jesse James	Planning	Fire	I	2	Within FMP NEPA	800	
FY09	Jesse James	Preparation	Fire	I	2	Within FMP NEPA	5	
FY09	Jesse James	Treatment	Fire	I	2	Within FMP NEPA	500	

FY09	Jesse James	Monitoring	Fire	I	2	Within FMP NEPA		FMH plots
FY07	South Slope	Planning	Fire	II	2	Within FMP NEPA	100	In Historic District. Dependent on future research of Lehmann lovegrass
FY07	South Slope	Preparation	Fire	II	2	Within FMP NEPA	1	
FY08	South Slope	Treatment	Fire	II	2	Within FMP NEPA	100	
FY08	South Slope	Monitoring	Fire	II	2	Within FMP NEPA		FMH plots
FY03	Little Picket	Treatment	Fire	I	2	Within FMP NEPA	640	
FY03	Little Picket	Monitoring	Fire	I	2	Within FMP NEPA		FMH plots
FY03	Madrone	Preparation	Fire	II	1	Within FMP NEPA	2	
FY03	Madrone	Treatment	Fire	II	1	Within FMP NEPA	450	
FY03	Madrone	Monitoring	Fire	II	1	Within FMP NEPA		FMH plots
FY07	Shake Spring	Planning	Fire	I	2	Within FMP NEPA	400	
FY08	Shake Spring	Preparation	Fire	I	2	Within FMP NEPA	2	
FY08	Shake Spring	Treatment	Fire	I	2	Within FMP NEPA	400	
FY08	Shake Spring	Monitoring	Fire	I	2	Within FMP NEPA		FMH plots
FY08	Upper Rhyolite	Planning	Fire	I	2	Within FMP NEPA	200	
FY09	Upper Rhyolite	Preparation	Fire	I	2	Within FMP NEPA	2	
FY09	Upper Rhyolite	Treatment	Fire	I	2	Within FMP NEPA	200	
FY09	Upper Rhyolite	Monitoring	Fire	I	2	Within FMP NEPA		FMH plots
FY05	Rhyolite #5	Planning	Fire	I	2	Within FMP NEPA	50	
FY5	Rhyolite #5	Preparation	Fire	I	2	Within FMP NEPA	1	
FY05	Rhyolite #5	Treatment	Fire	I	2	Within FMP NEPA	50	
FY06	Rhyolite #5	Monitoring	Fire	I	2	Within FMP NEPA		FMH plots
FY09	Inspiration Point	Planning	Fire	I	2	Within FMP NEPA	150	
FY10	Inspiration Point	Preparation	Fire	I	2	Within FMP NEPA	1	
FY10	Inspiration Point	Treatment	Fire	I	2	Within FMP NEPA	150	
FY10	Inspiration Point	Monitoring	Fire	I	2	Within FMP NEPA		FMH plots
FY10	Little Jesse James	Planning	Fire	I	2	Within FMP NEPA	500	
FY11	Little Jesse James	Preparation	Fire	I	2	Within FMP NEPA	2	
FY11	Little Jesse James	Treatment	Fire	I	2	Within FMP NEPA	500	
FY11	Little Jesse James	Monitoring	Fire	I	2	Within FMP NEPA		FMH plots
FY11	North Slope	Planning	Fire	I	2	Within FMP NEPA	50	
FY12	North Slope	Preparation	Fire	I	2	Within FMP NEPA	1	
FY12	North Slope	Treatment	Fire	I	2	Within FMP NEPA	50	
FY12	North Slope	Monitoring	Fire	I	2	Within FMP NEPA		FMH plots

Appendix G
Fire Monitoring Plan

Introduction

This plan is in compliance with RM-18 Chapter 11 Wildland and Prescribed Fire Monitoring, which states that "All NPS units applying wildland fire use and/or prescribed fire to accomplish resource benefits must prepare a Fire Monitoring Plan." This plan is appended to the 2005 Fire Management Plan. Monitoring is considered a critical component of fire management; "In order to evaluate resource management and fire management objectives, units must monitor the effects of fire." (RM-18 Ch. 11) Four monitoring levels are recognized and are cumulative—environmental planning, fire observations, immediate postfire effects, and long-term change. This document will identify monitoring rationale as well as specific monitoring protocols for Chiricahua National Monument.

Descriptions of vegetation communities and their relationship to fire can be found in the main body of this Fire Management Plan, Chapter III. In the past, management conflicts included installing new water and septic systems in close proximity to plots, driving through plots to service utilities, and visitor impacts to plots too close to heavy visitor use areas (e.g. campground, trails, Faraway Ranch picnic area). Other natural resource-related conflicts include plots that experienced severe flooding events, plots experiencing high pine mortality rates from bark beetle infestation, and plots will blowdown.

Description of Ecological Models

Four dominant plant communities have been identified for fire effects monitoring at Chiricahua National Monument: Pine with Mixed Conifers and Hardwoods community, Mixed Oak community, Manzanita/Shrub community, and Mixed Grasseswith Minor Shrub/Tree component community. Other communities exist to varying degrees, but are either not a major contributor to fire behavior, not large enough to distinguish as a separate vegetation community (e.g. rush community in Silver Spur meadow), or not to be subjected to prescribed burning (e.g. landscaped yard at Faraway Ranch). Major species found in each vegetation community and fire history studies are reviewed in the description of vegetative communities of the Fire Management Plan, Chapter III. Fire effects on these species are reviewed in Appendix B of the Fire Management Plan. Chiricahua National Monument is extremely diverse, with over 1100 species of plants found within its boundary; other species and their associated fire effects may be obtained in the Fire Effects Information System (FEIS), http://www.fs.fed.us/database/feis, from FMH evaluation of prescribed burns and their associated fire effects, and from individual prescribed burn documentation and monitoring reports.

Management Objectives

Prior to Anglo settlement in the 1850s, Chiricahua National Monument experienced a range of fire regimes as associated with vegetation communities. Chapter III of the FMP reviews the fire history literature in detail. Fire history studies and results of past prescribed burns aided in the determination of management objectives for prescribed burning. Mixed conifers likely experienced a low to moderate intensity fire every 9-22 years. Mixed oaks may have burned every 10-30 years. The side slopes populated with manzanita and native grasses burned with

moderate or high intensity every 40-80 years. The grassland meadows at the mouths of the east-west running canyons burned every 4-8 years with moderate or high intensity.

Prescribed fire goals and objectives exist for the four monitoring types and are found in their respective monitoring type descriptions. Management objectives are described in terms of percent change from the current condition instead of target population size. Until further study is conducted on pre-suppression era structure and composition, target population size will not be used as a basis for management objectives. The following lists these goals and objectives by monitoring type:

Pine with Mixed Conifer and Hardwoods Community:

Goals:

- Produce an open, pine-dominated woodland community with minimal pole-sized trees and understory brush
- Reduce dead and down fuel loading and ladder fuels to reduce threat of a stand-replacing wildland fire
- Protect Mexican spotted owl habitat by retaining large overstory trees and opening up the subcanopy

Objectives:

- Reduce live pole-size tree density by 30-60%, five years postburn
- Reduce dead and down fuel loadings (10, 100, and 1000-hr TLFM size classes) by 40-60%, immediate postburn
- Reduce live overstory tree density by 5-20%, five years postburn
- Reduce manzanita cover by more than 40%, five years postburn
- Reduce litter fuel loadings by 40-60%, immediate postburn
- Increase cover of native grasses and forbs by 10-30%, two years postburn

Mixed Oak Community:

Goals:

- Produce a community mixed with pine and oak species
- Reduce dead and down fuel loading and ladder fuels to reduce threat of a stand-replacing wildland fire
- Rejuvenate understory grasses and forbs
- Protect Mexican spotted owl habitat by retaining large overstory trees and opening up the subcanopy
- Prevent introduction of new non-native plant species, and maintain or reduce current non-native plant species

Objectives:

- Reduce live pole-size tree density by 30-50%, five years postburn
- Reduce dead and down fuel loadings (1, 10, 100, and 1000-hr TLFM size classes) by 40-60%, immediate postburn
- Reduce live overstory tree density by 10-30%, five years postburn
- Increase percent cover of native perennial grasses and forbs by 10-30%, two years postburn

- Reduce manzanita cover by more than 40%, five years postburn
- Maintain non-native plant species to less than 10% of cover composition, five years postburn
- Reduce litter fuel loadings by 10-50%, immediate postburn

Manzanita Shrub Community:

Goals:

- In type converted landscapes (from grassland to shrubland), reduce cover of shrubs to promote growth of grasses
- In historic shrub-dominated landscapes adjacent to developments and/or heavy visitor use areas, reduce cover of shrubs to reduce threat to life, safety, and property.
- Prevent introduction of new non-native plant species, and maintain or reduce current non-native plant species

Objectives:

- Reduce shrub cover by 30-50%, immediate postburn
- Maintain shrub cover at less than 50%, five years postburn
- Increase cover of native grasses and forbs by 10-30%, where they occur, five years postburn

Mixed Grasses with Minor Shrub/Tree Component Community:

Goals:

- Promote growth of native grasses and forbs by reducing woody invasive species in meadows and by reintroducing fire to fire-adapted grass species
- Prevent introduction of new non-native plant species, and maintain or reduce current non-native plant species

Objectives:

- Increase percent cover of native grasses and forbs by 10-30%, two years postburn
- Maintain non-native plant species to less than 10% of cover composition, five years postburn
- Reduce density of woody invasive species by 10-30%, five years postburn

Monitoring Design

The Fire Monitoring Handbook monitoring design will be used with no deviations. See the Fire Monitoring Handbook for a description of specific protocols for forest, brush, and grass plots.

Monitoring Objectives

None of the studies described in the FMP (Chapters III and VII) gave a definitive answer to what characteristics Chiricahua NM's plant communities should possess. Currently, a comparative study is being conducted between the monument and the Ajos-Bavispe Forest Reserve in Sonora, Mexico to determine structure and composition differences between a mountain range that has had 100 years of suppression and a mountain range that has experienced almost no suppression. From these preliminary study results, prescribed burn objectives and monitoring objectives have been created that more closely resemble what these vegetation communities may have possessed before the age of Anglo settlement and fire suppression. Since additional comparative study is

warranted, the monitoring objectives listed below are broadly stated and the level of accuracy to substantiate these objectives relatively low.

Pine with Mixed Conifer and Hardwoods Community:

- Measure pole-sized tree density with a sufficient sample size to be 90% confident that the sample mean will be within 25% of the population mean.
- Measure total fuel loading with a sufficient sample size to be 80% confident that the sample mean will be within 20% of the population mean.
- Measure overstory tree density with a sufficient sample size to be 80% confident that the sample mean will be within 20% of the population mean.
- Measure percent shrub cover with a sufficient sample size to be 80% confident that the sample mean will be within 20% of the population mean.
- Measure cover of native grasses and forbs with a sufficient sample size to be 80% confident that the sample mean will be within 20% of the population mean.

Mixed Oak Community:

- Measure the density of pole-sized trees with a sufficient sample size to be 90% confident that the sample mean will be within 25% of the population mean.
- Measure total fuel loading with a sufficient sample size to be 80% confident that the sample mean will be within 20% of the population mean.
- Measure overstory tree density with a sufficient sample size to be 80% confident that the sample mean will be within 20% of the population mean.
- Measure percent cover of brush species with a sufficient sample size to be 80% confident that the sample mean will be within 20% of the population mean.
- Measure percent cover of non-native plant species with a sufficient sample size to be 80% confident that the sample mean will be within 20% of the population mean.

Manzanita Shrub Community:

- Measure percent cover of shrub species with a sufficient sample size to be 90% confident that the sample mean will be within 25% of the population mean.
- Measure percent cover of native grasses and forbs with a sufficient sample size to be 80% confident that the sample mean will be within 20% of the population mean.

Mixed Grasses with Minor Shrub/Tree Component Community:

- Measure percent cover of native grasses and forbs with a sufficient sample size to be 90% confident that the sample mean will be within 25% of the population mean.
- Measure composition of non-native plant species with a sufficient sample size to be 80% confident that the sample mean will be within 20% of the population mean.
- Measure density of woody invasive species with a sufficient sample size to be 80% confident that the sample mean will be within 20% of the population mean.

Sampling Design

Monitoring type descriptions are reviewed annually and updated as needed. Sampling unit size and field placement protocols are in the Fire Monitoring Handbook. Rejection criteria are listed in the monitoring type description sheets. Control plots are not used regularly at Chiricahua NM; however, the monument does have a few control plots that were invalidated as burn plots. Ten

plots per monitoring type will minimally be installed to run minimum sample size calculations. Additional plots will be installed in accordance with those calculations.

Field Measurements
The field methods as detailed in the Fire Monitoring Handbook will be used without any deviations.

Timing of Monitoring
Plots will be monitored according to the Fire Monitoring Handbook protocols (preburn, postburn, 1 year, 2 year, 5 year, 10 year, 20 year intervals). Due to the two growth/flowering seasons in the monument, plots may be optimally read from April through September, although certain plot types may be read at any time during the year (e.g. those without significant grass or forb species).

Monitoring Plot Location
Each plot has a written description to navigate to the plot, as well as a map with azimuth and pacing directions. These are found in the individual plot file in the Resource Management office, as well as on the FMH database (written instructions only). In addition, each plot has a GPS location (in UTMs) listed in the plot file, on an ArcView map of plot locations, and in an MS Excel file in the Resource Management office. Due to steep terrain and narrow canyons, GPS locations have, on average, less than 30 feet accuracy. A 2003 plot map is attached.

Prescribed Fire Monitoring Parameters
The four monitoring levels, designed to provide a minimum acceptable standard (MAS) of conformance with RM-18, are: reconnaissance, fire conditions, immediate postfire effects, and long-term change; these levels are cumulative. Level 1 and 2 fire monitoring contain the following:

Level 1: Reconnaissance MAS
- Fire cause, location, and size
- Fuel and vegetation type
- Relative fire activity
- Potential for further spread
- Current and forecasted weather
- Resource or safety threats and constraints
- Smoke volume and movement

Level 2: Fire Conditions MAS
- Fire Monitoring Period
  - Fire number and name
  - Observation date and time
  - Monitor’s name
- Ambient Conditions
  - Topographic Variables
    - Percent slope
    - Aspect of terrain

    - Fire Weather Variables
        - Air temperature
        - Relative humidity
        - Wind speed
        - Wind direction
        - Percent shading
        - 1, 10, 100, 1000-hr time lag fuel moisture
        - Live fuel moisture
        - Drought index by fuel model
- Fuel Model
    - 13 Fire Behavior Prediction System fuel models or customized model
- Fire Characteristics
    - Linear rate of spread
    - Perimeter and area growth
    - Flame length
    - Fire spread direction
- Smoke Characteristics
    - Visibility
    - Particulates
    - Carbon monoxide
    - Total smoke production
    - Mixing heights
    - Transport and surface wind speeds and direction
    - Documented complaints from downwind areas
- Fire Conditions
    - Duff moisture
    - Flame zone depth

Intended Data Analysis Approach

Data analysis was traditionally done through the FMH software for the Fire Effects Annual Report; these reports are on file in the Resource Management office and encompass the dates 1992-2002. As of 2002, two of the four monitoring types have enough plots to run minimum sample size calculations; regardless, additional plots will have to be installed in all monitoring types to get valid numbers from this calculation. Minimum sample size calculations will be run until the minimum plot numbers are met for each variable. For all variables related to condition or change objectives, minimum sample size calculations will be run again once all the plots burned within a monitoring type reach one year postburn and again when the timeframe mentioned in the management objective has been reached.

As of 2005, the Fire Effects Assessment Tool (FEAT) will be the new data analysis tool used for the fire effects dataset. Chiricahua NM is in the process of converting data to the new system.

Monitoring Implementation Schedule
See Chapter IV Table IV-9 for a list of the Fuels Treatment schedule. Plots will be established according to the FMH protocols and in numbers deemed reasonable for the fuel treatment unit size, plant communities, and topography. Plots will be installed in each fuel treatment unit on the schedule and will be sampled up to 2 years prior to burning and no later than 2 months after burning the unit.

Data Sheet Examples
See the Fire Monitoring Handbook for examples of data sheets used in sampling.

Responsible Parties
This monitoring plan was developed by:
Carrie Dennett, Ecologist and FMO, Chiricahua National Monument, National Park Service

Review of this plan was completed by:
Alan Whalon, Chief of Resource Management, Chiricahua National Monument, National Park Service

Brooke Gebow, Senior Research Specialist, University of Arizona, School of Renewable Natural Resources

Neil Mangum, Superintendent, Chiricahua National Monument, National Park Service

Administrative duties will be completed by:
Plan revisions, data analysis, annual review, crew supervision, data collection, data entry—Chief of Resources Management/Fire Management Officer, Chiricahua National Monument

Park liaison—Chief of Resources Management/Fire Management Officer, Chiricahua National Monument

Funding Needs Assessment
Chiricahua NM receives no funding for fire effects monitoring except for that requested through project funds (which only funds pre- and postburn installation and read). Instead, plots are installed and read by ONPS-funded staff with the assistance of the seasonal fire crew, in times of low fire danger, and equipment and supplies are purchased from an ONPS account.

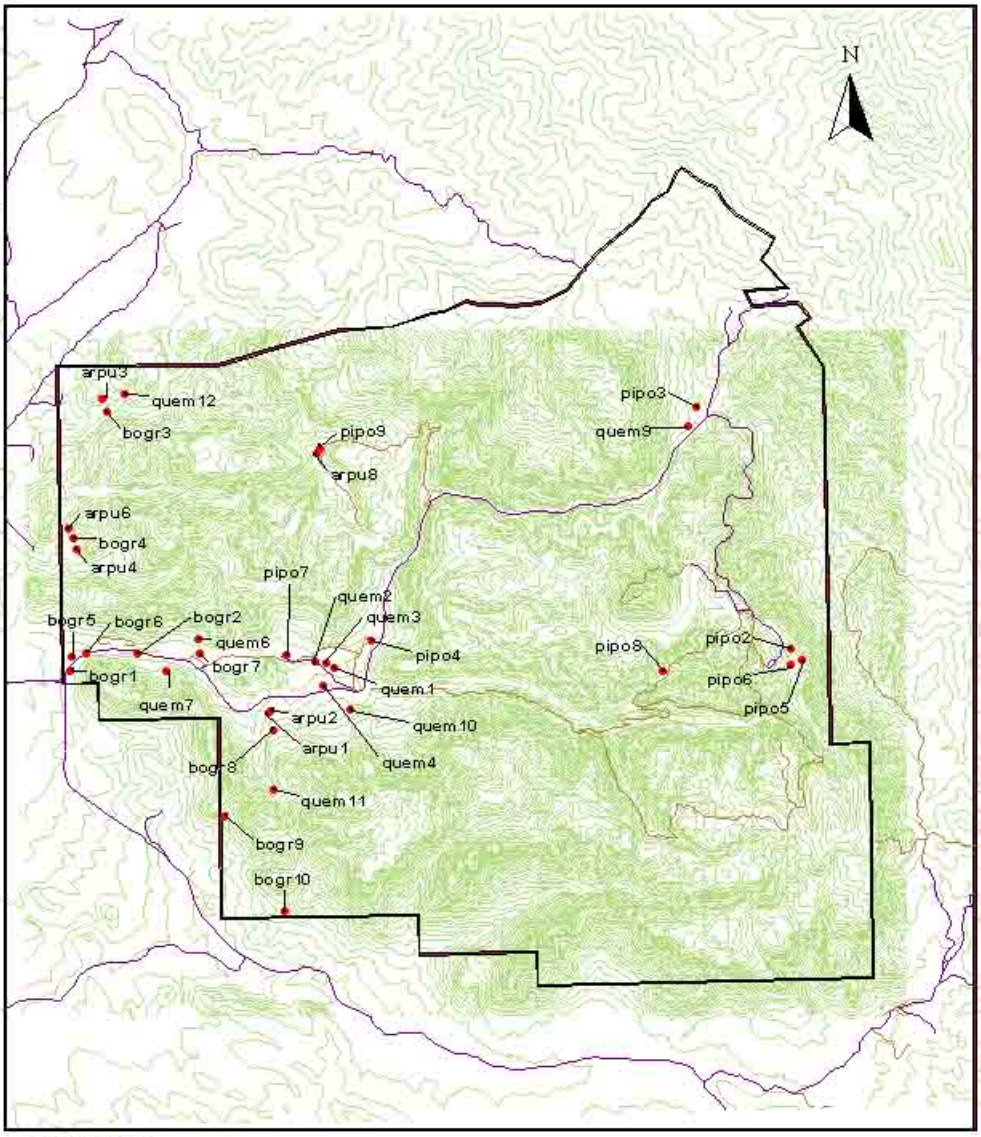
Management Implications and Potential Results
Monitoring results will be analyzed and reviewed by the Chief of Resources Management/Fire Management Officer on a yearly basis; determination of acceptable results will be completed, and changes to prescriptions, burn objectives, monitoring objectives, burn unit boundaries, and research needs will be suggested and documented at that time. Minor changes to the program will be implemented in the next prescribed fire season. Major changes will be sent to the Regional Fire Ecologist for review and validation.

Monitoring data will be reported to other NPS personnel and in publications, as needed.

Consultation and Coordination

The Regional Fire Ecologist will be consulted in matters of major monitoring or prescribed fire program changes. Major changes to the program may necessitate a new NEPA document should the new program objectives and implementation be outside the scope of the original NEPA document. In addition, Chiricahua NM will coordinate all monitoring activities with the Forest Service when those activities impact USFS lands (in the ZOC) and will give a copy of all datasets and reports to the Forest Service. If needed, Chiricahua NM will coordinate with Saguaro National Park for assistance with plot installation and data collection.

CHIRICAHUA NATIONAL MONUMENT
FMH PLOT LOCATIONS



Ruth Olsen
March 4, 2003

Appendix H
Glossary

Term	Abbrev.	Definition
Above ground level	AGL	Feet above ground level. Used frequently in aviation operations, usually in connection with a stated altitude.
Aerial Fuel		All live and dead vegetation located in the forest canopy or above the surface fuel, including tree branches and crowns, snags, moss, and high brush.
Appropriate Management Action		Specific actions taken to implement a management strategy.
Appropriate Management Response	AMR	Specific actions taken in response to a wildland fire to implement protection and fire use objectives.
Arizona Game & Fish Department	AGFD	Arizona Game & Fish Department
Best available science		Best available science to resolve a problem.
Best management practices	BMP	Best management practices to resolve a problem. Also used in smoke modeling.
Burn Boss	RXB2	Burn Boss Type 2.
Burned Area Emergency Rehabilitation	BAER	Emergency actions taken during or after wildland fire to stabilize and prevent unacceptable resource degradation or to minimize threats to life or property resulting from the fire. The scope of BAER projects are unplanned and unpredictable requiring funding on short notice.
Canopy		The stratum containing the crowns of the tallest vegetation present, (living or dead) usually above 20 feet in height.
Chain		A unit of linear measurement equal to 66 feet. Commonly used to report fire perimeters and other fireline distances.
Class I Air		An area set aside under the Clean Air Act to receive the most stringent protection of air quality from degradation. Mandatory federal Class I Areas are (1) international parks, (2) national wilderness areas which exceed 5,000 acres in size, (3) national memorial parks which exceed 5,000 acres in size, and (4) national parks which exceed 6,000 acres and were in existence prior to the 1977 Clean Air Act Amendments.
Compactness		The spacing between fuel particles. This can be especially important in the surface layer of fuel, where the amount of air circulation affects rate of drying, rate of combustion, etc.
Continuity		The proximity of fuel, vertical and horizontal, to each other that governs the fire's capacity to sustain itself. This applies to aerial fuel as well as surface fuel.
Control Line		An inclusive term for all constructed or natural fire barriers and treated fire edges used to control a fire.
Crown Fire		A fire that advances from top to top of trees or shrubs independently of a surface fire. Sometimes crown fires are classed as either running or dependent to distinguish the degree of independence from the surface fire.
Cultural Resources		Archeological features, recent person-made features, and select natural resources important in understanding social activities or religious beliefs of

Term	Abbrev.	Definition
		Native Americans and European Settlers on a specific site.
Dendrochronology		The dating of past events (e.g., fire, climate, disease) through the study of tree ring growth.
DI-1202		Fire reporting system document.
Diameter at Breast Height	DBH	Diameter at Breast Height of a tree.
Duff		A layer of partially decomposed organic matter immediately above the mineral soil and below the litter layer, consisting primarily of fallen foliage, herbaceous vegetation and decaying wood (twigs and small limbs).
Escaped Fire		A fire which has exceeded or is expected to exceed the capability of initial attack resources and reasonable reinforcements necessary for prompt control or that exceeds fire prescription.
Extreme Fire Behavior		Implies a level of wildland fire behavior characteristics that ordinarily precludes methods of direct control action. One or more of the following is usually involved: high rates-of-spread; prolific crowning and/or spotting; presence of fire whirls; a strong convection column. Predictability is difficult because such fires often exercise some degree of influence on their environment, behaving erratically and sometimes dangerously.
Fine Fuel		Small diameter, fast-drying fuels such as grass, leaves, draped pine needles, ferns, tree moss and some kinds of slash which, when dry, ignite readily and are consumed rapidly. Characterized by a comparatively high surface area-to-volume ratio,less than ¼ inch in diameter, and have a timelag of one hour or less. Also called flash fuels.
Fire Danger		A general term used to express the sum of constant danger and variable danger factors affecting the inception, spread, and resistance to control, and subsequent fire damage; often expressed as an index.
Fire Danger Rating		A relative number indicating the severity of wildland fire danger as determined from burning conditions and other variable factors of fire danger.
Fire Frequency		The historical return interval of fire to a defined environment. The number of fires per unit time in some designated area. Size of area must be specified.
Fire Intensity		The product of the available heat of combustion per unit of ground and the rate of spread of the fire, interpreted as the heat released per unit of time for each unit length of fire edge. The primary unit is BTU per second per foot of fire front.
Fireline		See Control Line.
Fire Management		An extension of the concept of wildland fire decision making which takes into account resource values, role of fire in the environment, the level of protection required, opportunities for management-ignited prescribed use of fire, consideration of fire effects, and the efficiency of the fire control operation. Activities required for the protection of burnable wildland values from fire and the use of prescribed fire to meet land management objectives.
Fire Management Unit	FMU	A term used to denote the division of an area for fire planning purposes based on common fire management objectives.

Term	Abbrev.	Definition
Fire Perimeter		The entire outer edge or boundary of a fire.
Fire Prevention		Activities directed at reducing fire occurrence, cost of suppression, and fire-caused damages to resources and property; includes public education, law enforcement, personal contact, administration, and reduction of fire hazard risks.
Fire Regime		Periodicity and pattern of naturally-occurring fires in a particular area of vegetative type, described in terms of frequency, biological severity, and areal extent.
Fire Risk		The probability that a wildland fire will start as determined by the presence and activities of causative agents.
Fire Season		One or more wildland fires (types 11 and 15) in ten day period (10% occurrence rule), as recorded in the Shared Applications Computer System (SACS) for a statistically representative planning period (e.g. 10 years), Supported by fire danger indices such as designated weather observations and calculated NFDRS codes for the primary fuel model. The period or periods of the year during which wildland fires are likely to occur, spread, and affect resources values sufficient to warrant organized fire management activities; a period of the year with beginning and ending dates as established by some fire control agencies.
Fire Weather		Weather conditions which influence fire ignition, behavior, and suppression.
Fish & Wildlife Service	FWS	Fish & Wildlife Service.
Flame Length		The distance measured from the tip of the flame to the midpoint of the flaming zone at the base of the fire. It is measured on a slant when flames are tilted due to effects of wind or slope.
Forb		An herbaceous plant with a soft, rather than permanently woody stem, other than grass.
Fuel Break		A wide strip or block of land on which the native or pre-existing vegetation has been permanently modified so that fires burning into it can be more readily extinguished. It may or may not have fire lines constructed in it prior to fire occurrence.
Fuel Loading		The weight of fuel in a given area, usually expressed in tons per acre. Fuel loading may be referenced to fuel size or timelag categories; and may include surface fuel or total fuel.
Fuel Model		A simulated fuel complex for which all fuel descriptors required by the mathematical fire spread model have been specified.
Fuel Type		An identifiable association of fuel elements of distinctive species, form, size, arrangement, or other characteristics. General fuel types are grass, brush, timber, and slash.
General Management Plan	GMP	General Management Plan.
Hazard		A fuel complex defined by kind, arrangement, volume, condition, and location that forms a threat of ignition or of suppression difficulty.
Humidity		The measure of water vapor content in the atmosphere.
Hydrophobic		Resistance to wetting exhibited by some soils, also called water repellency.

Term	Abbrev.	Definition
Ignition		The initiation of combustion.
Implementation Procedures Reference Guide	IPRG	Wildland and Prescribed Fire Policy Implementation Procedures Reference Guide.
Indirect Attack		A method of suppression in which the control line is mostly located along natural fire breaks, favorable breaks in topography, or at considerable distance from the fire, and all intervening fuel is backfired or burned out.
Initial Action		Action taken by the first resources to arrive at a wildland fire to meet protection and fire use objectives.
Initial Attack	IA	The prompt, pre-planned, aggressive suppression response consistent with firefighter, public safety, and values to be protected. The actions taken by the first resources to arrive at a wildfire to protect lives and property, and prevent further extension of the fire.
Ladder Fuel		Fuel which provide vertical continuity between strata. Fire is able to carry from surface fuel by convection into the crowns with relative ease.
Liaison Officer	LOFR	Liaison officer.
Litter		The upper most layer of loose debris composed of freshly fallen or slightly decomposed organic materials such as dead sticks, branches, twigs, and leaves and needles.
Live fuel moisture		The amount of moisture in living plants, such as trees, grasses, and shrubs, in which the seasonal moisture content cycle is controlled largely by internal physiological mechanisms, rather than by external weather influences. Ratio of the amount of water to the amount of dry plant material in living plants.
Maximum Manageable Area	MMA	The firm limits of management capability to accommodate the social, political, and resource impacts of a wildland fire. Designated as a drawn line on a map.
Mesic		Relating to moist habitat.
Minimum Impact Suppression Techniques	MIST	The application of strategy and tactics which effectively meet suppression and resource management objectives with the least cultural, environmental, and social impacts.
Mosaic		The intermingling of plant communities and their successional stages in such a manner as to give the impression of an interwoven design. Also, the intermingling of burned and unburned areas on a specific piece of land.
National Environmental Policy Act	NEPA	Established procedure that Federal agencies must follow in making decisions on Federal actions which may impact the environment. Procedures include evaluation of environmental effects of proposed actions, and alternatives to proposed actions; involvement of the public and cooperating agencies.
National Fire Danger Rating System	NFDRS	National Fire Danger Rating System. A uniform fire danger rating system that focuses on the environmental factors that control the moisture content of fuels.
National Fire Plan Operations and Reporting System	NFPORS	An interagency system designed to assist field personnel in managing, budgeting, and reporting accomplishments for work conducted under the National Fire Plan.

Term	Abbrev.	Definition
Notice of Intent	NOI	Notice of Intent.
Orographic		Associated with or induced by the presence of mountains.
Particulate Matter	PM	1. Fine liquid or solid particles such as dust, smoke, mist, fumes, or smog found in air or emissions. 2. Very small solid suspended in water. They vary in size, shape, density, and electric charge, can be gathered together by coagulation and flocculation. Any liquid or solid matter except uncombined water, which exists as a liquid or solid at standard conditions.
Patrol		1. To travel a given route to prevent, detect, and suppress fires. 2. To go back and forth watchfully over a length of control line during or after its construction to prevent slopovers, control spot fires, or extinguish overlooked hotspots.
Perennial		Present at all seasons of the year and continuing from year to year.
Precipitation		The collective name for moisture in either liquid or solid form large enough to fall from the atmosphere and reach the earth's surface.
Preparedness		Activities that lead to a safe, efficient and cost effective fire management program in support of land and resource management objectives through appropriate planning coordination. Condition or degree of being ready to cope with a potential fire situation. Mental readiness to recognize changes in fire danger and act promptly when action is appropriate.
Prescribed Fire		Any fire ignited by management actions to meet specific resource management objectives and ignited in accordance with established prescription criteria in a predetermined area. A written, approved Prescribed Fire Plan must exist and NEPA requirements must be met prior to ignition. NEPA requirements can be met at the land use or fire management planning level.
Prescription		Measurable criteria which guide selection of appropriate management response and actions. Prescription criteria include weather and fuel moisture information, and may include safety, public health, environmental, geographic, and administrative, social, or legal considerations.
Rate of Spread		The relative activity of a fire extending its horizontal dimensions. It is expressed as rate of increase of the total perimeter of the fire; or as rate of forward spread of the fire front; or as rate of increase in area, depending on the intended use of the information. Usually its (forward) rate of spread is expressed in chains or acres per hour.
Red card		Fire qualification card issued to fire qualified persons showing their qualifications and training needs to fill specified fire suppression and support positions in a large fire suppression or incident organization.
Relative Humidity	RH	The ratio of the amount of moisture in the air to the amount which the air could hold at the same temperature and pressure if it were saturated; usually expressed in percent.
Remote Automated Weather System	RAWS	Remote Automated Weather System that usually transmits data via satellite telemetry for distribution to fire managers nationwide.
Resource Advisor	READ	Resource Advisor.
Resource Management Plan	RMP	Resource Management Plan.

Term	Abbrev.	Definition
Sensitive Receptor Sites		Population centers such as towns and villages, camp grounds and trails, hospitals, nursing homes, schools, roads, airports, Federal Class I Areas, etc. where smoke and air pollutants can adversely affect public health, safety, and welfare.
Seral		Of, relating to, or constituting an ecological stage in succession.
Size Class		An alpha character used in documentation of wildland fire that represents a size of the fire area: Class A less than 0.25 acres Class B 0.26 - 9 acres Class C 10 - 99 acres Class D 100 - 299 acres Class E 300 - 999 acres Class F 1,000 - 4,999 acres Class G over 4,999 acres
Snag		A standing dead tree or part of a dead tree from which at least the leaves and smaller branches have fallen.
Southwest Coordination Center	SWCC	Southwest Coordination Center.
Spotting		Behavior of a fire producing sparks or embers that are carried by convection columns and/or the wind and which start new fires beyond the zone of direct ignition by the main fire.
Stability		A state of atmosphere in which the vertical distribution of temperature is such that an air particle will resist vertical displacement from its level (stable air).
Succession		The process of vegetational development whereby an area becomes successively occupied by different plant communities of higher ecological order.
Suppression		A management action intended to protect identified values from a fire, extinguish a fire or alter a fire's direction of spread. All the work of extinguishing or confining a fire beginning with its discovery.
Surface Fire		A fire that burns surface litter, debris, and small vegetation.
Surface Fuel		All materials lying on, or immediately above, the ground, including needles or leaves, duff, grass, small dead wood, downed logs, stumps, large limbs, low brush and reproduction.
Time Lag Fuel Moisture	TLFM	The moisture content of the fuels, divided into size categories. Time needed under specified conditions for a fuel particle to lose about 63% of the difference between its initial moisture content and its equilibrium moisture content. If conditions remain unchanged, a fuel will reach 95% of its equilibrium moisture content after 4 timelag periods.
Topography		The configuration of the earth's surface, including its relief and the position of its natural and manmade features.
Torching		The burning of the foliage of a singe tree or small group of trees, from the bottom up.

Term	Abbrev.	Definition
Virga		Wisps of precipitation emitted from a cloud that evaporates before reaching the ground.
Visibility		The greatest distance that prominent objects can be seen and identified by unaided, normal eyes. (Usually expressed in miles, or fractions of a mile.)
Weather Information and Management System	WIMS	An interactive computer system designed to accommodate the weather information needs of all federal and state natural resource management agencies. Provides timely access to weather forecasts, current and historical weather data, the National Fire Danger Rating System (NFDRS), and the National Interagency Fire Management Integrated Database (NIFMID).
Wildland		An area in which development is essentially non-existent, except for roads, powerlines, and similar transportation facilities. Structure, if any, are widely scattered.
Wildland Fire		1. An unplanned wildland fire requiring suppression actions, or other action according to policy, as contrasted with a management-ignited prescribed fire burning within prepared lines enclosing a designated area, under prescribed conditions. 2. A free burning wildland fire unaffected by fire suppression measures. 3. Any non-structure, free burning and unwanted fire, other than prescribed fire, that occurs in the wildland. The term “Wildfire” is being replaced by “Wildland Fire” within the Federal government lexicon.
Wildland Fire Implementation Plan	WFIP	Wildland Fire Implementation Plan.
Wildland Fire Management Information System	WFMI	Tracks DI-1202s, Individual Fire Reports.
Wildland Fire Management Plan		A strategic plan that defines a program to manage wildland and prescribed fires and documents the Fire Management Program in the approved land use plan. The plan is supplemented by operational procedures such as Preparedness Plans, Pre-planned Dispatch Plans, Prescribed Fire Plans, Hazard Fuel Reduction Plans, and Prevention Plans.
Wildland Fire Situation Analysis	WFSA	A real time decision making process that evaluates alternative management strategies against selected safety, environmental, social, economical, political, and resource management objectives as selection criteria.
Zone of Cooperation	ZOC	Management of a land area that is shared by two government agencies.

Appendix I

Concurrence for Chiricahua National Monument Fire Management Plan

AESO/SE
02-21-03-F-0265

July 23, 2004

Memorandum

To: Superintendent, Chiricahua National Monument and Fort Bowie National Historic Site, Willcox, Arizona

From: Field Supervisor

Subject: Chiricahua National Monument Fire Management Plan Biological and Conference Opinion

Thank you for your request for formal consultation with the U.S. Fish and Wildlife Service (FWS) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (Act). Your request for formal consultation and conference was dated March 25, 2004, and received by us on March 29, 2004. At issue are impacts that may result from the proposed Chiricahua National Monument (CNM) Fire Management Plan (FMP) and future emergency wildfire suppression actions located in Cochise County, Arizona. You determined that the proposed action is likely to adversely affect the threatened Mexican spotted owl (*Strix occidentalis lucida*) (MSO) and its proposed and designated critical habitat.

In your letter, you requested our concurrence that the proposed action was not likely to adversely affect the endangered northern aplomado falcon *(Falco femoralis septentrionalis*), jaguar (*Panthera onca*), and Mexican gray wolf (*Canis lupus baileyi*), and the threatened lesser long-nosed bat (*Leptonycteris curosae yerbabuenae*). We concur with your determination for these species. Our analysis is provided in Appendix A of this biological and conference opinion (BO).

This BO is based on information provided in the March 2004, biological assessment, meetings and telephone conversations in 2002, 2003, and 2004 with your office, and other sources of information. Literature cited in this BO is not a complete bibliography of all literature available on the species of concern, fire management and its effects, or on other subjects considered in this BO. A complete administrative record of this consultation is on file at this office.

Consultation History

$ January 30, 2002: We met with your staff regarding project concerns.

$ March 29, 2002: We met with University of Arizona (UA) staff (your contractor) to review species addressed and the Biological Evaluation (BE) format.

$ May 21, 2002: We met with UA staff to discuss MSO critical habitat and fire timing concerns for listed species.

$ June 4, 2002: We met with your staff to review a draft of the BE.

$ March 13, 2003: We received the BE and request for concurrence (dated March 10, 2003).

$ December, 2003: We discussed with the UA staff the possibility of incorporating specific fuel-reduction and fire-use projects in the Biological Assessment, and the resulting BO, in order to reduce consultation over the tenure of the FMP.

$ January 14, 2004: We met with the UA staff to discuss the content of the Biological Assessment (BA), including appropriate conservation measures.

$ March 29, 2004: We received your BA and request for formal consultation (dated March 25, 2004).

$ May 25, 2004: We recommended that your office include emergency wildfire suppression as part of the proposed action for this consultation. Your office concurred with including suppression and requested a draft BO.

$ June 9, 2004: We sent a draft BO for your review and comment.

$ June 22, 2004: We received your e-mail response to the draft BO; with comments and recent MSO survey information.

BIOLOGICAL AND CONFERENCE OPINION

SCOPE OF THIS BIOLOGICAL AND CONFERENCE OPINION

This consultation includes all the actions as described in the FMP, along with emergency suppression actions for wildfires during the next five years. No further consultation would be needed for prescribed fire, managed wildland fire, fuel thinning, or wildfire emergency suppression unless one or more of the reinitiation criteria, listed in the "REINITIATION STATEMENT" of this document, are triggered.

DESCRIPTION OF THE PROPOSED ACTION

CNM proposes to decrease fuels and improve vegetation conditions through managed wildland fire, prescribed fire, and thinning, and to suppress wildfires for a five-year period (2004 to 2009) on CNM and adjacent lands. Only 3 acres of thinning (fuel reduction around developed areas) is proposed over the tenure of the plan. These activities could occur throughout the year. This project proposes that most of the CNM backcountry be managed for wildland fire use. This project intends that wildland fire and prescribed fire may cross the boundary that separates CNM from U. S. Forest Service (Forest Service) lands, and fire will be managed in this "zone of cooperation" by both agencies. For CNM land, an appropriate number of acres per year to burn were determined to be 1,200, or 10 percent of the park. That limit might be exceeded if a wildland fire use event is predicted to yield outstanding resource

benefits. Currently the largest prescribed burn proposed over the tenure of the new plan is 1,000 acres. The project proposes the following:

- Two fire management units (FMUs) (Figure 1): FMU 1 is a corridor encompassing canyon-bottom developed areas and the site of suppression and prescribed burning. FMU 2 is a backcountry unit covering the rest of the park that permits wildland fire use (formerly known as prescribed natural fire) under pre-decided, specific conditions (see next section), with emergency suppression and prescribed burning also allowed.

- A "zone of cooperation" that extends beyond the CNM boundary with the Forest Service. CNM and the Forest Service will jointly decide whether or not to suppress wildfires in this zone. The Forest Service would maintain responsibility for emergency suppression actions. The CNM would plan (with FS counsel and review) and conduct fires that would be managed and allowed to burn in this zone that uses geographic and topographic landforms for appropriate and safer fire management instead of arbitrary lines that separate agency holdings.

- There would be designated and protected subunits within the FMUs that would dictate special procedures for protection of listed species, their habitat, and other resource concerns.

Prescribed fire is the use of human ignited fires to meet desired resource objectives. Ignition could by a variety of methods on the ground or in the air. Wildland fire, which previously was known as prescribed natural fire, is using naturally ignited fires to meet resource objectives. Emergency wildfire suppression may be implemented to suppress a wildfire that will not be managed as a wildland fire, including fires that may have been managed as prescribed fires and wildland fires but do not stay within prescriptions. The fires will be monitored from the ground or air to assess whether they are meeting resource objectives and to determine appropriate suppression actions. A variety of suppression actions may be implemented to manage prescribed fires and wildland fires, and to suppress wildfires. Suppression activities could include fireline construction, aerial water and retardant drops, backfires, and other suppression activities.

General Description of the Project Area

CNM is located in the northern end of the Chiricahua Mountains in southeastern Arizona (Figure 2). Located 124 miles southeast of Tucson, Arizona and 70 miles north of Douglas, Arizona and the International Border with Mexico, most of CNM's 11,985 acres are federally designated wilderness. The CNM is bordered on three sides (north, east, and south) by lands administered by the Coronado National Forest and on the west side by privately owned ranch land in the Sulphur Springs Valley.

CNM and adjacent lands feature spires and unusual rock formations that are the eroded remnants of a 2,000-foot layer of ash and pumice fused into rock called rhyolite tuff. These materials were deposited by an immense volcanic eruption about 27 million years ago. This geologic attraction sits at the four-way intersection of the Chihuahuan and Sonoran deserts, the southern Rocky Mountains, and the northern Sierra Madre Occidental. "Crossroads" geography and elevational

ranges between 5,000 feet to 10,000 feet within the Chiricahua Mountains create an area of high biological diversity.

The action area for this project includes all lands within CNM, Forest Service lands within the ‘‘zone of cooperation’’ and other lands to the north, south, and east within approximately ¼ mile of the “zone of cooperation”. These are the areas that may be directly or indirectly affected by the proposed action. Lands within approximately ¼ mile of the “zone of cooperation” are included within the action area because of possible smoke moving into these areas during fire use that may affect MSO.

Fire Management Units

The 300-acre FMU 1 (“corridor”) is the sloping bottom portion of Bonita Canyon. The western edge is at 5,140 feet in elevation and the eastern edge is at 5,360 feet. Bonita Creek forms the northern boundary of the FMU on its west side. The FMU boundary then follows the 5,360-foot contour (line) east to the northernmost point in the Bonita Canyon campground. The boundary turns south onto Bonita Canyon Drive, loops around the Visitor Center parking lot to the outside of the housing area fuel break, then connects back to the road. With the exception of the geology exhibit building at Massai Point, all CNM structures lie within FMU 1.

FMU 2 (“backcountry”) covers the remaining wilderness-designated areas of CNM (11,685 acres) and includes the zone of cooperation.

Vegetation

The proposed project designates four vegetation types in the CNM (Figure 3). This project is based on the structural vegetation types recognized by National Park Service fire personnel and currently defined as fire monitoring vegetation types.

Mixed grasses with minor shrub-tree component. At the west end of CNM, this type occurs in several patches totaling about 1,000 acres. Original composition is difficult to determine given a history of grazing, fire suppression, and invasion by non-native Lehmann lovegrass (*Eragrostis lehmanniana*), but several native grama grasses (*Bouteloua* spp.) are present. The tree ring work of Kaib et al. (1996) suggests that fires may historically have ignited in valley grasslands and burned into Chiricahua canyons every four to eight years. Fuel models 1 and 2 (Anderson 1982) are used to characterize fire behavior in this type. Table 1 presents properties of these models.

Anticipated outcomes from prescribed burning or wildland fire use within burn units in mixed grasses are:

1) Increase native grass and forb cover by 10-30 percent, two years post-burn.

2) Maintain non-native plant species at less than 10 percent of cover composition, five years post-burn.

3) Reduce density of woody invasive species by 10-30 percent, five years post-burn.

Manzanita shrub community. Small patches of this type occur within FMU 1, with most of the 1,600 acres of this vegetation type occurring in FMU 2. Wright and Bailey (1982) report that a stand-replacing fire regime best characterizes interior chaparral communities. Using fire scar data from pinyon pine (*Pinus discolor*) found within pointleaf manzanita (*Arctostaphylos pungens*) stands, Baisan and Morino (1999) estimated a 30-year to 80-or 90-year fire return interval in the CNM. Fuel models 5 and 6 (Anderson 1982) are used to characterize fire behavior in this vegetation type (Table 1).

Anticipated outcomes from prescribed burning or wildland fire use within burn units in manzanita are:

1) Reduce shrub cover by 30-50 percent, immediately post-burn.

2) Maintain shrub cover at less than 50 percent, five-years post-burn.

3) Increase native grass and forb cover by 10-30 percent where they occur, five-years post-burn.

Mixed oaks is a general woodland category that covers the areas where oaks make up at least 60 percent of the canopy. Pinyon pine, alligator juniper (*Juniperus deppeana*), Apache pine (*P. englemannii*), pointleaf manzanita, and Arizona cypress (*Cupressus arizonica*) also appear in this type. The type covers approximately 7,500 acres of the CNM's 11,985 acres and is common in both FMUs. The major species in this vegetation type re-sprout following top-kill by fire. These woodlands are thought to experience less-frequent fire than the other CNM vegetation types, on the order of fifty to hundreds of years between events, depending on stand composition and location (Baisan and Morino 1999). Fuel models 8 and 10 (Anderson 1982) are used to characterize fire behavior in this vegetation type (Table 1).

Anticipated outcomes from prescribed burning or wildland fire use within burn units in mixed oak are:

1) Reduce live pole-sized (<6" DBH) tree density by 30-50 percent, five-years post-burn.

2) Reduce live overstory (>6" DBH) tree density by 10-30 percent, five-years post-burn.

3) Increase native perennial grass and forb cover by 10-30 percent, two-years post-burn.

4) Reduce manzanita cover by more than 40 percent, five-years post-burn.

5) Reduce dead and down fuel loadings (1, 10, 100, and 1,000 time lag fuel moisture size classes) by 40-60 percent, immediately post-burn.

6) Maintain non-native plant species to less than 10 percent of cover composition, five-years post-burn.

7) Reduce litter fuel loadings 10-50 percent, immediately post-burn.

Pine with mixed conifers and hardwoods occupy the highest elevations and patches along major drainages in CNM (1,900 acres). Arizona (*Pinus arizonica*), Apache, and Chihuahua *(P. leiophylla* var. *chihuahuana*) pines of this structural type are thick-barked, fire-tolerant species that will dominate with increasing fire frequency. This vegetation type is found mostly in FMU 2. Baisan and Morino (1999) found minimum fire return interval at a given point in this type to be nine to 16 years. Fuel models 9 and 10 (Anderson 1982) are used to characterize fire behavior in this vegetation type (Table 1).

Anticipated outcomes from prescribed burning or wildland fire use within burn units in pines are:

1) Reduce live pole-sized tree density by 30-60 percent, one year post-burn.

2) Reduce dead and down fuel loadings (10, 100, and 1,000 time lag fuel moisture size classes) by 40-60 percent, one year post-burn.

3) Reduce live overstory tree density by 5-20 percent, five-years post-burn.

4) Reduce manzanita cover by more than 40 percent, five years post-burn.

5) Reduce litter fuel loadings by 40-60 percent, immediately post-burn.

6) Increase cover of native grasses and forbs by 10-30 percent, two years post-burn.

The vegetation and other characteristics within the "zone of cooperation" are similar to adjacent lands on CNM. Goals, objectives, and outcomes are the same for these areas for fires that are managed through this proposed action.

A strict set of criteria governs the decision-making process (Table 2) for allowing natural ignitions to burn, and the Superintendent and Chief of Resources Management/Fire Management Officer all must be available for consultation at the time of ignition to consider wildland fire use. For this project, natural ignitions poised to enter the zone of cooperation beyond the CNM boundaries will also require agreement from the Forest Service District Ranger and/or qualified Fire Management Officer.

Prescribed burning is the centerpiece of the new fire management plan. CNM began its prescribed burning program in 1975 and, to date, about 3900 acres have been treated. Figure 4 shows the burn complexes (larger subdivisions) and individual burn units planned for the coming 10 years. Table 3 reviews past burns. Table 4 is the proposed schedule of future prescribed burns, with general objectives listed for each.

Conservation Measures

The following conservation measures are to be implemented only to the extent that doing so will not compromise human health and safety.

For all threatened and endangered species

$ By December 31 of each year, CNM will submit a report to us detailing that calendar year's actions involving prescribed fires, wildland fires and emergency wildfire suppression. The report will describe the fires and associated actions, impacts on threatened and endangered species, implementation and effectiveness of the conservation measures in this BO and Appendix A, quantification of any incidental take as defined in this BO, rehabilitation completed for this and previous year's fire and suppression actions under this consultation, and planned fuel-reduction activities for the next year. CNM will work with us in determining the specific information necessary and the format.

$ By March 1 of each year, prior to any managed fire implementation that year, CNM will meet with us to review the report and discuss the upcoming year's plans relative to the previous year's actions and cumulative actions.

For Mexican spotted owl

CNM proposes the measures listed below to minimize and mitigate effects of prescribed burning, wildland fire, mechanical thinning, and emergency wildfire suppression on MSO and critical habitat. Measures that protect Protected Activity Centers (PACs) in the CNM (Echo and Shake Spring) will also apply to the PACs on the CNF (Wood Canyon and Indian Spring), the remainder of the CNM's FMU 2, and the zone of cooperation to the extent feasible. CNM will:

1) Consult park biologists when making decisions about fire use and suppression.

2) Restrict prescribed fire and wildland fire to low (preferably) and moderate (when necessary to achieve goals) intensity burns in Pine with Mixed Conifers and Hardwoods, and Mix Oaks vegetation types. High-intensity burns are acceptable (at the CNM's discretion) in other vegetation types.

3) As a first entry burn, conduct low-intensity prescribed fire and wildland fire within and immediately adjacent to the MSO PACs to consume surface fuels in order to reduce risk of catastrophic fire. Develop prescriptions that target jackpotted fuels and that will meet desired objectives. Manually reduce fuels that may contribute to a catastrophic fire. As a re-entry burn, conduct low- to moderate-intensity prescribed fire and wildland fire within and immediately adjacent to the PACs to consume dead and downed fuels as well as to clear understory vegetation that may contribute to a catastrophic fire.

4) Minimize heat impacts to the MSO and known and possible nest sites by conducting low-intensity prescribed burns and wildland fire use that will have slow rates of spread and low flame lengths in the most sensitive areas. Keep high flame lengths away from areas immediately below known and possible nest sites by varying ignition patterns, excluding those areas from ignition, rearranging fuels to facilitate low-intensity burning, and burning in cooler months where fire behavior is less extreme.

5) Conduct prescribed fire, wildland fire, and mechanical thinning treatments to minimize effects on reproduction; avoid actions with known potential for negative effects.

6) Use prescribed fire and wildland fire to maintain and enhance MSO habitat inside and outside of the PACs by varying the management prescriptions to (a) reproduce natural disturbance patterns; (b) maintain all species of native vegetation in the landscape, including early seral species; (c) allow natural gap processes to occur, thus producing horizontal variation in stand structure; and (d) promote the growth of additional large oaks and pines by thinning out understory vegetation through the use of moderate-intensity burning and by pre-treating large trees (ringing, foam, limbing).

7) Follow the MSO Recovery Plan (RP)(U. S. Fish and Wildlife Service 1995) pine-oak forest habitat structure guidelines in setting project objectives: (a) minimize cutting of trees and snags larger than 18 inches dbh, and avoid altogether cutting trees or snags larger than 24 inches DBH (exceptions can be made when absolutely necessary for safety reasons) and (b) thin trees measuring up to 9 inches DBH. The RP specifies retaining a majority of down logs measuring greater than 18 inches at midpoint diameter, but few such logs exist at the CNM; logs greater than 16 inches at midpoint diameter will be retained. Treatments should result in increased cover of grasses and forbs one year out. Other objectives as detailed in the Mexican spotted owl RP are unattainable in this specific situation due to topographic and geologic features, i.e. large rock formations and no existing trees in large size classes.

8) Monitor fire behavior and long-term effects on vegetative/habitat characteristics for adaptive management.

9) Delineate maximum manageable areas (MMAs) to avoid impacts to sensitive areas. An MMA is a large perimeter around a smaller prescribed burn unit within which fire is allowed to spread before suppression action must be taken. It is not actively ignited during the prescribed burn, and it allows for setting up the trigger points that will drive management actions based on resource values.

10) Adhere to Arizona Department of Environmental Quality air quality standards. Use small-scale ignition to reduce temporary smoke impacts to the MSO. Limit the number of acres burned per day as well as the burn duration to mitigate smoke hazards. Ensure that transport winds are favorable to move smoke up and away from the PACs.

11) Locate staging areas and other fire “activity centers” outside the park or at the park entrance more than a mile from designated PAC boundaries.

12) Carry out thorough rehabilitation of areas within and immediately adjacent to the PACs affected by suppression actions.

13) Avoid aircraft flight closer than 1,000 feet from any designated PAC boundaries.

14) Limit retardant/water drops on the perimeter of and within the PACs. Do not drop retardant or water on known or suspected nests.

15) Notify a park biologist if MSO are discovered during fire operations, and adjust activities to minimize impacting reproduction. Fire crewmembers will neither approach nor haze any owls they find.

16) Continue to survey known PACs in the CNM.

17) Survey any PAC that year for MSO status before implementing a prescribed burn or mechanical thinning in or adjacent to that PAC.

The following analysis and conclusions address the effects of the proposed action on the MSO. Concurrences for other species are addressed in Appendix A.

STATUS OF THE SPECIES

The Mexican spotted owl was listed as a threatened species in 1993 (U. S. Fish and Wildlife Service 1993). The primary threats to the species were cited as even-aged timber harvest and the threat of catastrophic wildfire, although grazing, recreation, and other land uses were also mentioned as possible factors influencing the MSO population. We appointed the Mexican Spotted Owl Recovery Team in 1993, which produced the RP for the Mexican Spotted Owl in 1995 (U. S. Fish and Wildlife Service 1995).

A detailed account of the taxonomy, biology, and reproductive characteristics of the MSO is found in the Final Rule listing the MSO as a threatened species (U. S. Fish and Wildlife Service 1993) and in the RP (U. S. Fish and Wildlife Service 1995). The information provided in those documents is included herein by reference. Although the MSO's entire range covers a broad area of the southwestern United States and Mexico, the MSO does not occur uniformly throughout its range. Instead, it occurs in disjunct localities that correspond to isolate forested mountain systems, canyons, and in some cases steep, rocky canyon lands. Surveys have revealed that the species has an affinity for older, well-structured forest, and the species is known to inhabit a physically diverse landscape in the southwestern United States and Mexico.

The U.S. range of the MSO has been divided into six recovery units (RU), as discussed in the RP. The action area is within the Basin and Range West RU. According to the RP, 91 percent of MSO known to exist in the United States between 1990 and 1993 occurred on lands administered by the Forest Service. Most owls have been found within Forest Service Region 3 (including 11 National Forests in Arizona and New Mexico). Forest Service Regions 2 and 4 (including 2 National Forests in Colorado and 3 in Utah) support fewer owls.

A reliable estimate of the numbers of owls throughout its entire range is not currently available (U. S. Fish and Wildlife Service 1995), and the quality and quantity of information regarding numbers of MSO vary by source. U. S. Fish and Wildlife Service (1991) reported a total of 2,160 owls throughout the United States. Fletcher (1990) calculated that 2,074 owls existed in Arizona and New Mexico. However, Ganey *et al.* (2000) estimates approximately 2,950 ± 1,067 (SE) MSOs in the Upper Gila Mountains RU alone. The Forest Service Region 3 most recently reported a total of approximately 980 PACs established on National Forest lands in Arizona and

New Mexico (USDA Forest Service, Southwestern Region, December 19, 2002). Based on this number of MSO sites, total numbers in the United States may range from 980 individuals, assuming each known site was occupied by a single MSO, to 1,960 individuals, assuming each known site was occupied by a pair of MSOs. The Forest Service Region 3 data are the most current compiled information available to us; however, survey efforts in areas other than National Forest System lands have likely resulted in additional sites being located in all Recovery Units. Currently, we estimate that there are likely 12 PACs in Colorado (not all currently designated) and 105 PACs in Utah.

Since the owl was listed, we have completed or have in draft form a total of 128 formal consultations for the MSO. These formal consultations have identified incidences of anticipated incidental take of MSO in 339 PACs. The form of this incidental take is almost entirely harm or harassment. These consultations have primarily dealt with actions proposed by the Forest Service, Region 3. However, in addition to actions proposed by the Forest Service, Region 3, we have also reviewed the impacts of actions proposed by the Bureau of Indian Affairs, Department of Defense (including Air Force, Army, and Navy), Department of Energy, National Park Service, and Federal Highway Administration. These proposals have included timber sales, road construction, fire/ecosystem management projects (including prescribed natural and management ignited fires), livestock grazing, recreation activities, utility corridors, military and sightseeing overflights, and other activities. Only one of these projects (release of site-specific owl location information) has resulted in a biological opinion that the proposed action would likely jeopardize the continued existence of the MSO.

In 1996, we issued a biological opinion on Forest Service Region 3's adoption of the RP recommendations through an amendment of their Forest Plans. In this non-jeopardy biological opinion, we anticipated that approximately 151 PACs would be affected by activities that would result in incidental take of MSOs, with approximately 26 of those PACs located in the Basin and Range West RU. In addition, we completed a reinitiation of the 1996 Forest Plan Amendments biological opinion, which anticipated the additional incidental take of five MSO PACs in Region 3 due to the rate of implementation of the grazing standards and guidelines, for a total of 156 PACs. To date, consultation on individual actions under the amended Forest Plans has resulted in 254 PACs adversely affected, with 68 of those in the Basin and Range West RU.

The current condition of MSO habitat within Arizona and New Mexico is a result of historical and recent human use, as well as climate change, vegetation species conversion, and wildfires. As stated in the 1996 Forest Plan Amendments biological opinion, a precise assessment of baseline owl habitat is difficult to assemble. Based on a regional habitat mapping exercise conducted last year, there is an approximate total of 6.6 million acres of MSO habitat on National Forest Lands in the Southwestern Region. This figure included approximately 935 PACs (588,000 acres), other protected habitat (2.1 million acres), and restricted habitat (3.9 million acres). Though we have received more current information regarding PAC delineation and occupancy (980 PACs have been delineated on Region 3 National Forest lands as of December 31, 2002), we consider the estimate of PAC acres and habitat to be fairly accurate.

Historical and current uses of MSO habitat include both domestic and wild ungulate grazing, recreation, fuels reduction treatments, resource extraction (e.g., timber, oil, gas), and

development. These activities have the potential to reduce the quality of MSO nesting, roosting, and foraging habitat, and may cause disturbance during the breeding season. Livestock and wild ungulate grazing is prevalent throughout Region 3 National Forest lands and is thought to have a negative effect on the availability of grass cover for prey species. Recreational impacts are increasing on all forests, especially in meadow and riparian areas. There is anecdotal information and research that indicates owls in heavily used recreation areas are much more erratic in their movement patterns and behavior. Fuels reduction treatments, though critical to reducing the risk of catastrophic wildfire, can have short-term adverse affects to MSO through habitat modification and disturbance. As the population grows, especially in Arizona, small communities within and adjacent to National Forest System lands are being developed. This trend may have detrimental effects to MSO by further fragmenting habitat and increasing disturbance during the breeding season.

Currently, high intensity, stand-replacing fires are influencing ponderosa pine and mixed conifer forest types in Arizona and New Mexico. Mexican spotted owl habitat in the southwestern United States has been shaped over thousands of years by fire. Since MSO occupy a variety of habitats, the influence and role of fire has most likely varied throughout the owl's range. In 1994, at least 40,000 acres of nesting and roosting habitat were impacted to some degree by catastrophic fire in the Southwestern Region (Sheppard and Farnsworth 1995). Between 1991 and 1996, the Forest Service estimated that approximately 50,000 acres of owl habitat has undergone stand-replacing wildfires (G. Sheppard, Forest Service, Kaibab National Forest, Arizona, pers. comm.). However, since 1996, fire has become catastrophic on a landscape scale and has resulted in hundreds of thousands of acres of habitat lost to stand-replacing fires. This is thought to be a result of unnatural fuel loadings, past grazing and timber practices, and a century of fire suppression efforts. The 2002 Rodeo-Chediski fire, at 462,384 acres, burned through approximately 55 PACs on the Tonto and Apache-Sitgreaves National Forests and the White Mountain Apache Reservation (within the Upper Gila Recovery Unit). Of the 11,986 acres of PAC habitat that burned on National Forest lands, approximately 55 percent burned at moderate to high severity. Based on the fire severity maps for the fire perimeter, tribal and private lands likely burned in a similar fashion. We define moderate severity burn as high scorch; trees burned may still have some needles and high severity burn as completely scorching all trees (trees completely dead).

The Basin and Range West RU encompasses a small portion of New Mexico and the majority of southern Arizona and is the second largest RU in the United States. The base of the Mogollon Rim defines the northern border of this RU. The western boundary defines the western extent of the MSO's range. Land ownership within this RU is a mosaic of public and private lands, with the MSO primarily occupying Forest Service lands. The Forest Service has designated 154 PACs on the Coronado, Tonto, Prescott, and Apache-Sitgreaves National Forests, 149 of which are considered occupied. These PACs contain approximately 80, 000 acres.

The RU is characterized by numerous mountain ranges, which rise abruptly from the broad, plain-like valleys and basins. In southern Arizona, these mountain ranges are often referred to as the Sky Islands. Vegetation ranges from desert scrubland and semi-desert grassland in the valleys upwards to montane forests (chaparral and pine-oak woodlands at low and middle elevations and ponderosa pine, mixed-conifer, and spruce-fir forests at higher elevations).

Within the Sky Islands, MSO habitat is characterized by woodland habitat and territories occur in both heavily forested terrain and in areas with hardwood and conifer stringers dominated by Madrean evergreen woodland. In general, however, much of the MSO habitat occurs in forested, steep-slope canyons and drainages. The mature trees throughout much of the forest outside of these canyons and drainages have been partially or completely harvested.

The primary threats to MSO within this RU are catastrophic wildfire, recreation, and livestock grazing (U. S. Fish and Wildlife Service 1995). As in the Upper Gila Mountain RU, this area has experienced multiple wildfires that have influenced MSO habitat. The Clark Peak, Gibson Canyon, Miller, Noon, Rattlesnake, Shovel, Bullock, and Oversite fires burned at varying intensities throughout MSO PACs on the Coronado National Forest. The Four Peaks/Lone Fire was a catastrophic, high-intensity wildfire on the Tonto National Forest that burned through two MSO PACs. In 2003, there were two fires that burned at high-intensity across significant acreage that included MSO habitat. The Aspen Fire on the Coronado National Forest burned approximately 85,000 acres and partially burned nine MSO PACs and the Helen's 2 Fire burned approximately 3,500 acres and impacted three MSO PACs within Saguaro National Monument.

There are a total of 38 wildland urban interface projects in this RU. Nineteen of the proposed projects contain MSO PACs; 28 PACS within this RU will receive fuels reduction treatments. No more than 2,000 acres of protected habitat are expected to be intensively treated, with the remainder of protected habitat treated per the recommendations in the RP. The restricted habitat is all located within 0.5 mile of private land and will most likely receive fairly intensive treatments.

Critical Habitat

A final rule designating critical habitat for Mexican spotted owl was published on June 6, 1995 (*60 FR 29914*). Critical habitat designated in the 1995 rule was set aside by a New Mexico federal court ruling in 1997 (*Coalition of Arizona-New Mexico Counties for Stable Economic Growth v. U.S. Fish and Wildlife Service*, No. 95-1285-M Civil, April 1, 1997), which affirmed an earlier ruling that analysis of the effects of critical habitat designation pursuant to NEPA was required (*Catron County Board of Commissioners v. United States Fish and Wildlife Service*, 75 F.3d 1429, 1439 [10th Cir. 1996]). These court rulings prompted us to withdraw critical habitat designation for Mexican spotted owl (63 FR 14378).

In March 2000, a New Mexico federal court ruling ordered us to publish a final designation of critical habitat for Mexican spotted owl by January 15, 2001 (*Southwest Center for Biological Diversity and Silver v. Babbitt and Clark*, CIV 99-519 LFG/LCS-ACE, 13 March 2000). Critical habitat was again proposed in July, 2000, and a final rule designating critical habitat for Mexican spotted owl was published on February 1, 2001 (66 FR 8530). In 2003, a Federal court in Arizona ruled (*Center for Biological Diversity v. Norton*, Civ. No. 01-409 TUC DCB, January 13, 2003) that the 2001 critical habitat designation violated the requirements of the Act and the Administrative Procedures Act (5 U.S.C. 551 *et seq.*). Although critical habitat as designated in the 2001 rule was allowed to stand in the interim, we were ordered to re-propose critical habitat by April 13, 2004 and publish a final rule on critical habitat by August 20, 2004. On November

18, 2003, we published a notice in the *Federal Register* reopening the public comment period on the July 2000 proposed rule to designate critical habitat for Mexican spotted owl (68 FR 65020).

The primary constituent elements essential to the conservation of the MSO include those physical and biological features that support nesting, roosting, and foraging. The primary constituent elements for Mexican spotted owl were determined from studies of their habitat requirements and the information provided in the RP. Since owl habitat can include both canyon and forested areas, primary constituent elements were identified in each area.

The primary constituent elements that occur in mixed conifer, pine-oak, and riparian forest types, as described in the RP, have the following attributes:

• High basal area of large diameter trees;

• Moderate to high canopy closures;

• Wide range of tree sizes suggestive of uneven-age stands;

• Multi-layered canopy with large overstory trees of various species;

• High snag basal area;

• High volumes of fallen trees and other woody debris;

• High plant species richness, including hardwoods;

• Adequate levels of residual plant cover to maintain fruits, seeds, and regeneration to provide for the needs of Mexican spotted owl prey species.

For canyon habitat, the primary constituent elements include the following:

• Cooler and often more humid conditions than the surrounding area;

• Clumps or stringers of trees and/or canyon wall containing crevices, ledges, or caves;

• High percent of ground litter and woody debris;

• Riparian or woody vegetation (although not at all sites).

ENVIRONMENTAL BASELINE

The environmental baseline includes past and present impacts of all Federal, State, or private actions in the action area, the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the impact of State and private actions which are contemporaneous with the consultation process. The environmental

baseline defines the current status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consultation.

Status of the species within the action area

MSO PACs totaling 1,200 acres are located in FMU 2. These PACs are Echo (CNM #001) and Shake Spring (CNM #002). In CNM, MSO records from 1973 to 1994 include a total of 21 visual sightings or vocalizations. All of these occurred within the area now designated as the Shake Spring PAC. These efforts have annually detected 0, 1, or 2 MSO using the two designated PACs. Reproduction was never confirmed in any year for either PAC. A single pair of owls occupied the Echo PAC area in 2003. Mousing was used to determine that the pair was not nesting. A single pair of owls occupied the Echo PAC area in 2004 (possibly the same pair as in 2003). Mousing on two separate visits did not result in conclusive results, but the mousing results indicated that reproductive activity may be occurring. See Appendix B for details of CNM MSO PAC survey and monitoring results since 1994. It is unlikely that any MSO will establish in other portions of CNM due to lack of vegetation characteristics for nesting and roosting, likely limits on nesting areas in the rock formations, and considering that extensive surveys and monitoring have been conducted since 1973.

Two PACs are located on Forest Service land on the edge of the proposed zone of cooperation, with very small portions within the zone of cooperation. They are designated as Wood Canyon (CNF #0501A011) (T16S, R30E, Sec 6 & 7 in the Wood Canyon drainage) and Indian Spring (CNF #0501A012) (T16S, R30E, Sec 8 & 17 in the Indian Creek drainage). Both PACs were derived from Management Territories that were developed from historical data in 1990. The CNF has had no projects in those areas that have necessitated MSO analysis and thus have conducted no recent surveys or monitoring in the areas. Portions of these PACs are within the action area, and small portions are within the project area that may be burned. Douglas Ranger District (CNF) maps show a nest/roost site near the heads of Wood Canyon and Indian Springs Canyon.

The CNM PACs are comprised of pine with mixed conifers, and hardwoods and mixed oak vegetation communities. The 100-acre core consists of the same communities, where the MSO would likely nest in the sparsely vegetated rock pinnacles. The vegetation types used by owls are not predicted by the CNM to become nesting and roosting habitat since the geology and climate at the CNM are not likely to generate the stands characterized by high basal tree area, large trees, multi-storied canopy, high canopy cover, and downed logs and snags. However, most of FMU 2 meets the definition of “Reserved Lands,” as described in the RP, given that it consists of designated wilderness in a national park. On Reserved Lands, careful application of wildland fire use (prescribed natural fire, in the terminology of the RP) and prescribed fire are permitted. As described in this document, the CNM is cautious about prescribed fire and monitors the results. A description of monitoring data collected for each vegetation type appears in Appendix C. The CNF PACs are likely of similar vegetation characteristics, but possibly with less rock substrate for nesting.

Prey habitat is diverse, which likely supplies diverse prey composition and numbers. Current density and availability of prey is unknown, but it is likely sufficient to provide for the few MSO that may occur in the action area. Because reproduction has not been confirmed, it is unknown if prey availability is sufficient for reproduction, but other factors may be influencing reproductive activities. CNM is currently conducting small mammal surveys in the Shake Spring and Echo PACs to determine and monitor prey composition and habitat.

Critical Habitat

CNM lies within current designated critical habitat. The action area outside of CNM lies within proposed critical habitat. The vegetation in the project area (areas that may be treated) generally does not have the constituent elements for mixed conifer, pine-oak, or riparian forest types. Areas within the project area may provide constituent elements of canyon habitat since areas known, and suspected, to be used by MSO for nesting or roosting are rock pinnacles, which more closely resemble canyon habitat. These areas likely include cooler conditions than the surrounding areas, canyon walls containing crevices or ledges, some areas with a high percent of woody debris, and woody vegetation.

B. Factors affecting species' environment within the action area

Current activities within the action area are mainly recreation and vehicle use. These activities generally occur on established roads and trails, though some off-trail hiking may occasionally occur. Recreation and vehicle use is relatively high on CNM near the visitor center and along the main road through the CNM, and vehicle use is high on the Pinery Canyon Road (in the "zone of cooperation"). Recreation and vehicle use is relatively low in the remainder of the action area due to the remote and steep topography of the areas. Some livestock use may occur in the bottoms of canyons outside the CNM (such as along Pinery Canyon Road).

EFFECTS OF THE ACTION

The proposed action includes activities that could directly and indirectly affect the MSO and critical habitat. All actions may occur anytime during the year, including during the MSO breeding season, but are limited by implementation of conservation measures and by appropriate prescriptions for prescribed fire and wildland fire use.

The proposed action is highly unlikely to result in the direct death of an adult MSO or juveniles (late breeding season) because of their mobility during fire or suppression actions. The proposed action could result in the death of nestlings or juveniles (early breeding season) because of their lack of mobility (as compared to adults) in the PACs if there is reproduction that year. Prescribed fire, wildland fire use, and emergency suppression could directly kill nestlings or juveniles through the managed fire or through the management actions used to control or suppress the fire, such as fireline construction and aerial retardant or water drops. The likelihood of this mortality is low because:

- There are conservation measures to determine the presence of MSO in and near the PACs, CNM will alter management if presence is determined, and CNM will limit or avoid actions that may affect survival or reproduction (Measures 10, 11, 13, 14, 15, 16, and 17).
- There are conservation measures to limit the intensity of managed fires in the PACs that would decrease the likelihood of fires reaching nestlings or juveniles (Measures 2, 3, 4, and 5).
- Reproduction in and adjacent to the CNM PACs has not been confirmed even though survey and monitoring efforts (including mousing attempts) have been conducted since 1994. The

likelihood of a pair nesting or of reproductive success in any year is low, and it is unlikely that reproductive activity would occur every year. (Appendix B).

- The likelihood of a wildfire occurring specifically at or near a nest or juvenile is very low considering that the nest and juvenile roosting sites early in the breeding season would likely be in the rock pinnacles or cliff faces that will limit flame length and fuels near the roost or nest.

No impacts to nesting habitat are anticipated because possible nesting areas in the action area are mostly associated with rock substrates, and none of the vegetation types in the action area are likely nesting or roosting habitat, nor likely to ever be nesting or roosting habitat. Treatments may be implemented within the 100-acre core areas, which the RP identifies as no-entry areas in order to protect nest and roost characteristics. Restrictions in these 100-acre areas are not necessary since the crevices or ledges that MSO in the area might use for nesting will not be impacted.

Temporary indirect effects to MSO on CNM may occur from smoke (including on Forest Service lands), heat, noise, and a reduction in MSO prey species (due to changes in prey species habitat) because areas that are or may be used by MSO (including the 100-acre cores) may be treated. Because the proposed action emphasizes low-to moderate-intensity burns, and CNM will implement the conservation measures, such as surveying PACs before implementation of prescribed burns and adjusting actions if necessary, these indirect effects are unlikely to adversely affect the survival or reproduction of any owls that may be in the area.

$ Smoke, heat, and noise in or near PACs within the project area may result in adult MSO or juveniles (late breeding season) moving, or in other temporary changes in their activities to avoid these impacts, but would be minimal and likely only occur during implementation of the proposed action. These disturbances may impact nestlings or juveniles (early breeding season) because of their lack of mobility. These disturbances may result in additional stress and disruption of activities (including feeding), but this would be temporary, and stress and activities would return to pre-disturbance levels. Smoke, heat, and noise impacts are greatly reduced with implementation of the conservation measures, such as those that limit actions in and near PACs.

$ Indirect effects from smoke to owls on Forest Service lands within the action area (but outside the project area) would be the same as what was described on CNM. MSO within and outside of PACs may adjust some of their activities during the smoke period, but they would likely return to pre-burn activities.

$ A temporary reduction in prey species may occur in burned areas for the first growing season after a burn. Prey species composition may change slightly in a treated area due to changes in vegetation characteristics and composition, but prey availability will likely return to similar conditions during and after the next growing season. Canopy closure in the forested areas is not expected to measurably change. Ground, herbaceous, and shrub cover may be decreased substantially in some treated areas (part of the expected outcomes). These changes will alter habitat characteristics for some prey species, with some species' numbers likely increasing and some likely decreasing. The CNM emphasis on providing a diversity of age and structural characteristics throughout the project area will likely result in a diversity of prey species over time. To monitor prey status, CNM is conducting small mammal surveys in the Shake Spring and Echo PACs.

The RP identifies catastrophic fire as a primary threat to the MSO. Prescribed fire and wildland fire will reduce the chance of catastrophic fire in the project area by reducing the fuels on the ground. The RP also recommends that any actions manage for nest and prey habitat characteristics for MSO. The proposed actions will have no impact on nest habitat since nests are associated mainly with rock substrates on the CNM. Prey habitat may be impacted by the proposed actions, but such impacts are anticipated to be only temporary. We anticipate that prey habitat will increase in diversity in the short to long-term, which will provide prey availability similar to current conditions.

Critical Habitat

The constituent elements of MSO critical habitat for nesting or roosting structure in canyons (cool conditions, crevices/ledges) are unlikely to be affected in the action area. The proposed action may impact constituent elements for MSO prey in this area by decreasing woody debris and vegetation. As described previously, decreasing woody debris and vegetation will alter the habitat conditions for MSO prey. This alteration may result in decreased habitat quality for MSO prey in the short-term, but will likely result in greater diversity of prey habitat throughout the project area, starting after the first growing season post-fire and to the long-term. CNM will be conducting small mammal surveys in the PACs that will provide information on whether this assumption is supported.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The action area occurs entirely on Federal land, and therefore non-Federal actions are likely to be minimal.

CONCLUSION

After reviewing the current status of MSO, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the our biological opinion that the proposed action, with the conservation measures, is not likely to jeopardize the continued existence of the MSO, and is not likely to destroy or adversely modify designated or proposed critical habitat. We present these conclusions for the following reasons:

1. **We anticipate that no more than one MSO PAC may be affected to a significant extent (see incidental take statement below).**
2. **The intent of the RP in protecting nesting substrates and providing a diversity of prey habitats will be met.**
3. **The chance of catastrophic fire in the area, which is one of the concerns for MSO described in the RP, will decrease from current levels.**
4. **Reproduction has not been confirmed in the CNM PACs.**

5. **No MSO PACs or designated or proposed critical habitat is likely to be impacted to a significant extent. We anticipate that nesting and roosting habitat in the rock substrates will not be impacted. Prey habitat may be impacted, but habitat will recover, and likely provide more diversity in prey than before project implementation.**
6. **Conservation measures will be implemented that will reduce the likelihood of managed fire or emergency wildfire suppression actions affecting MSO survival or reproduction, if present during that year.**

In summary, our conclusion that the proposed action is not likely to jeopardize the continued existence of the MSO, and is not likely to destroy or adversely modify designated or proposed critical habitat, is based on our analysis of the rangewide status of the MSO, the environmental baseline, the effects of the proposed action, and the cumulative effects. There are concerns with the long-term effects of the recent catastrophic fires throughout the species range, including the Chiricahua Mountains in which the action area is located. The proposed action addresses this concern by reducing the likelihood of catastrophic fire on the CNM and surrounding areas. The proposed action may have some negative impacts on individuals, their habitat, and their prey, but these impacts would be temporary. Implementing the proposed action, including the conservation measures, will likely result in a more diverse landscape that would maintain the quality of habitat for the survival and reproduction of the MSO in the CNM and surrounding areas.

The conclusions of this biological opinion are based on full implementation of the project as described in the Description of the Proposed Action section of this document, including any Conservation Measures that were incorporated into the project design.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is defined (50 CFR 17.3) to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined (50 CFR 17.3) as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. "Incidental take" is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

Amount or Extent of Take

For the purposes of this consultation, incidental take is anticipated as either the direct mortality of individual birds or the alteration of habitat that affects the behavior (i.e. breeding or foraging) of birds to such a degree that the birds are considered lost as viable members of the population and thus "taken." They may die or fail to breed, fail to successfully rear young, raise less fit young, or desert the area because of disturbance or because the habitat no longer meets the owl's needs.

Our current section 7 consultation policy provides for incidental take if an activity compromises the integrity of a PAC. Actions outside PACs will generally not be considered incidental take.

This biological opinion anticipates that one MSO PAC may be affected to the extent that taking of MSO will occur. This taking could be in the form of death, injury, harm, or harassment of up to two adults and associated eggs or juveniles. Authorized taking will be considered to have been exceeded if fire management or suppression actions affect more than one PAC in any of the following manners:

1. Over 10 percent of the PAC experiences a high-intensity burn as defined in the FMP and supporting documents.

2. Fire, smoke, heat, noise, or other disturbances associated with fire management and suppression affects a 100-acre core area during the MSO breeding season (March 1-August 31) if reproductive activities are known or suspected.

We recommend that if, during the five-year duration of the proposed action, any PAC is affected in one or more of the manners described above, the CNM contact our office to determine if reinitiation of consultation is necessary so as to avoid exceeding the amount of authorized incidental take.

Effect of Take

In this BO, we have determined that this level of anticipated take is not likely to result in jeopardy to the species.

Reasonable and Prudent Measures

Due to the relevant conservation measures that are described in the Description of the Proposed Action section, and are part of the proposed action, no reasonable or prudent measures are necessary.

Review requirement: Reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize incidental take that might otherwise result from the proposed action. If, during the course of the action, the level of incidental take is exceeded, such incidental take would represent new information requiring review of the need for reasonable and

prudent measures. CNM must immediately provide an explanation of the causes of the taking and review with us the need for possible inclusion of reasonable and prudent measures.

DISPOSITION OF DEAD OR INJURED LISTED SPECIES

Upon locating a dead, injured, or sick listed species initial notification must be made to the FWS's Law Enforcement Office, 2450 West Broadway Road #113, Mesa, Arizona (telephone: 480/967-7900) within three working days of its finding. Written notification must be made within five calendar days and include the date, time, and location of the animal, a photograph if possible, and any other pertinent information. The notification shall be sent to the Law Enforcement Office with a copy to this office. Care must be taken in handling sick or injured animals to ensure effective treatment and care and in handling dead specimens to preserve the biological material in the best possible state.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. We recommend that you fully characterize the rock pinnacle areas that are used by MSO on the CNM, and use this information to identify other areas on the CNM that may provide this nesting substrate. This information can be used when you revise your FMP after five years to possibly provide other management considerations to help recover MSO.
2. We recommend that you continue your prey monitoring within the PACs for the full five years, and possibly expand your sample areas outside of PACs. This information can be used when you revise your FMP after five years to possibly provide other management considerations to help recover MSO.
3. We recommend that you coordinate with CNF in determining the status of the two PACs on the eastern edge of the action area, and use this information in your planning for fires in these areas.

In order for us to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, we request notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes consultation and conferencing for the proposed action. You may ask us to confirm the conference opinion as a biological opinion issued through formal consultation if critical habitat is designated. The request must be in writing. If we review the proposed action and find there have been no significant changes in the action as planned or in the information used during the conference, we will confirm the conference opinion as the biological opinion for the project and no further section 7 consultation will be necessary.

This concludes formal consultation on the action outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

We appreciate your efforts to identify and minimize effects to listed species from this project. For further information please contact Mark Crites (520) 670-6150 (x229) or Jim Rorabaugh (602) 242-0210 (x238). Please refer to the consultation number 02-21-03-F-0265 in future correspondence concerning this project.

/s/ Steven L. Spangle

cc: Regional Director, Fish and Wildlife Service, Albuquerque, NM (ARD-ES)
Field Supervisor, Fish and Wildlife Service, Albuquerque, NM
Assistant Field Supervisor, Fish and Wildlife Service, Tucson, AZ
Assistant Field Supervisor, Fish and Wildlife Service, Flagstaff, AZ
Forest Supervisor, Coronado National Forest, Tucson, AZ
District Ranger, Douglas Ranger District, Coronado National Forest, Douglas, AZ

Chief, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ
Regional Supervisor, Arizona Game and Fish Department, Tucson, AZ
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