Saguaro National Park

National Park Service

US Department of the Interior

Saguaro National Park
Fire Management Plan
Environmental Impact Statement

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Dear Friends:

The *Saguaro Fire Management Plan Environmental Impact Statement* has been prepared as a result of several recent events that have happened in the world of Wildland Fire Management. The National Fire Plan adopted by Congress has directed all agencies to take a strong look at vegetation and fuel accumulation in relation to safety for firefighters, the public, and surrounding communities. We are also directed to reduce the threat to real property from wildland fire concurrent with the mission we are here to perform. The mission of the National Park Service is "…to conserve the scenery and the natural and historic objects and the wildlife 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 the future generations...." This mission is one that we do not take lightly. It is paramount that we continue to manage this resource by allowing the natural processes to perpetuate the ecological and wilderness values for which the national park was established and recognized.

This *Saguaro Fire Management Plan Environmental Impact Statement* presents three alternatives (including no action) that propose to deal with the complex problems of fire hazard reduction, while protecting, restoring, and maintaining, the historic and natural systems. By considering the use of other treatments available for dealing with fuel accumulation, in conjunction with proven methods that have been in use for three decades, we feel that restoration can be accomplished in those areas that have suffered the worst from vegetation encroachment, increasing forest density, and over protection. Lastly, by basing our proposals on the target forest conditions that should be present, these alternatives propose only an appropriate level of work, in the appropriate places, to restore these conditions and reduce the threats from unwanted wildland fires.

We look forward to the opportunity to use this information in the development of a Fire Management Program that guides these activities in Saguaro National Park.

Sincerely,

Sarah Craighead
Superintendent

Abstract

This *Saguaro National Park Fire Management Plan Environmental Impact Statement* documents the analysis of two action alternatives and a no action alternative for a revised *Saguaro Fire Management Plan*. Revisions to the fire management program are needed to meet public safety and natural and cultural resource management objectives in Saguaro National Park. The action alternatives vary in their mix of treatments available to the program for accomplishing work. The No Action Alternative describes the existing fire management program. The program has been locally effective but has not been able to restore large areas of the park to natural, fire influenced conditions, nor has it been able to keep more of the park from needing restoration. As a result, the incidence of catastrophic fire has increased in recent decades.

Saguaro National Park occupies 91,327 acres, consisting of two units. The Tucson Mountain Unit is located west of metropolitan Tucson and encompasses 24,034 acres and the Rincon Mountain District on the east side of Tucson with 67,293 acres. Wildland fire occurred naturally throughout the higher elevations of the park, as an important ecosystem process that kept forest fuels and community structure within their natural range of variability. Past fire suppression activities have led to increases in fuel loads and changes in plant community structure, and to the increasing potential for catastrophic fire. The risk of catastrophic fire is highest in the areas where fire has been excluded and fuels have built up to hazardous levels. The treatments proposed in the fire management plan would be guided by restoration and maintenance target conditions, based upon the natural range of variability for park plant communities.

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Executive Summary

Introduction

The *Saguaro National Park Fire Management Plan Environmental Impact Statement* (EIS) presents several alternatives to revise Saguaro National Park's fire management program and to implement National Park Service and federal wildland fire policies in the park. Most of Saguaro is a vast wilderness intersected by road and trail corridors and dotted with historical sites and administrative and recreational areas. The park is adjacent to communities, private lands, and public lands managed by other agencies. Because of this mosaic of land uses and designations, land management policies and activities are complex. This is especially true for fire management actions, which must be applied in different ways in the various areas of the park. This document proposes alternatives for managing wildland and prescribed fire and for maintaining and restoring ecosystems and reducing fuels in forests and woodlands. It also examines the environmental impacts of each alternative.

With a revised fire management plan, Saguaro's fire management program would employ a variety of fire management activities to accomplish land and resource management objectives and to reduce the risk of unwanted fire in and adjacent to the park. Depending on the area needing attention, the park would use different methods (also known as *treatments*) to manage fire and reduce decades of buildup of burnable vegetation and woody debris (dead and down wood, leaves, duff). Strategies for implementation would be based on knowledge gained from fire and fuels research, monitoring, and experience in the Saguaro area over the last half century.

Fire management planning and programs have been operational since 1970, two years after the National Park Service changed its policy from controlling natural processes to allowing natural processes to occur when possible. This means, for fire management, that the National Park Service went from suppressing all fires to letting some fires burn if they would contribute to accomplishing resource management objectives without 0threatening developed or populated areas or cultural sites. Many refinements in the fire management program have been made since then—they will continue to be made as knowledge of fire ecology and fire behavior increases.

Fire management plans are fundamental strategic documents that guide the full range of fire management related activities. They are required by the National Park Service Director's Order 18 which says: "Every park area with burnable vegetation must have a fire management plan approved by the superintendent," and the 2001 Federal Wildland Fire Management Policy, which reiterates: "Complete, or update, Fire Management Plans for all areas with burnable vegetation."

Purpose of and Need for the Saguaro Fire Management Plan

Purpose:

The purpose of the Saguaro Fire Management Plan EIS is to present and analyze alternatives for carrying out the fire management program in Saguaro National Park. It also presents and analyzes effects that would occur as a result of implementing these alternatives in different areas of the park. The specific purposes of the Saguaro Fire Management Plan are to:

¨ Identify and implement methods to restore and maintain park ecosystems and ecosystem processes that allow fire to play its natural role in the ecosystem, both as wildland fire and prescribed fire.

¨ Reduce the risk of fire to cultural resources (i.e., historic buildings, pictographs) through fuels reduction, prescribed burning, or fire suppression to prevent fires from damaging cultural resources.

¨ Reduce the risk of catastrophic fire, while continuing to reverse the adverse effects from past fire suppression and prevention activities.

¨ Execute a fire management program that provides a safe environment for firefighters and the public, including safe operations and fire management related facilities (helibases, fire camps).

¨ Provide a plan that is consistent with National Park Service wildland fire management policy and adheres to guiding principles from the Federal Fire Policy, which recognizes that:

· Firefighter and public safety is the first priority in every fire management activity.

· Wildland fire is an essential ecological process and natural change agent.

· Fire management plans, programs, and activities support land and resource management plans and their implementation.

· Sound risk management is a foundation for all fire management activities.

· Fire management programs and activities are economically viable, based on values to be protected, costs, and land and resource management objectives.

· Fire related plans and activities should be based upon the best available science.

· Fire management plans and activities incorporate public health and environmental quality considerations.

· Federal, state, tribal, local, and interagency coordination and cooperation are essential.

· Standardization of policies and procedures with other agencies is an ongoing objective.

Need:

Since 1968, National Park Service policy has been to allow natural processes to occur. The fire management program has pursued this policy for over three decades, yet the program, while making significant inroads, has not been able to meet park resource management objectives of restoring ecosystems and providing protection for developed areas and cultural resources. The long-term buildup of fuels has continued under the existing plan in many areas of Saguaro National Park. Increased application of prescribed fire and additional methods of reducing fuels are needed to restore fire to ecosystems and reduce forest fuels in at-risk areas. A revised Saguaro Fire Management Plan is needed because:

¨ Fire has a natural role in maintaining and sustaining ecosystems in Saguaro National Park, some of which have been altered by past fire suppression activities. Refinements to the fire management program are needed that will promote ecosystem sustainability.

¨ Communities, cultural resources (i.e. historic structures, pictographs), campgrounds, and other developed areas of the park need protection from unwanted, high-intensity wildland fires throughout Saguaro National Park. Fire treatments and pretreatments are needed that will reduce the risk of

catastrophic fire and ensuing property loss, and begin to reverse the fuel accumulation and ecosystem changes that have created these risks.

- Management of wildland fires, prescribed burning, and fuel reduction treatments require up-to-date planning and preparation.

- Fire management activities require collaboration with federal, state, county, tribal and local agencies, and a fire management plan provides a basis for communication, coordination, and project planning with partner agencies.

- Saguaro National Park must comply with the 2001 Federal Fire Policy.

Decisions to be Made:

The Superintendent of Saguaro National Park will make a recommendation for the final decision to the Regional Director, Intermountain Region, who is the Deciding Official of the Saguaro Fire Management Plan/EIS. They will recommend and decide upon:

1) Whether or not to implement the proposed action, an alternative to the proposed action, or to continue current fire management operations (the No Action Alternative).

2) What mitigation and monitoring, if any, will be included in the decision.

Issues and Concerns Used to Develop the Alternatives
Preliminary issues were identified using public and agency comments and consultations, as well as open house records from the public scoping periods in 2002.

The issues raised and comments made by the public during scoping and through the consultation process were summarized as concern statements (and are listed in Section 1, Purpose and Need). The issues form much of the basis for the analysis in the Saguaro Fire Management Plan/EIS; they were used in developing action alternatives and determining the scope of analysis. The expressed concerns related to the following subjects:

Fire Management Activities Many of the comments addressed the actual management of the fire program, or various strategies, philosophies, or goals for fire management; many comments addressed the use of prescribed fire, managed wildland fires, thinning, mechanical treatment, and other methods.

Ecosystems (general discussions) and Fire Management numerous comments addressed restoration of Saguaro's ecosystems and the role of fire as a natural process. Other commentaries emphasized that the National Park Service should conduct studies needed to understand the fire ecology of Saguaro.

Elements of the Natural Environment Concerns about the effects of fire on specific natural resources (wildlife, water, soil stability, vegetation, and others) were expressed.

Air Quality comments were received about compliance with air quality regulations, reduced air quality from smoke, and the differing effects on air quality from various fire management techniques.

Wilderness Comments were received on the role of fire in wilderness, as well as the appropriateness of various fire management activities.

Access comments spoke to the appropriateness, inappropriateness, or need for roads, bridges, and trails providing access and firebreaks.

Communication, Coordination, and Consultation: Many comments addressed the need for and role of consultation, communication, and coordination activities between the fire management program and communities, other agencies, organizations, and other groups.
Alternatives, including the preferred alternative

Process for Formulating the Alternatives: The action alternatives considered in the Saguaro Fire Management Plan/Environmental Impact Statement were developed from comments and concerns expressed by the public; input from federal, state, and local agencies; guidance from existing park plans; policy guidance from the National Park Service, the 2001 Federal Fire Policy, and the National Fire Plan; and research, monitoring, and experience from the existing fire management program.

Using the issues first identified in January 2002, the fire management staff at Saguaro began consultations with fire and resource management specialists in Saguaro and other fire and land management agencies. Concepts for developing a range of alternatives began taking shape following consultations with the park's Resource Management Division. It was suggested that the alternatives vary in the following way:

¨ By the various combinations of wildland fire, prescribed burning, fuels treatments, and fire suppression considered in the program.

Finally, the comments received during the October 2002 scoping period were used to further develop the range of alternatives and identify needed analyses.

An analysis of the natural fire regime for each of Saguaro's main vegetation types combined with the known fire history was used to identify land that needs the reintroduction of fire for ecosystem restoration or where high levels of fuels threaten buildings or cultural resources.

The action alternatives, Alternatives D and E, were developed with three specific goals: to re-introduce fire into areas of Saguaro that show adverse effects of fire suppression, to maintain the natural fire regime in park ecosystems where vegetation is within its natural range of variability, and to reduce forest fuels.

Alternatives Considered
The Alternatives considered in the Saguaro Fire Management Plan/EIS are:

- Alternative C: No Action Alternative (Current Plan)
- Alternative D: Implementation of a Fire Management Plan that utilizes Prescribed fire and non-fire treatments (no wildland fire for resource benefit) in FMU 1 and total suppression in FMU 2.
- Alternative E: Implement an FMP that utilizes wildland fire use for resource benefit (WFURB), prescribed fire, non-fire treatments, and suppression to accomplish objectives in FMU 1 and total suppression in FMU 2. (Preferred Alternative)

Fire Management Units

Fire Management Units (FMU) are areas of the park governed by distinct fire management strategies. Boundaries are clear, and procedures are laid out in detail for each FMU. In the current fire planning effort, the main difference between the No Action (existing plan) alternative and the preferred alternative is in the definitions of the FMU's and the implementation process. The main difference between the No Action alternative and Alternative D is the definition of the FMU's and the tools used for fire

management. Fire managers propose to group FMU's into similar management units (units that are managed the same) and to incorporate new policy and knowledge of the ecosystems in the park.

For all alternatives, excluding the no-action alternative, there would be two FMU's.

FMU 1 ranges in elevation from approximately 4000ft (Upper Sonoran Zone) to 8,666ft (Map II-1) on top of Mica Mountain. Desert grassland merges with pine-oak woodland. Pine-oak woodland gives way to pine-oak forest, which then gives way to pine forests. The addition and loss of elevation from 4000 to 8600 feet is gradual, leading to many shared species between adjacent associations. Small areas of mixed conifer forest occupy north-facing slopes at high elevations. Riparian forest and riparian woodland occur locally in canyon bottoms. Wet and dry meadows are found in scattered clearings at high elevations, the former around springs the latter often on old burns or disturbed sites (Bowers 1987). See section III for a more detailed description of plant associations.

Found within the unit are Manning Camp and Happy Valley Lookout. Manning Camp is on the list of historical structures creating some unique protection concerns. The Park's preferred alternative would maximize use of wildland fire and prescribed fire for this FMU. The appropriate suppression response will be used in the lower elevational limits (4000-5200 feet) of this FMU when Saguaro's are present. Suppression will also occur in this unit when safety or resource/cultural management objectives are not being met or there is a perceived threat to the resources by fire and resource managers. National Fire Danger Rating System (NFDRS)/Fire Behavior fuel models F/6 (intermediate brush) and L&A/1 (western perennial or annual), C/2 (open pine with grass), U/9 (western long needle pine) and G/10 (short needle, closed, heavy dead) are representative of the area.

FMU 2 is comprised of two separate tracks of land. The Rincon Mountain District below 4000 feet, contains 13,800 acres, approximately one-half of which is designated wilderness (Map II-1); and the entire Tucson Mountain District which contains 24,034 acres (Map II-2), with wilderness accounting for 13,200 acres. This unit will be managed under a suppression response. Suppression between 3500-4000 feet (uper boundary of Arizona Upland) will depend on the presence or absence of the Saguaro cactus. Since the occurrence of this species as well as this vegetation type vary by elevation, if Saguaro's are present the fires will be suppressed. Everything below 3500 feet will be suppressed. National Fire Danger Rating System (NFDRS)/Fire Behavior fuel models F/6 (intermediate brush) and L/1 (western perennial) are representative of the area. The Arizona Upland, which is a subdivision of Sonoran desert scrub, occurs in the Rincon mountain district from the base of the mountains to an approximate elevational range of 3500-5200 feet respectively, and encompasses 90% of the Tucson mountain district except for a small patch of desert grassland. The Arizona Upland is characterized by the large number of cacti and by the drought-deciduous habit of many of the trees and shrubs. Vegetation within the Arizona upland subdivision in both the Rincon mountain and Tucson mountain district can further be subdivided into associations depending on species composition. At the Rincon mountain district, three associations exist within the Arizona upland subdivision: Bursage-Palo Verde, Bursage-Saguaro Mixed-Scrub, and Creosote Bush. Additionally, several riparian vegetation series are found throughout the area of Arizona upland: Mixed Broadleaf (sycamore-velvet ash-cottonwood), Mesquite, Cottonwood-Willow, and Mixed Narrowleaf (buttonbush-seep willow) (Guertin 1998; Brown, Lowe and Pase 1980). At the Tucson Mountain District, six associations exist within the Arizona upland subdivision: Creosote Bush, Creosote Bush-Bursage, Palo Verde-Saguaro-Ironwood, Palo Verde-Saguaro, Jojoba Mixed-Scrub and Desert Riparian Scrub (Rondeau et al 1996). See section III of the Fire Management Plan for a more detailed description of plant associations.

Any fire occurring in this area will be aggressively suppressed -- suppression actions however, must consider values to be protected, least cost, resource damage caused by the suppression action, and the first priority at all times, firefighter and public safety.

Strategies Used to Maintain and Restore Ecosystems

Managed Wildland Fire (Includes Wildland Fire for Resource Benefits and Fire Suppression)

Managed wildland fire is the practice of managing a naturally-ignited wildland fire by allowing it to burn while keeping it within a specific area called a maximum manageable area (MMA). Safety of firefighters and the public is the number one concern in managing a wildland fire. Through pre-planning, constant monitoring, and holding actions, many wildland fires can be kept well away from people, buildings and infrastructures, and valued resources such as historic buildings and T&E habitat. Elements of managing a wildland fire include public information and education, coordination with other agencies, and fire behavior research.

Because fire is a natural process in the Rincon Mountains, allowing wildland fires to burn meets park goals to maintain a natural environment in Saguaro National Park. Wildland fires have been managed in Saguaro to meet resource objectives since the 1970's. Any fire that burns within wildlands and is not a prescribed fire (or a structural fire) is a wildland fire.

Because a fire may burn for varying amounts of time and different times of the year, the effects of a managed wildland fire on plants, animals, soil, and cultural resources can vary throughout the fire's area. Depending on fuel moisture conditions and loading, within one fire there are areas of very little fuel consumption as well as areas of total fuel consumption. Hotter areas create an arrangement of small to large openings (gaps) in the canopy, which allow light onto the forest floor to start new plants or restore plants that require more sunlight than is found in dense, overgrown forests. The variability of environmental conditions and wildland fire create a mosaic of effects that can be hard to replicate using prescribed fire.

Internal mop up should be limited with all suppression actions as ground disturbance causes damage to natural resources. Firefighters should refer to the minimum impact suppression tactics (MIST) guide or consult a resource advisor.

Prescribed Fire

Prescribed fires are management-ignited fires that are intentionally lit to meet resource objectives when predetermined and approved conditions are met. Prescribed fire has been used in Saguaro National Park since 1985 to meet a variety of resource objectives. Meadows have burned to remove tree encroachment and promote the growth of grasses and forbs through nutrient recycling. Forested areas have been burned to reduce fuels and create gaps in the canopy to promote growth of understory species. Woodlands have been burned to reduce stem density of manzanita and increase grass production. Prescribed burns have been used to replicate historic fire frequencies and to restore forests to a condition more indicative of an era when fires were not suppressed.

Since 1985, fire managers in Saguaro have ignited 11 prescribed burns totaling 3897 acres. This amount of burning has not been enough to undo the impacts of several decades of landscape-scale fire exclusion. To be truly effective, most prescribed burn units require multiple burns to meet resource objectives.

In Saguaro National Park, 5-10 years typically pass between prescribed burns. Therefore, when only prescribed fire is used, several decades are needed to restore forests that require multiple burns.

To provide additional fire protection around significant values, prescribed fire can be applied in strategic locations using special techniques. By igniting fires that burn hot enough to create openings in a forest canopy, gaps can be created which would provide protection form unwanted wildland fire. These openings, typical of a fire-influenced forest, can break up crown fires that might approach areas where protection of life and property is critical. Prescribed burns used in this manner provide a fuel-transition area that will help prevent rapid, uncontrolled fire spread. These lighter fueled areas can also provide locations where tactical plans can be implemented to stop the spread of a wildland fire.

Non-Fire Fuel Treatments

Pre-treatment of prescribed burn units entails removing some trees, shrubs, and snags to help keep the fire within the designated area or to protect values. Removal can be accomplished through mechanical equipment such as chain saws and cross cut saws or the object can have fire line cut around it to keep fire from the potential hazard. Where multiple burns are needed to reduce hazardous levels of fuels, pre-treatments can speed up the process by several years. In addition, pre-treatment significantly increases the protection of life and property from the potentially damaging effects of prescribed burning.

Adaptive Management

Adaptive Management is a fusion of science and management used to improve and care for natural resources. It is also defined as: the process of continually adjusting management in response to new information, knowledge, or technologies. Adaptive management at Saguaro would be used to guide fire management activities while drawing on the best available science, emergent technologies, and an ever-increasing database on the role and effects of fire on park resources.

The adaptive management cycle includes development of a plan with stated goals and objectives. The cycle is described as; implementation of the planned actions, monitoring of results, evaluations of the outcome of the actions, and hypothesis testing to refine prescriptions and methods (Kaufmann et al. 1994). In the fire management program, evaluations will help refine fire management strategies and assess how the program has met goals and objectives leading to ecosystem restoration and maintenance, including fuel reduction. After each event, evaluation by fire experts and managers will determine if the action had the desired effects, if more information is needed, and if a change in actions is necessary to meet the objectives.

Alternatives Considered but Rejected

Alternative A: Implementation of a Fire Management Plan that utilizes Wildland Fire Use for Resource Benefit and Prescribed fire (no suppression or non-fire treatments) in FMU 1 only and total suppression in FMU 2.

This alternative would allow for all fires to burn naturally.

Reason for Dismissal: This alternative could gradually accomplish the objectives on some areas, but management would not have control of the location or time of a fire which could cause detrimental effects on Natural and Cultural Resources.

Alternative B: Landscape Alternative:
Saguaro National Park shares boundaries with the Coronado National Forest, private landowners, BLM and the state. Ideally, the NPS would work together with these partners to formulate a fire management plan that covered the entire landscape.

Reason for dismissal: While this alternative should be the long range goal of both Saguaro National Park and the US Forest Service, current differences in land management planning efforts, staffing levels, and land use will require intervention beyond the ability of the National Park Service to accomplish, and the present timing realities deem it unreasonable. Saguaro National Park needs an updated fire management plan as soon as possible to guide the implementation of its fire management programs. A mountain-wide, completely integrated plan will take years to develop. It will require dedicated staff and resources not currently available to the agencies and groups potentially involved, and it will require outside facilitation. We view the new plan as a step toward the landscape ideal and a realistic way to satisfy Goal 7 of the Fire Management Plan at the present time (Maintain cooperative planning with other land agencies and landowners). This intermediate step will give parties experience working together under diverse missions and planning processes. Progress toward the landscape plan can occur while the park continues its fire program, guided by the Fire Management Plan developed in conjunction with the Environmental Impact Statement.

Alternatives Under Consideration:

- Alternative C: No Action Alternative.

This alternative would maintain the current Fire Management Plan.

- Alternative D: Implementation of a Fire Management Plan that utilizes Prescribed fire and non-fire treatments (no wildland fire for resource benefit) in FMU 1 and total suppression in FMU 2.

This Alternative would not allow any wildland fires for resource benefit to burn in the park. All ignitions no matter what the cause would be fully suppressed. The park would become a prescribed fire and non-fire treatment park for the life of this plan.

- Alternative E: Implement an FMP that utilizes wildland fire use for resource benefit (WFURB), Prescribed, non-fire treatments, and suppression to accomplish objectives in FMU 1 and total suppression in FMU 2. (Preferred Alternative)

This alternative would allow for Wildland Fire Use for Resource Benefit, Prescribed Fire and non-fire treatments to occur in FMU #1. This alternative would be subject to suppression. This is the preferred Alternative for the park.

Alternative C, D and E have been retained as "reasonable" alternatives, and we discuss them below and in Section 2 in more detail.

- ALTERNATIVE C – NO ACTION

Under the No Action Alternative, the existing direction and level of accomplishment of Saguaro's fire management program as described in the 1991 Fire Management Plan would continue. This alternative would utilize a range of fire management strategies that include prescribed fire, managed wildland fire, fire suppression, and hand cutting followed by prescribed fire. This alternative allows for interagency cooperation by allowing natural ignitions that are meeting resource objectives to cross boundaries with land management agencies that have similar objectives. Since the inception of the fire management program in Saguaro, natural fire regimes are being restored and fuel build-up has been reduced in some areas, but not at the rate needed for effective ecosystem maintenance and restoration.

Map II-3 and 4 define the six fire management units of the existing FMP, the No Action Alternative.

FMU#1 is found above the 7000ft contour line and encompasses approximately 7000acres. The unit contains coniferous forest and lies within the designated wilderness. This unit is classified as an appropriate suppression response unit. Park policy in this unit will be one of allowing natural prescribed fire and prescribed burning while continuing the suppression of fires outside the prescription parameters. The unit includes the coniferous forest vegetation zone, and lies within the designated wilderness area created by Public Law 94-567 of October 20, 1975. All human caused wildland fires will be suppressed.

FMU #2 contains vegetation described as oak and oak/pine woodland occupying an area of approximately 34,000 acres. This unit is also classified as appropriate suppression response with park policy allowing for prescribed natural fire and prescribed burning.

FMU#3 contains 12,000 acres, all designated wilderness. This unit contains vegetation described as Sonoran desert scrub and desert grassland. This unit will also be an appropriate suppression response unit. Park policy in this unit will be one of allowing prescribed natural fire, but one in which prescribed burning will only be applied for restoration of the historic vegetation communities such as grassland.

In FMU #1,2 and 3, lightning-caused fires except those that threaten human life and property, facilities, cultural resources, threatened and endangered species, or other important resources are permitted to burn. Other considerations for the prescription include:

- Fire growth predictions
- Energy release component and burning index.
- Red flag watch or warning associated with current or forecasted weather
- Air quality restrictions resulting from ventilation conditions or state DEQ smoke curtailment requests
- Proper preparedness level, staffing, and resources in place
- Drought evaluation
- Existing/predicted weather

The 1991 plan dictates that the causes of all fires will be determined to make proper management decisions. All wildland fire use will be monitored daily or more frequently in accordance with the Western Region Fire Monitoring Handbook (1991) and the Wildland Fire Situation Analysis; the park will continuously update information on fire size, location, behavior, smoke dispersal, safety conditions, and effects.

FMU #4 is a suppression unit containing 10,000 acres in the Sonoran desert and upland, approximately one-half of which is designated wilderness.

FMU #5 contains 8,000 acres in the Sonoran upland located in the Tucson Mountain District with wilderness accounting for 7200 acres, and is classified as an appropriate suppression response. Park policy in this unit will be one of allowable prescribed natural fire with no prescribed burning.

FMU #6 is a suppression unit containing 13,000 acres in the Sonoran desert and upland located in the Tucson Mountain District, approximately 6000 of which is designated wilderness.

- ALTERNATIVE D – IMPLEMENTATION OF A FIRE MANAGEMENT PLAN THAT UTILIZES PRESCRIBED FIRE AND NON-FIRE TREATMENTS (NO WILDLAND FIRE FOR RESOURCE BENEFIT) IN FMU 1 AND TOTAL SUPPRESSION IN FMU 2.

Maps II-1and 2 illustrate the layout of management units defining alternative D and E. This alternative will change how the park manages fire by focusing on prescribed fire and non-fire treatments.

FMU #1 encompasses the area of the park above 4000ft in elevation. In this FMU natural ignitions would be allowed to burn and prescribe fires would be initiated in specific areas of the park under conditions, which meet resource objectives. Suppression will be triggered in the lower limits of this FMU if there are Saguaro's present. Non-fire treatments would also be allowed in this unit. Non-fire is hand removal of trees for thinning purposes. This FMU contains 5 of the 6 vegetation zones outlined for fire management. These include the desert grassland, pine-oak woodland, pine-oak forest, pine forest and mixed conifer forest.

FMU #2 encompasses the entire west district as well as everything below 4000ft in elevation in the east district. This unit would be zoned suppression only with the exception being if park managers deemed it unsafe to suppress or if new scientific data suggests that fire should be a part of this ecosystem. In the latter scenario an amendment to the plan would need to be completed before fire is allowed in this FMU.

This alternative would allow fire management operations to incorporate the new policy direction and terminology as well as new information of threatened and endangered species management. Natural ignitions would not be allowed to burn in the park. The goal of prescribed fire would be to restore fire in an ecologically appropriate manner to fire prone ecosystems in the park's fire management unit 1. The goal of non-fire treatments in FMU 1 would be to reduce the risk of catastrophic fire as well as provide for improved fire lines for prescribed burns. Suppression would be continued in developed areas, near park boundaries with jurisdictions having different fire management objectives and in areas where human life would be placed at risk.

- ALTERNATIVE E – IMPLEMENT AN FMP THAT UTILIZES WILDLAND FIRE USE FOR RESOURCE BENEFIT (WFURB), PRESCRIBED, NON-FIRE TREATMENTS, AND SUPPRESSION TO ACCOMPLISH OBJECTIVES IN FMU 1 AND TOTAL SUPPRESSION IN FMU 2. (PREFERRED ALTERNATIVE)

Maps II-1 and 2 illustrates the layout of management units defining the FMU's for alternative D and E. Like the no action alternative, this alternative allows for prescribed fire and wildland fire use in areas above 4000ft (approximately 53000 acres) where Saguaro's are not present while continuing the appropriate suppression response. This alternative differs in the no action alternative by allowing for non-fire treatments in FMU 1.

FMU #1 encompasses the area of the park above 4000ft in elevation. In this FMU natural ignitions would be allowed to burn and prescribe fires would be initiated in specific areas of the park under conditions, which meet resource objectives. Since the desert scrub elevational limits are variable, fires will be allowed to burn in the upper limit of the desert scrub (4000-5200ft) as long as Saguaro's are not present. This FMU contains 5 of the 6 vegetation zones outlined for fire management. These include the desert grassland, pine-oak woodland, pine-oak forest, pine forest and mixed conifer forest.

FMU #2 encompasses the entire west district as well as everything below approximately 4000ft in elevation in the east district. This unit would be zoned suppression only with the exception being if park managers deemed it unsafe to suppress or if new scientific data suggests that fire should be a part of this ecosystem. In the later scenario an amendment to the plan would need to be completed before fire is allowed in this FMU. In the upper elevational limits of this FMU (3500-4000ft) fire would be allowed to play a role in the absence of Saguaro's.

The preferred alternative would allow fire management operations to incorporate the new policy direction

and terminology as well as new information of threatened and endangered species management. Natural ignitions would be allowed to burn in specific areas of the park under conditions, which meet resource objectives. The goal of prescribed fire would be to restore fire in an ecologically appropriate manner to fire prone ecosystems in the park and to enhance the opportunity for, and management of, wildland fires that benefit and protect the resources in FMU 1. Also under this alternative, suppression would be continued in developed areas, near park boundaries with jurisdictions having different fire management objectives, in areas where human life would be placed at risk, in fires not meeting resource objectives, or for fires that run any risk of becoming unnaturally-large, high-intensity fires. This alternative would allow for interagency cooperation by allowing natural ignitions that are meeting resource objectives to cross boundaries with land management agencies that do have similar objectives.

Actions Common to All Alternatives

Public Safety
Public and firefighter safety is the number one priority of all alternatives. The 2001 Federal Fire Policy states: "Firefighter and public safety is the first priority, and all fire management plans and activities must reflect this commitment." National Park Service Wildland Fire Policy (Director's Order 18) echoes this direction: "The National Park Service is committed to protecting park resources and natural ecological processes, but firefighter and public safety must be the first priority in all fire management activities." The Saguaro Fire Management Plan, regardless of what alternative is selected, would enact necessary measures and direction to ensure the safety of firefighters and the public.

Public Information and Education
An active partnership in fire education would be a component of the yearly planning for park staff in the divisions of Interpretation and Resources Management and in the branch of Fire and Aviation. Fire education would be a component of the park's interpretation program. During emergency wildland fire situations, park interpretive staff would assist in providing information to visitors and in assisting the incident information officer.

Mitigation Measures
To ensure that implementation of any action alternative protects natural and cultural resources and the quality of the visitor experience, a consistent set of mitigation measures would be applied to actions implemented under this plan. These mitigation measures would also be applied to other future actions that are guided by this plan. Mitigations have been identified that relate to safety and human impacts, natural resources, cultural resources, treatment of snags and slash, visual quality, communication/coordination and wilderness values/suppression.

Protection of Sensitive Resources
Saguaro National Park has a variety of special places and sensitive cultural and natural resources. The sensitive resources that are known would be protected. For example, if known habitat for a special-status species is within any proposed prescribed fire or managed wildland fire area, the habitat would be evaluated and appropriate mitigation measures would be applied, if necessary. Resource specialists would be involved in prescribed fire planning according to fire management protocols. On-the-ground inventory of the prescribed fire unit would be specifically requested if sensitive resources were within the unit, so that appropriate protection measures could be taken.

Non-Native Plant Species Management Activities
Fire would be used as a tool, when needed, in managing invasive non-native species, as prescribed in other action planning. In some areas outside of the Park, the timing of prescribed burns has contributed to the invasion of non-natives. As a result of knowledge gleaned through monitoring, prescribed burns in these areas would be scheduled for seasons when propagation would not be enhanced by fire.

Air Quality/Smoke Management
With all treatments involving fire, there would be strict adherence to state and federal regulations. This process mandates consultation with State, county, and other federal agencies that are involved with similar land treatments. Ignition of prescribed fires would need prior approval from Arizona Department of Environmental Quality (ADEQ). Monitoring would accompany all prescribed fires by documenting visual aspects of the smoke column or particulate monitoring with specialized equipment.

Air Quality Watershed Strategy
Smoke movement patterns have a direct relationship to watersheds, especially below 7,500 feet. If several fires were burning simultaneously in the same air-quality watershed, down-valley smoke might be extreme. Because of this, the park would potentially control additional starts within an air-quality watershed that already had a fire burning within it.

Research and Monitoring
Fire monitoring would include monitoring of wildland and prescribed fires and the systematic collection and recording of data on fuels, topography, weather, air quality, fire behavior, and ecosystem response. For cultural resources, cultural resource specialists would identify any necessary pre-burn mitigation, resource protection measures, and the most appropriate monitoring strategy for the planned and unplanned burns.

The current fire management program is based on more than 30 years of scientific studies and research. As the program continues to mature, additional information will be needed to refine objectives and meet new challenges. New research needs and priorities would be identified by the Fire Management Office in conjunction with Saguaro's Resources Management. Adaptive Management would be used at Saguaro National Park to guide fire management activities while drawing on the best available science, emergent technologies, and an ever-increasing database on the role and effects of fire on park resources.

Trails Used for Fire Protection
Trails within the park would provide access for monitoring and control of wildland fires. Trails would be used as boundaries for prescribed burns, anchor points for constructing fire line, and as fire line. They would provide access for crews trying to get to an unwanted fire rapidly.

Saguaro Fire Management Organization and Responsibilities
The fire management program in Saguaro National Park is directed by the Fire Management Officer (FMO). The Fire Management Officer works for the Chief, Division of Visitor Protection and supervises five specialists in charge of four functional areas. These are: wildland fire suppression/aviation, fire ecology/effects, prescribed fire/fire use, fire use module activities and administration.

Fire Reporting
Fire reporting follows guidelines established by National Park Service policy and Directors Order 18 and the associated reference manual, RM-18 (NPS 1998, 1999b). All fires, regardless of type, are required to have a written report, which is tracked at the park and at national levels.

Affected Environment

A list of specific resource topics was developed to focus on and compare environmental impacts of fire management activities among alternatives. These resource topics were selected based on federal law, regulations, and executive orders; National Park Service management policies; National Park Service and federal wildland fire management policies; National Park Service subject-matter expertise; and concerns expressed by the public or other agencies during the public scoping periods.

The existing environment that could be affected by actions proposed in this Saguaro Fire Management Plan/EIS is described in Section 3. These conditions establish the baseline for the analysis of effects found in Section 4, Environmental Consequences.

Environmental Consequences

An impact analysis for each of the impact topic areas (listing above) has been completed for each of the three alternatives in the Saguaro Fire Management Plan/Environmental Impact Statement. Section 4, Environmental Consequences, describes both beneficial and adverse effects in detail. Below is a summary of the findings.

Summary of Environmental Consequences: Overall Impacts by Topic
(Note: More in-depth analysis and definitions of the type, duration, and intensity of impacts for each impact topic can be found in Section IV.)

Impact Topic	Alternative C (No Action Alternative)	Alternative D (Prescribed Fire and Non-fire Treatments Alternative)	Alternative E (Variable Action Alternative — Preferred Alternative)
Vegetation			
	Impacts from Alternative C on park vegetation would generally be beneficial, long term, and minor to moderate. Prescribed fire and wildland fire use for resource benefit would help restore fire to fire-adapted vegetation types, as well as reduce fuel buildup throughout the park, which would decrease the chance for catastrophic fire. However, continued use of fire in Sonoran desertscrub and grasslands could have adverse effects. Continued use of an outdated fire management plan (FMP) without a site-specific fire implementation plan could also have adverse effects. Overall, impacts would have the potential to be adverse, long term, and minor to major.	Under Alternative D, impacts on park vegetation in specific areas targeted for prescribed burns would be beneficial, long term, and minor to moderate, as the risk of high severity fires in those areas is reduced. Maximum suppression would minimize death and injury to plants (and animals) in the short run and favor late seral species. However, the risk of high-severity fire that would lead to lower overall diversity would be the highest under this alternative, following buildup of fuels caused by suppression of all wildland fires. There would also be greater impacts from fire suppression activities. Overall, impacts would have the potential to be adverse, long term, and minor to major.	Under Alternative E, prescribed fire and wildland fire use for resource benefit would help restore fire to fire-adapted vegetation types as well as reduce fuel buildup throughout the park, which would decrease the chance for catastrophic fire. Fire would be suppressed in non fire-adapted vegetation types. An updated FMP would allow managers to make better-informed decisions that take into account new, site-specific data on resources and fire behavior. Overall, impacts would have the potential to be beneficial, long term, and negligible to moderate.
Wildlife			
	Alternative C, which does not have a site-specific fire implementation plan and allows for the occurrence of some wildland fire use for resource benefit in the upper elevations of Sonoran desertscrub, would have relatively high potential (i.e., higher than Alternative E but less than Alternative D) to adversely affect wildlife resources in the park.	Impacts of Alternative D on wildlife would be adverse, long term, and moderate to major due to the continuation of the direct effects of high fuel loading on habitat structure and quality in some areas, and the continued threat of catastrophic fire from fuel buildup caused by suppression of all wildland fires.	Alternative E, which would allow wildland fire use for resource benefit and prescribed fire above 4,000 feet within the constraints of the implementation plan, would reduce fuel loads (and thus the risk of catastrophic wildfire) while minimizing adverse impacts on sensitive resources. Potential adverse impacts on wildlife species

Impact Topic	Alternative C (No Action Alternative)	Alternative D (Prescribed Fire and Non-fire Treatments Alternative)	Alternative E (Variable Action Alternative — Preferred Alternative)
	Impacts would be adverse, long term, and moderate to major.		would therefore be minimized as well. Overall, impacts on wildlife from the Preferred Alternative would be beneficial, long term, and minor to major.
Species of Special Concern			
Gila Topminnow	Alternative C, which would not have a site-specific fire implementation plan and would allow for the occurrence of some wildland fire use for resource benefit in the upper elevations of Sonoran desertscrub, would have potential to adversely affect the park's Gila topminnow habitat/reintroduction site. Overall, impacts could be adverse, long term, and minor to major.	Under this alternative, there would be considerable risk of catastrophic fire due to fuel buildup caused by suppression of all wildland fires, and so, like Alternative C, it has potential to adversely affect the park's Gila topminnow habitat/reintroduction site. Overall, impacts could be adverse, short or long term, and negligible to major.	This alternative would provide the park's Gila topminnow habitat/reintroduction site with the most protection by reducing fuel loads with both wildland fire for resource benefit and prescribed fire and by the implementation of a site-specific fire implementation plan. Overall, impacts from this alternative should be beneficial, long term, and negligible to moderate.
Lesser Long-nosed Bat	As Alternative C is the only one that would allow wildland fire use for resource benefit and prescribed fire in the Sonoran desertscrub and desert grassland. It would have the most potential to adversely affect lesser long-nosed bats in the short or long term with minor to moderate impacts due to the bat's major food source being located in the Sonoran desertscrub.	Under this alternative, there would be considerable risk of catastrophic fire above 4,000 feet due to fuel buildup caused by suppression of all wildland fires. It therefore would have intermediate potential (i.e., between Alternatives C and E) to adversely affect lesser long-nosed bats. Adverse impacts would be short or long term, and minor to moderate.	This alternative would provide the most protection for lesser long-nosed bats by decreasing the likelihood of catastrophic fire and by not using wildland fire use for resource benefit in non-fire-adapted ecosystems. Overall, impacts would be beneficial, long term, and negligible to minor.
Cactus ferruginous pygmy-owl	Because this alternative is the only one that would allow wildland fire use for resource benefit in Sonoran desertscrub, it has the most potential to adversely	Under this alternative there is considerable risk of catastrophic wildfire above 4,000 feet (due to suppression of all wildfires and the lack of wildland fire use for resource	The greatest potential fire-related threat to cactus ferruginous pygmy-owls in the park is from fire that destroys or degrades their habitat/components,

Impact Topic	Alternative C (No Action Alternative)	Alternative D (Prescribed Fire and Non-fire Treatments Alternative)	Alternative E (Variable Action Alternative — Preferred Alternative)
	affect cactus ferruginous pygmy-owls. Depending on how a fire affects habitat components, impacts would have the potential to be adverse, short or long term, and negligible to moderate.	benefit). However, this alternative does not allow fire in the habitats of the cactus ferruginous pygmy-owls; and so it has intermediate (i.e., between Alternatives C and E) potential to affect cactus ferruginous pygmy-owls. Impacts could be beneficial or adverse, short or long term, and negligible to moderate.	particularly riparian or xeroriparian resources, and mesquite bosque below 4,000 feet. This alternative would provide the most protection from such adverse impacts. Impacts would be beneficial, short or long term, and negligible to minor.
Peregrin Falcon	Catastrophic fire would be no more likely to occur under Alternative C than under Alternative E, and would be less likely than under Alternative D. However, without a site-specific fire implementation plan, fire would be more likely to cause adverse impacts to resources important to peregrine falcons under this alternative than under Alternative E. Overall, impacts could be adverse, short term, and negligible to moderate.	Peregrin falcons could be adversely impacted in a minor to major way in the short and long term by catastrophic fire, which would be most likely under this alternative due to fuel buildup caused by the lack of wildland fire use for resource benefit.	Impacts on peregrine falcons under Alternative E would be essentially the same as under Alternative C. However, catastrophic fire with the potential to harm resources essential to peregrine falcons would be least likely under this alternative due to the development of a site-specific fire implementation plan. Thus, the likelihood of adverse impacts would be less under Alternative E than under Alternative C.
Mexican Spotted Owl (MSO)	The current prescribed burn program does offer some short-term moderate benefits to the owls and their habitats. However, under this alternative, there would be the potential for major adverse effects from catastrophic fire in the short and long term. These risks would stem in part from the decision-making process under the current fire management plan, and from park managers' inability to apply prescribed burning and wildland fire use for resource benefit in Mexican	There would be greater potential for major adverse impacts on MSOs from catastrophic fire in the short and long term under this alternative than under the others. However, the park would be able to conduct prescribed burns in MSO PACs to reduce fuel loads, and thus the vulnerability of MSO roost and nest trees to fire. Therefore, there would be more opportunity to protect MSOs and their habitats under Alternative D than under Alternative C, offering the owls some	Under Alternative E, there would be the opportunity to take advantage of naturally ignited fires to reduce fuel loads throughout the park using an updated, site-specific fire implementation plan, and to conduct prescribed burns, including within PACs. This latter treatment would reduce fuel loads and the vulnerability of MSO roost and nest trees to fire. Therefore, this alternative offers the most options and the best strategy for

Impact Topic	Alternative C (No Action Alternative)	Alternative D (Prescribed Fire and Non-fire Treatments Alternative)	Alternative E (Variable Action Alternative — Preferred Alternative)
	spotted owl protected activity centers.	long- as well as short-term benefits.	protecting MSOs and their habitats in the park, and offers them major long- as well as short-term benefits.
Plant Species of Special concern found below and above 4,000 feet in elevation. Pima Indian Mallow, Trelease Agave, Needle-spine pineapple cactus, and Needle-spine pineapple cactus	The No Action Alternative would allow for the occurrence of some wildland fire use for resource benefit and prescribed fire in the upper elevations of Sonoran desertscrub and in the desert grassland, which comprise much of these species and their habitat. This treatment would potentially have adverse effects on desertscrub, which is an non-fire-adapted vegetation type and desert grassland, which needs further study. Since The No Action Alternative would not have a site-specific fire implementation plan that would allow park managers to properly consider these species and mitigate these effects by avoidance, it would have the potential to adversely affect them. Overall, impacts could be adverse, long term, and minor to major.	Due to the lack of wildland fire use for resource benefit, the chance for catastrophic fire would increase throughout the park due to fuel buildup mostly at elevations above 4,000 feet. Although these species are potentially found at elevations and in vegetation types where fire is uncommon (below 4,000 feet), catastrophic fires could more readily spread to those elevations through the buildup of fuels at higher elevations. Impacts would be adverse, long term, and negligible to major	Alternative E provides the greatest opportunity, when compared to the No Action Alternative and Alternative D, to reduce the risk of catastrophic fire throughout the park by using wildland fire use for resource benefit, prescribed fire, and non-fire treatments. In addition the site-specific fire implementation plan and the elimination of fire from non-fire adapted vegetation types provides the best protection for the population of these species. Overall, impacts would be beneficial, long-term, and minor to moderate.
Plant Species of Special concern found below and above 4,000 feet in elevation. Desert night-blooming cereus, Thornber pincushion cactus, and Tumamoc	The No Action Alternative would allow for the occurrence of some wildland fire use for resource benefit and prescribed fire (in the Rincon Mountain District) in the upper elevations of Sonoran desertscrub and in the desert grassland. This treatment would potentially have adverse effects on these species that are found in the desertscrub, which is a non-fire-adapted vegetation type and desert	Due to the lack of wildland fire use for resource benefit, the chance for catastrophic fire would increase throughout the park due to fuel buildup mostly at elevations above 4,000 feet. Although these species are potentially found at elevations and in vegetation types where fire is uncommon (below 4,000 feet), catastrophic fires could more readily spread to those elevations through the	Alternative E provides the greatest opportunity, when compared to the No Action Alternative and Alternative D, to reduce the risk of catastrophic fire throughout the park by using wildland fire use for resource benefit, prescribed fire, and non-fire treatments. In addition the site-specific fire implementation plan and the elimination of fire from non-fire

Impact Topic	Alternative C (No Action Alternative)	Alternative D (Prescribed Fire and Non-fire Treatments Alternative)	Alternative E (Variable Action Alternative — Preferred Alternative)
globeberry	grassland, which needs further study. Since The No Action Alternative would not have a site-specific fire implementation plan that would allow park managers to properly consider these species and mitigate these effects by avoidance, it would have the potential to adversely affect them. Overall, impacts could be adverse, long term, and minor to major.	buildup of fuels at higher elevations. Impacts would be adverse, long term, and negligible to major.	adapted vegetation types where these species are located provides the best protection for these species. Overall, impacts would be beneficial, long-term, and minor to moderate.
Physical Environment — Watersheds, Soils, and Water Quality/Quantity			
	Alternative C would have adverse or beneficial, long-term, and moderate to major impacts on the physical environment. This conclusion is weighed on a combination of beneficial, long-term, moderate impacts with the proper use of wildland fire for resource benefit and prescribed fire, and the potential for adverse, long-term, and major impacts without an updated, site-specific fire implementation plan.	This alternative would have adverse, long-term, and moderate impacts on the physical environment. This conclusion is based on combining the beneficial, long-term, moderate to major impacts in treatment areas with the potential for areas of adverse, long-term, and major impacts due to the lack of wildland fire use for resource benefit and increased fuel loads. This lack would increase the chance for large, high-severity fires in a greater area than Alternatives C and E, which would likely occur during the life of the plan.	Overall, impacts on soil and watershed conditions under Alternative E would be beneficial, long term, and minor to moderate. High-severity fires could occur during the life of this plan, but the treatments proposed would reduce fire size and effects on soils and sheds, including the potential for adverse impacts on water yield, peak flow, nutrient yield, sediment yield, and stream system response.
Air Quality			
	Emissions under the No Action Alternative would be greater than under Alternative D in the short run (due to more fire), but through continued use of prescribed fire and wildland fire use for resource benefit that would result in	Alternative D would cause the least amount of emissions in the short run. However, with continued suppression and increased fuel loads, the chance for long-duration catastrophic fire would increase, which would increase emissions over the	The impacts of this alternative would, for the most part, be the same as Alternative C. However, with a new site-specific fire implementation plan that takes into account new information on fire behavior and air quality issues,

Impact Topic	Alternative C (No Action Alternative)	Alternative D (Prescribed Fire and Non-fire Treatments Alternative)	Alternative E (Variable Action Alternative — Preferred Alternative)
	decreased fuel loads, the chance of long-duration catastrophic fire events would decrease. Therefore, impacts would be adverse, short term, and negligible to minor.	long run. Minor to moderate changes in air quality measurements (from current conditions) that could be attributed to park's fire activity would be expected in the long run. Overall, impacts would be adverse, short term, and minor to moderate.	adverse impacts would likely be lessened.
Cultural Resources			
	The majority of the park's significant cultural resources are located primarily in Sonoran desertscrub areas. Alternative C would allow wildland fire use for resource benefit in the higher elevations of Sonoran desertscrub, and could therefore have more adverse impacts on cultural resources than the other alternatives (although most of the cultural resources are found in the lower elevations of Sonoran desertscrub). Historic Manning Cabin would have the same protection under Alternatives C and E. Overall, impacts would be "not adverse," long term, and negligible to minor.	This alternative would effectively protect cultural resources in the short run, as treatments would be under management control. However, it would be the least effective alternative in the long run due to increased fire suppression and consequent fuel buildup that would increase the likelihood of catastrophic fire. Alternative D would have moderate short-term beneficial impacts with long-term adverse impacts varying from minor to Major.	Alternative E would be the most effective at protecting cultural resources in the long run, as hazardous fuel loads would be reduced using wildland fire for resource benefit as well as prescribed fire, with the added benefit of an updated FMP that would include a cultural resource component (CRC). The CRC would help managers with mitigation measures and treatment options that protect cultural resources. Overall, impacts would be "not adverse," long term, and negligible to minor.
Visitor Convenience			
	Alternative C would have adverse, short-term, and negligible to minor impacts on visitor convenience due to short-term closures and restrictions because of fire management activities. The chance for large catastrophic fires would continue to decrease due to the use of both wildland	This alternative would have the most potential for adverse, long-term, and minor to major impacts on visitor convenience. This would be due to short-term closures and restrictions because of fire management activities, and longer-term closures and impacts from the increased	The impacts of Alternative E on visitor convenience would, for the most part, be the same as Alternative C. However, the ability to integrate new knowledge of fire history, behavior, and ecology into a site-specific fire implementation plan would reduce the risk of potential

Impact Topic	Alternative C (No Action Alternative)	Alternative D (Prescribed Fire and Non-fire Treatments Alternative)	Alternative E (Variable Action Alternative — Preferred Alternative)
	fire for resource benefit and prescribed fire.	chance for large catastrophic fires due to increased fuel loads brought about by the lack of wildland fire use for resource benefit.	adverse, long-term impacts by giving managers better site specific guidance for managing fires.
Local Communities			
	Alternative C could have economic benefits for the local communities by using local resources during fire activities (e.g. food, lodging). Since fire activities occur during the lowest visitor-use months and in the lowest visitor-use areas, the benefits through spending in the local communities would outweigh the minor impacts that temporary closures could have. In general, impacts would be beneficial, short term, and negligible.	This alternative would have the potential to benefit the local communities' economies through increased suppression activities, which would use local resources, as well as through increased likelihood of catastrophic fire events, which would also use local resources. Increased suppression would have a negative effect on local community members who live close to the park boundary, due to increased air and ground traffic and noise. In general, impacts would be beneficial, short term, and negligible to minor.	The impacts of Alternative E on local communities would be the same as Alternative C.
Life and Property			
	With continued use of wildland fire use for resource benefit and prescribed fire, short-term adverse impacts on life and property would be reduced by decreasing fuel loads and the risk of high-intensity catastrophic fire. Negligible to minor, long-term, beneficial impacts on life and property would accrue as management objectives are met. However, the current plan does not incorporate lessons learned, new data on fire behavior and effects, and new policy guidelines in a	This alternative would place firefighters and the public at risk more often than Alternatives C and E due to the high level of suppression activities. In the long run, there would be the potential for moderate to major adverse impacts on firefighter and public safety and property during periods of severe fire conditions.	This alternative would be the most effective at protecting life and property in the long run. Hazardous fuel loads would be reduced as in Alternative C, and lessons learned, new data on fire behavior and effects, and new policy guidelines would be integrated into fire management, which would have the potential to provide for more protection of life and property. With continued use of wildland fire for resource benefit and prescribed fire with appropriate

Impact Topic	Alternative C (No Action Alternative)	Alternative D (Prescribed Fire and Non-fire Treatments Alternative)	Alternative E (Variable Action Alternative — Preferred Alternative)
	site-specific fire implementation plan, which would provide for even more protection of life and property. Overall, impacts would be beneficial, long-term and negligible to minor.		protective measures, impacts to public safety and property would be negligible, short-term, and adverse. Minor, long-term, beneficial impacts to life and property would accrue as management objectives are met.
Wilderness			
	Fire management activities under the No Action Alternative would affect wilderness resources in generally beneficial ways, through actions that would maintain plant communities within their natural range of variability, and thus maintain wilderness values. Effects in wilderness areas that are not adapted to fire would be dependent on how quickly fires could be suppressed. In wilderness, helicopter and chainsaw noises would continue to introduce short-term intrusions, with adverse and moderate effects. Overall, these impacts would be beneficial, long term, and minor to moderate. However, the No Action Alternative would not include an updated, site-specific fire implementation plan with current scientific data to help guide managers in making effective, informed decisions with regard to suppression and wildland fire use for resource benefit in wilderness areas. Thus, the chance of adverse impacts would exist.	Both FMU's have wilderness areas. Alternative D would have adverse, long-term, and moderate to major impacts on wilderness in FMU 1 due to the increased likelihood of large catastrophic fires caused by fuel buildup from increased suppression activities. FMU 2 wilderness areas are not fire adapted and do not need fire to maintain them.	The impacts of Alternative E on wilderness would be the same as Alternative C, with the added benefit of utilizing an updated plan with more current and site-specific knowledge of resources, fire effects, and fire behavior, which would reduce the chance for adverse impacts in FMU 1. FMU 2 wilderness areas are not fire adapted and do not need fire to maintain them.

Impact Topic	Alternative C (No Action Alternative)	Alternative D (Prescribed Fire and Non-fire Treatments Alternative)	Alternative E (Variable Action Alternative — Preferred Alternative)
Environmental Justice			
	Fire management activities at Saguaro National Park have not targeted one or more areas as more important than other. The impacts of Alternative C upon minority and low-income populations in local communities would therefore be beneficial, short term, and negligible to minor.	The Impacts of Alternative D upon minority and low-income populations in local communities would be the same as Alternative C.	The Impacts of Alternative E upon minority and low-income populations in local communities would be the same as Alternative C.
Energy Consumption			
	Under Alternative C, energy would be consumed during all fire activities. Typically, more than 7,000 gallons of various fuels would be consumed per year. The impacts of the fire management program's energy demand would continue to be adverse, short term, and negligible.	Under Alternative D, energy would be consumed during all fire activities. Typically, more than 6,000 gallons of various fuels would be consumed per year. This alternative would use an estimated 1,000 gallons of fuel less than either Alternative C or E. However, impacts of the program's energy demand would be expected to be the same as the other alternatives (adverse, short term, and negligible).	The impacts of Alternative E's energy demand under would be the same as discussed under Alternative C.

Section I: Purpose and Need for Action

Introduction

Fire management is an integral part of the natural and cultural resources management program at Saguaro National Park. (Note: For ease of reading, "Saguaro National Park" is shortened to "Saguaro" in many instances throughout this document.) All major forest, woodland, and grassland plant communities in Saguaro have evolved under the influences of periodic fires, and many plants have developed adaptations to a regime of frequently occurring fires. Some plants are even dependent upon fire for successful reproduction. Unfortunately, decades of fire suppression have altered park vegetation, thus altering wildlife habitat as well. The restoration of fire to its natural role in park ecosystems is one of the highest natural resource management priorities at Saguaro.

Cultural resource management at Saguaro National Park also benefits from fire—fire can protect cultural sites or maintain cultural landscapes. For example, historic buildings must be protected from wildland fire, and one effective protection method is to periodically burn surrounding trees and shrubs to maintain open, fire-resistant forest. Historically, fire was used by American Indians to maintain the meadows and open stands of oaks and conifers in southern Arizona, thereby helping preserve important traditional plants and living spaces. Thus, fire plays a role in sustaining not only the natural ecosystems, but also the cultural value of the landscapes in Saguaro National Park and surrounding areas.

Saguaro National Park is divided into two districts located to the east and west of Tucson, Arizona (Map I-1). The park is adjacent to developed communities, private lands, and other public lands. Because of this mosaic of land uses and designations, and the fact that the park's two districts are separated by a large city, land management policies and activities are complex. This is especially true for fire management activities, which must be applied in different ways in the various areas of the park.

This *Saguaro Fire Management Plan/Environmental Impact Statement (EIS)* presents several alternatives to implement National Park Service and federal wildland fire policies and revise the fire management program at Saguaro National Park, which is currently operating under a fire management plan approved in 1991. The *Saguaro Fire Management Plan* would assist in achieving land management objectives defined in the park's 1988 *General Management Plan* and 1993 *Resources Management Plan*.

This plan proposes alternatives for managing wildland and prescribed fire, and for maintaining and restoring ecosystems, reducing fuels, and protecting cultural resources in the park. It also examines the environmental impacts of each alternative. With this plan, Saguaro's fire management program would employ fire management activities to accomplish land and resource management objectives and to reduce the risk of unwanted fire in and adjacent to the park. Depending on the area needing attention, the park would use different methods (also known as *treatments*) to manage fire and decades of buildup of burnable vegetation and woody debris (dead and dry wood, leaves, and duff). Strategies for implementation would be based on knowledge gained from fire and fuels research, monitoring, and experience in Saguaro over the last half century.

Fire management planning and programs have been operational in the national park system since 1970, before which the National Park Service changed its policy from controlling natural processes to allowing natural processes to occur when possible. For fire management, this means that the National Park Service went from suppressing all fires to letting some fires burn if they would contribute to accomplishing resource management objectives without threatening developed or populated areas or cultural sites. Refinements in fire management programs have been made since then and would continue to be made as knowledge of fire ecology and fire behavior increases.

Fire management plans are fundamental strategic documents that guide the full range of fire management related activities. They are required by the *National Park Service Director's Order 18* (National Park Service 2001), which says: "Every park area with burnable vegetation must have a fire management plan approved by the superintendent," and the *2001 Federal Wildland Fire Management Policy* (hereafter, *2001 Federal Fire Policy*), which reiterates: "Complete, or update, fire management plans for all areas with burnable vegetation."

The Decision to Prepare an EIS

The decision to prepare an EIS for the *Draft Saguaro Fire Management Plan* was made by an interdisciplinary team from Saguaro National Park after specific issues were raised while completing the National Park Service's Intermountain Region Environmental Screening Form. Members of the team were concerned about wildland fires and the buildup of forest fuels near sensitive natural resources.

Following the public comment period on the *Draft Saguaro Fire Management Plan/EIS* and consultations on any actions that may affect historic resources or special-status species, a final *Saguaro Fire Management Plan/EIS* would be prepared and distributed to the public. At the conclusion of a 30-day waiting period, the National Park Service would prepare a Record of Decision. At that time, any changes that are made to Saguaro's fire management program would be implemented. A summary document, the *Saguaro Fire Management Implementation Plan*, would also be prepared. It would focus on the actions selected for implementation and would become the working document for guiding wildland fire management actions in Saguaro National Park.

This *Saguaro Fire Management Plan/EIS* was prepared to comply with the requirements of the National Environmental Policy Act (NEPA) and the National Historic Preservation Act as well as the Endangered Species Act and the Wild and Scenic Rivers Act. The legal authority for preparing and implementing the *Saguaro Fire Management Plan* is 16 United States Code (USC) 1 through 4, which is the 1916 Organic Act for the National Park Service.

Purpose of Action

The purpose of the proposed action is to implement a new fire management plan at Saguaro National Park. The approved plan would provide a framework for making fire-related decisions and serve as an operations manual. This document specifies and justifies fire management goals and objectives as described below. Some of the elements are decreed by laws and policies, while others have been developed by the parties, including the public, that have participated in the process of creating the plan.

The specific purposes of the *Saguaro Fire Management Plan* are to:

- Identify and implement methods to restore and maintain park ecosystems and ecosystem processes that allow fire to play its natural role in the ecosystem, both as wildland fire and prescribed fire.
- Reduce the risk of fire damage to cultural resources (e.g., historic buildings, pictographs) through fuels reduction, prescribed burning, or fire suppression. Fire would also be used as a tool to manage cultural landscapes.
- Reduce the risk of catastrophic fire, including near the wildland/urban interface (communities, government and commercial buildings, and other developed areas), while continuing to reverse the adverse effects of past fire suppression and prevention activities.

- Execute a fire management program that provides a safe environment for firefighters and the public, including safe operations and fire management related facilities (e.g., helibases, fire camps, fire stations).
- Provide a plan that is consistent with National Park Service wildland fire management policy and adheres to guiding principles from the *2001 Federal Fire Policy*.

Need for Action

Wildland fire plays an important role in shaping the vegetative communities of Saguaro National Park. Although fire occurs infrequently on the desert floor, wildland fires have been particularly important in perpetuating natural ecosystem processes in the park's Rincon Mountains (Baisan 1990) and other mountain ranges of southern Arizona. Natural fire occurrence is episodic; fire-free intervals allow dead vegetative biomass to accumulate to the point where sustained fire, of varying intensity, is probably high.

The Rincon Mountains have a complex natural fire history as discussed in Section II. Prior to the 1970s, when aggressive fire suppression was the policy, accumulations of dead and down plant material were reduced by periodic natural fire events. During the period 1939 to 2002, 567 fires were reported in the Rincon Mountains, of which, less than 5% have been human caused. The Tucson Mountains, on the other hand, have a simple fire history. Fire has not been a natural dominant force in the Tucson Mountains. Since the addition of the Tucson Mountain District in the 1960's, only 20 fires were reported, of which, more than 95% of them have been human caused.

In recognition of fire as a natural ecosystem process, National Park Service policy requires that fire be addressed in the management of Saguaro National Park's plant communities. *National Park Service Management Policies* (National Park Service 1988), *National Park Service Guidelines for Fire Management* (Directors Order-18)(National Park Service 2002), and National Park Service resource management policies all endorse the restoration of natural fire as an ecosystem process in appropriate NPS units.

In 1971, Saguaro National Park developed a fire management plan introduced as Management Appendix 1 of the *Natural Resources Management Plan*. The plan was updated in 1979, 1983, and 1991. The 1979 fire management plan allowed lightning fires to burn within determined areas under certain conditions. The 1983 interim fire management plan stated that lightning activity is natural and fires resulting from such activity should be allowed to occur without intervention from humans. It further stated that historically this latter condition had not taken place, but that with the input of new information a new plan would be developed that would take into consideration several criteria for natural fire management and would replace all prior-planning documents. The 1991 fire management plan addressed the effects of fire on all biotic communities of the park, from the desert to the montane ecosystems. A second consideration of the 1991 plan was the use of fire management units based on "natural" fuel loading, natural vegetative associations, and fire control needs. A third part of this plan was the inclusion of a literature review of known fire effects on natural communities found in the park. Furthermore, it was the intent of the 1991 plan to consolidate all of the data relating to fire management at Saguaro National Park into one document.

The 1991 plan needs updating to incorporate advances in fire knowledge; results of burning and monitoring programs at Saguaro, new information about park resources including sensitive, threatened, or endangered species; and revisions in National Park Service policy. The fire management plan guides all aspects of a park's fire program. The National Park Service goal of fire management plan annual reviews and updates at least every 5-years acknowledges the rapidly changing fire context in parks. Ecologists are increasing our understanding of the role of fire in biotic communities. Fire scientists are learning more about fire behavior as fire-fighting techniques also improve. Policies have been rewritten to incorporate

these advances as well as to respond to growing concern at many levels about the legacy of the fire suppression era—more catastrophic events where frequent, low-intensity fires formerly kept fuel buildup in check.

Among the findings of the Interagency Fire Management Policy Review Team, released in May 1989, and the Federal Wildland Fire Management Policy & Program Review, released in December 1996, was the recommendation that no wildland fire for resource benefit be permitted until fire management plans met certain standards. Included among those standards was the requirement that all plans comply with NEPA.

Accordingly, this environmental analysis evaluates potential impacts to the environment from the proposed fire management program as outlined in the *Saguaro Fire Management Plan*.

Background

The "sky island" mountain ranges of southern Arizona have a high incidence of lightning fires. Over the past 30 years, lightning has started an average of 9 fires a year in Saguaro National Park. In some years, thousands of acres burned, while in other years only a few acres burned. These fires affected the amount and types of vegetation in those areas—both of which influence fire incidence and behavior.

Evolution of National Park Service Policy toward Natural Processes Management

Disruption of ecological processes and a diminished visitor experience, along with an evolving body of knowledge suggesting that fires are an essential element in the survival of many plant and animal species, led to a reassessment of the traditional National Park Service policy of suppressing lightning fires. A major step in this process was the report of the Advisory Board on Wildlife Management in the National Parks (Leopold et al. 1963). This report strongly influenced the National Park Service, which began to change its policy on natural process management in the late 1960s. In 1970, Saguaro National Park initiated use of prescribed fire, and in 1972 the park began to manage naturally ignited (i.e., lightning-caused) wildland fires.

Wildland Fire Conditions in Saguaro National Park

All vegetation that can sustain a wildland fire in Saguaro National Park will burn from time to time. As a result, plants and plant communities exist within a cycle of burning and growth. Between burns, the structure of the plant community changes as the smaller plants beneath the canopy (plants of the *understory*) grow larger and some plants out-compete or out-grow others. Some areas burn more frequently than others. Fire tends to move through ponderosa pine forests often, about every six years, creating an open understory while leaving the larger, fire-resistant trees of the *overstory* intact. On the other hand, mixed-conifer forests may burn frequently or may not be visited by fire for decades, with a fire frequency ranging from 5 to 70 years. Because the frequency of fire can vary greatly depending on vegetation type, the time between natural fires is expressed as a range, and called the *fire return interval*. The combination of the frequency, extent, duration, behavior, season, and effects of natural fire that typically would burn within a particular landscape is called the *fire regime*. When fires in a specific area are regularly put out, the natural fire regime is disrupted.

Saguaro National Park's fire records go back to 1930's. Managers at Saguaro therefore have approximately 75 years of records on fire and fire suppression activities on which to rely. In addition, tree ring studies provide a history of fire frequency sometimes dating back hundreds of years. This information is allowing managers to learn about the park's natural fire regimes.

Measuring the difference between the natural frequency of wildland fires and the number of years fire has been suppressed provides an indication of how far plant communities in a particular vegetation type have deviated from natural conditions; in other words, the number of fire return intervals that have been missed can be used to estimate how much the composition and structure of plant communities have been disrupted from what would have been seen had fires been allowed to burn naturally.

In Saguaro National Park, fire has largely been suppressed since the 1920's. In areas of decades-long fire suppression, vegetation types that have short fire return intervals have missed several fires and show a large deviation from natural conditions. This means that in forests, fuel has accumulated and forest density has increased to dangerous levels, while grasslands are being lost due to encroachment of woody species that fire would have kept out. Although in the last two decades the National Park Service has restored fire to many of these areas by allowing naturally ignited fires that meet management objectives to burn, and by using prescribed fire and non-fire treatments, the present program has not been able to meet the needs of the whole park.

Long-term Effects of Fire Suppression on Saguaro's Natural Resources

Because the National Park Service suppressed wildland fires in Saguaro National Park for decades, natural plant community succession, species composition, and structure have been altered. These changes are most pronounced in the desert grassland, Woodland and forest, and ponderosa pine/mixed-conifer forest communities. In forest communities, the forest canopy is becoming increasingly closed and forest openings smaller as shade-tolerant species grow in dense thickets, while fewer grasses, forbs, and shrubs are growing in the remaining openings. Grasslands are being lost as small trees and shrubs are encroaching on meadows that once would have been maintained by frequent fires. In addition, subtle but important hydrological changes may have occurred because of increased forest growth. Decreased runoff and infiltration may have altered the water table around meadows, helping to accelerate tree invasion. All of these changes have, in turn, caused deterioration in the habitat favored by many forms of wildlife.

In some cases, lack of fire has changed habitat that is critical for certain wildlife species. When the number and extent of forest openings are reduced, for example, key herbaceous and shrub species are also diminished. Wildlife that depend on these plants, such as deer, have less available habitat. Other species are dependent on fresh, fire-created snags (standing dead trees) for food (insects) and shelter, and may suffer a decline in the absence of fire. The effects of less burning can also extend up the food chain—for example, rodents are less abundant in areas where fire has been excluded (Werner 1997), almost certainly leading to a reduction in the carnivorous populations that depend on them.

Vegetation changes due to fire suppression have increased the risk of uncontrollable wildland fires in Saguaro National Park. The density of trees and shrubs in many areas has created a hazardous arrangement of closely standing, burnable vegetation, or *fuel ladders*, in the understory. Fuel ladders help fires ascend to the taller trees of the overstory. This combination of fuel ladders and a high density of fuels also increases the potential for insect and pathogen infestations, which may cause tree die-off and further increase the potential for fire. In the event of catastrophic fire, entire forest landscapes can be denuded and reverted to shrub communities, watershed and soil processes can be compromised, and other ecosystem values can be greatly altered.

Fire Suppression and Visitor Experiences

The effects of decades of fire suppression on the natural environment also degrade visitor experiences at Saguaro. Lack of fire has led to loss of vistas and forest openings, and there are fewer opportunities to see wildlife because of habitat changes from both fire suppression and catastrophic wildland fire events caused by fuel buildup.

Fire and Developed Areas

Communities and developed areas bordering Saguaro National Park, as well as developed areas within the park (Map I.1), are all located within vegetation types that have not evolved under the influence of fire (primarily Sonoran desertscrub). Fire in these areas continues to be rare and of little threat to human life or property. When fires are ignited by lightning strikes or accidentally started by humans, most either go out on their own or are successfully suppressed. For decades, and in spite of the current policy of allowing natural processes to occur, aggressive fire fighting has helped protect private and public property, historic and cultural resources, and boundary areas.

Existing Situation

Today, after more than 20 years of proactive fire management in Saguaro National Park, the goal of restoring natural fire regimes to the entire park landscape is far from being achieved, although significant inroads have been made. In addition, the *2001 Federal Fire Policy* specifically mandates public land agencies to reduce the amount of forest and shrubland fuels around areas with homes and buildings, and to restore ecosystems to a more natural, fire-tolerant balance. In order to avert catastrophic fires, this means reducing fuels and changing plant community structure near buildings and in wildland areas. At the same time, the National Park Service has issued new fire management guidelines that require updated fire management plans.

Saguaro's Wildland Fire Use for Resource Benefit and Prescribed Burn Program

In the early 1970s, managers at Saguaro National Park grew interested in re-establishing fire as one of the natural processes maintaining park ecosystems. To date, 84 naturally ignited fires meeting certain criteria have been allowed to burn in the park, totaling 9,786 acres. Park fire managers also recognized that carefully placed fires could reduce fuel buildup around valuable cultural and natural resources, thereby helping protect them from destructive wildfires. Since 1985, 11 prescribed burns have been carried out covering 3,897 acres in four of the park's six vegetation types. Close to 2,400 acres were in ponderosa pine, 50 acres in dry meadow, 500 acres in pine-oak forest, 1,000 acres in Woodland, and 50 acres in desert grassland. This amount of burning has not been enough to undo the impacts of many decades of landscape-scale fire exclusion. To be truly effective, most prescribed burn units require multiple burns to meet resource objectives.

Saguaro's burn program is science based. Since the late 1980s, the park has maintained an active fire effects monitoring program. For each prescribed burn, fire effects monitoring plots are established pre-burn and re-read immediate post burn, year one post burn, year two, year five, year ten, etc. until the unit is burned again, and the process starts over. To date, 58 plots have burned during prescribed burns in Saguaro National Park. Within these plots, trends in fuel loads, understory vegetation, tree density, insects and disease, shrub density and burn severity are examined. The data from the plots is analyzed to determine if the park is reaching its resource management objectives. This allows fire managers to initiate adaptive management practices by adjusting prescriptions in order to better meet objectives.

Purpose and Significance of Saguaro National Park

Saguaro National Park contains within its boundaries natural and cultural resources that are typical of and represent the Sonoran Desert in southern Arizona. The portion of the park now known as the Rincon Mountain District (RMD) was established as a national monument by presidential proclamation (no. 2032) on March 1, 1933. This proclamation states that the purpose of "reserving [the] land…as a national monument" was to preserve and protect "…the exceptional growth thereon of various species of cacti, including the so-called giant [saguaro] cactus". On November 15, 1961, Presidential Proclamation No. 3439 added lands in the Tucson Mountains to the Monument. A first enlargement of the Tucson Mountain District (TMD) occurred on October 21, 1976 (PL 94-578). Preservation of wilderness values

was legislatively mandated on October 20, 1976 (PL 94-576), when 13,470 acres in the TMD and 57,930 acres in the RMD were formally designated as wilderness in accordance with the provisions of the Wilderness Act. In 1994, legislation (PL 103-364) was signed into law that enlarged the boundaries of the monument and upgraded Saguaro from a national monument to a national park.

Both units of the park are located in Pima County, Arizona, and are separated by the city of Tucson. The TMD is located on the western edge of the city and is bordered primarily by Tucson Mountain Park on the south, and residential development on the north, east, and west. The RMD is located on the eastern edge of the city, approximately 35 miles east of the TMD, and is bordered on the east and portions of the north and south sides by the Coronado National Forest, Santa Catalina Ranger District. Residential developments border sections of the western, southwestern, and northwestern boundaries of this district. The park ranges in elevation from 2,180 feet (TMD) to 8,666 feet (RMD) and encompasses 6 structurally distinct biotic communities (see Section III).

The significance of Saguaro National Park lies in the rich diversity of Sonoran Desert life found within a framework of historic and prehistoric human occupation. Park management must assure that these natural and cultural resources are managed in such a manner as would leave them unimpaired for the enjoyment of future generations.

Goals and Objectives of Saguaro's Fire Management Program

The goal of the fire management program at Saguaro National Park is to effectively manage wildland and prescribed fires and provide for the protection of life, property, and cultural resources, while insuring the perpetuation of park ecosystems and natural resources. In addition, Saguaro's fire management program seeks to perpetuate natural systems that are dynamic and flexible, with maximum survival opportunities for native species, yet also function within the historic range of processes and disturbances. The program also seeks to recover, maintain, or increase the native diversity, resiliency, and stability of natural environments. To meet these goals:

1. The fire management program would be based upon sound historic data and processes, current health and conditions, best available science, and chosen outcomes and conditions informed by monitoring our current actions and collecting pertinent information at a variety of scales.
2. **The fire management program would maintain the highest respect and regard for the park's ecosystems (natural systems and environments), but also take human processes (past and current actions, at a variety of scales) and structures (cultural resources and present-day facilities) into account as a part of the system's function.**
3. The fire management program would employ planned and measurable actions, and would monitor defined indicators to produce conditions that are attainable and sustainable, and that maintain or improve ecosystem health. Park managers recognize that this would be an ongoing and developing process. They also recognize their inability to exercise complete management and control over all conditions, and would exercise flexibility and adaptive management.

All fires at Saguaro National Park are classified as either wildland or prescribed fires. Prescribed fires include those ignited by managers under an approved plan to achieve resource management objectives. All fires that do not meet the criteria for prescribed fires are classified as wildland fires, and would receive the appropriate management response (either suppression or wildland fire use for resource benefit). Wildland fire management actions would minimize the impact of the action commensurate with effective control and values to be protected. Saguaro's fire management plan provides direction and guidance to achieve the following resource management and fire management objectives at the park:

1. **Give primary consideration to firefighter, employee, and public safety.**
2. **Manage fire to minimize threats of unacceptable effects of fire to property outside the park.**

   2.a. Identify and map county, state, federal, and private lands within one mile of the park's designated boundary.

3. Restore and maintain fire-prone ecosystems through the ecologically appropriate use of fire.

   3.a. Using the best available scientific data, continue to develop a range of desired conditions, as well as ecologically sound objectives for the fire management program in the park's different ecological landscape settings and plant communities.

   3.b. Include established ecological objectives in the burn plan for each prescribed fire.

   3.c. Identify and map sensitive natural resources within the park's boundaries that could be negatively impacted by fire.

4. Utilize research and monitoring to improve our understanding of the role of fire in the park's plant communities.

   4.a. Adapt protocols utilizing the National Park Service's *Fire Monitoring Handbook* and Fire Effects Assessment Tool that will ensure fire effects are tracked for all prescribed fire use in the park.

   4.b. Develop an appropriate monitoring plan for each prescribed fire or wildland fire for resource benefit.

   4.c. Each year, the fire ecologist and/or lead fire effects monitor will prepare and present an report of data and effects, to measure how well fire management objectives were met.

   4.d. Recognize and address knowledge gaps through research studies.

5. Integrate fire management with all other aspects of park management.

   5.a. The entire fire management staff will conduct a biannual briefing (i.e., before and after the fire season) with interested park staff and interagency cooperators.

   5.b. Insure that collaborative planning among park staff is carried out during any prescribed and wildland fire projects.

   5.c. Fire activities in the park will be directed by the Fire Management Committee under the direction of the Superintendent and the Fire Management Officer.

6. **Educate employees and the public about the scope and effect of wildland and prescribed fire management, including fuels management, resource protection, prevention, hazard/risk assessment, mitigation and rehabilitation, and fire's role in ecosystem management.**

   6.a. Establish fire information teams appropriate for each wildland or prescribed fire operation.

   6.b. Work with the Division of Interpretation to integrate fire management issues and objectives into the park's interpretive plan.

   6.c. Hold yearly meetings and seminars to educate park staff on Saguaro's fire management program.

7. Maintain cooperative planning with other land agencies and landowners.

   7.a. Inform and involve these groups, at the appropriate level, in major planning efforts.

8. Protect sensitive cultural resources.

   8.a. Work with National Park Service cultural resource staff to ensure the protection of sensitive cultural resources.

8.b. Identify and map sensitive cultural resources within the park's boundaries that could be negatively impacted by fire.

Relevant Regulations and Policies

Wildland fire management activities conducted by the National Park Service are guided by *National Park Service Management Policies* (2001), and the *2001 Federal Fire Policy*. Director's Order 18 guides the development of National Park Service policy relative to fire management, and dictates the program requirements for fire management plans. These requirements are listed in table I.1. The *Saguaro Fire Management Plan/EIS* is in compliance with these policies.

National Park Service Management Policies

Table I-1. National Park Service Fire Management Program Requirements

National Park Service Policy Directing Development of Fire Management Plans—Director's Order 18: Wildland Fire Management Section 5: Program Requirements
Every park area with burnable vegetation must have a fire management plan approved by the Superintendent.
All approved fire management plans will: • Reinforce the commitment that firefighter and public safety is the first priority. • Describe wildland fire management objectives, which are derived from land, natural, and cultural resource management plans and address public health issues and values to be protected. • Address all potential wildland fire occurrences and consider the full range of wildland fire management actions. • Promote an interagency approach to managing fires on an ecosystem basis across agency boundaries and in conformance with the inherent ecological processes and conditions characteristic of the ecosystem. • Include a description of rehabilitation techniques and standards that comply with resource management plan objectives and mitigate immediate safety threats. • Be developed with internal and external interdisciplinary input and reviewed by appropriate subject matter experts and all pertinent interested parties, and approved by the park superintendent. • Comply with NEPA and any other applicable regulatory requirements. • Include a wildland fire prevention analysis and plan. • Include a fuels management analysis and plan. • Include procedures for short- and long-term monitoring to document that overall programmatic objectives are being met and undesired effects are not occurring.
Until a fire management plan is approved, park areas must take an aggressive suppression action on all wildland fires, taking into account firefighter and public safety and resources to be protected within and outside the park.
Although resource impacts of suppression alternatives must always be considered in selecting a fire management strategy, resource benefits cannot be the primary consideration unless there is an approved fire management plan.

National Park Service Management Policies, Section 4.5 – Fire Management, as revised in 2001, states the following:

"Naturally ignited fire is a process that is part of many of the natural systems that are being sustained in parks. Human-ignited fires often cause the unnatural destruction of park natural resources. Wildland fire may contribute to or hinder the achievement of park management objectives. Therefore, park fire management programs will be designed to meet park resource management objectives while ensuring that firefighter and public safety are not compromised.

"Each park with vegetation capable of burning will prepare a fire management plan and will address the need for adequate funding and staffing to support its fire management program. The plan will be designed to guide a program that responds to the park's natural and cultural resource objectives; provides for safety considerations for park visitors, employees, neighbors, and developed facilities; and addresses potential impacts to public and private property adjacent to the park. An environmental assessment developed in support of the plan will consider the effects on air quality, water quality, health and safety, and natural and cultural resource management objectives. Preparation of the plan and environmental assessment will include collaboration with adjacent communities, interest groups, state and federal agencies, and tribal governments.

"All fires burning in natural or landscaped vegetation in parks will be classified as either wildland fires or prescribed fires. All wildland fires will be effectively managed through application of the appropriate strategic and tactical management options. These options will be selected after comprehensive consideration of the resource values to be protected, firefighter and public safety, and costs. Prescribed fires are those fires ignited by park managers to achieve resource management and fuel treatment objectives. Prescribed fire activities will include monitoring programs that record fire behavior, smoke behavior, fire decisions, and fire effects to provide information on whether specific objectives are met. All parks will use a systematic decision-making process to determine the most appropriate management strategies for all unplanned ignitions, and for any prescribed fires that are no longer meeting resource management objectives.

"Parks lacking an approved fire management plan may not use resource benefits as a primary consideration influencing the selection of a suppression strategy, but they must consider the resource impacts of suppression alternatives in their decisions. Until a plan is approved, parks must immediately suppress all wildland fires, taking into consideration park resources and values to be protected, firefighter and public safety, and costs. Parks will use methods to suppress wildland fires that minimize impacts of the suppression action and the fire, and are commensurate with effective control, firefighter and public safety, and resource values to be protected."

In addition, Section 6.3.9 states:

"Fire management activities conducted in wilderness areas will conform to the basic purposes of wilderness. The park's fire management and wilderness management plans must identify and reconcile the natural and historic roles of fire in the wilderness, and will provide a prescription for response, if any, to natural and human-caused wildfires. If a prescribed fire program is implemented, these plans will also include the prescriptions and procedures under which the program will be conducted within wilderness. Actions taken to suppress wildfires will use the minimum requirement concept, and will be conducted in such a way as to protect natural and cultural resources and to minimize the lasting impacts of the suppression actions."

Federal Wildland Fire Management Policy

The Interagency Federal Wildland Fire Policy Review Working Group revised the Federal Wildland Fire Management Policy in 2001. The policy's main elements are listed in Table I-2.

Table I-2. Main Elements of the *2001 Federal Wildland Fire Management Policy*

Policy Element	Policy
Safety	Firefighter and public safety is the first priority. All fire management plans and activities must reflect this commitment.
Ecosystem Sustainability	The full range of fire management activities will be used to help achieve ecosystem sustainability including its interrelated ecological, economic, and social components.
Response to Wildland Fire	Fire, as a critical natural process, will be integrated into land and resource management plans and activities on a landscape scale, and across agency boundaries. Response to wildland fire is based on the ecological, social, and legal consequences of the fire. The circumstances under which a fire occurs, and the likely consequences for firefighter and public safety and welfare, natural and cultural resources, and values to be protected dictate the appropriate management response to the fire.
Use of Wildland Fire	Wildland fire will be used to protect, maintain, and enhance resources and, as nearly as possible, be allowed to function in its natural ecological role. Use of fire will be based on approved fire management plans and will follow specific prescriptions described in operational plans.
Rehabilitation and Restoration	Rehabilitation and restoration efforts will be undertaken to protect and sustain ecosystems, public health, and safety, and to help communities protect infrastructure.
Protection Priorities	The protection of human life is the single, overriding priority. Setting priorities among protecting human communities and community infrastructure, other property and improvements, and natural and cultural resources will be based on the values to be protected, human health and safety, and the costs of protection. Once people have committed to an incident, these human resources become the highest value to be protected.
Wildland/Urban **I**nterface	The operational roles of federal agencies as partners in the wildland/urban interface are wildland firefighting, hazardous fuels reduction, cooperative prevention and education, and technical assistance. Federal agencies may assist with exterior structural protection activities under formal Fire Protection Agreements that specify mutual responsibilities of the partners, including funding. (Some federal agencies have full structural protection authority for their facilities on lands they administer; they may also enter into formal agreements to assist state and local governments with full structural protection.)
Planning	Every area with burnable vegetation must have an approved fire management plan. Fire management plans are strategic plans that define a program to manage wildland and prescribed fires based on the area's approved land management plan. Fire management plans must provide for firefighter and public safety; include fire management strategies, tactics, and alternatives; address values to be protected and public health issues; and be consistent with resource management objectives, activities of the

	area, and environmental laws and regulations.
Science	Fire management plans and programs will be based on a foundation of sound science. Research will support ongoing efforts to increase our scientific knowledge of biological, physical, and sociological factors. Information needed to support fire management will be developed through an integrated interagency fire science program. Scientific results must be made available to managers in a timely manner and must be used in the development of land management plans, fire management plans, and implementation plans.
Preparedness	Agencies will ensure their capability to provide safe, cost-effective fire management programs in support of land and resource management plans through appropriate planning, staffing, training, equipment, and management oversight.
Suppression	Fires are suppressed at minimum cost, considering firefighter and public safety, benefits, and values to be protected, consistent with resource objectives.
Prevention	Agencies will work together and with their partners and other affected groups and individuals to prevent unauthorized ignition of wildland fires.
Standardization	Agencies will use compatible planning processes, funding mechanisms, training and qualification requirements, operational procedures, values-to-be-protected methodologies, and public education programs for all fire management activities.
Interagency Cooperation and Coordination	Fire management planning, preparedness, prevention, suppression, fire use, restoration and rehabilitation, monitoring, research, and education will be conducted on an interagency basis with the involvement of cooperators and partners.
Communication and Education	Agencies will enhance knowledge and understanding of wildland fire management policies and practices through internal and external communication and education programs. These programs will be continuously improved through the timely and effective exchange of information among all affected agencies and organizations.
Agency Administrator and Employee Roles	Agency administrators will ensure that their employees are trained, certified, and made available to participate in the wildland fire program locally, regionally, and nationally as the situation demands. Employees with operational, administrative, or other skills will support the wildland fire program as necessary. Agency administrators are responsible and will be held accountable for making employees available.
Evaluation	Agencies will develop and implement a systematic method of evaluation to determine the effectiveness of projects begun under the *2001 Federal Wildland Fire Management Policy*. The evaluation will assure accountability, facilitate resolution of areas of conflict, and identify resource shortages and agency priorities.

Other Relevant Regulations and Policies

Table I-3. Other Relevant Regulations and Policies Listed by Topic

Topic	Relevant Regulations and/or Policies
Air Quality	Federal Clean Air Act; Clean Air Act Amendments of 1990; *National*

Topic	Relevant Regulations and/or Policies
	Park Service Management Policies 2001; Utah Administrative Code, Title 307
Endangered or Threatened Species and Their Habitats	Endangered Species Act; *National Park Service Management Policies 2001*
Soils	*National Park Service Management Policies 2001*
Vegetation	*National Park Service Management Policies 2001*
Water Quality and Hydrology	Clean Water Act; Executive Order 12088; *National Park Service Management Policies 2001*
Wetlands and Floodplains	Executive Order 11988; Executive Order 11990; Rivers and Harbors Act; Clean Water Act; *National Park Service Management Policies 2001*
Wilderness	Director's Order 41; *National Park Service Management Policies 2001*
Wildlife	*National Park Service Management Policies 2001*
Cultural Resources	Section 106; National Historic Preservation Act; 36 CFR 800; NEPA; Executive Order 13007; Director's Order 28; *National Park Service Management Policies 2001*
Economics	40 CFR 1500 Regulations for Implementing NEPA
Energy Requirements and Conservation Potential	*National Park Service Management Policies*
Environmental Justice	Executive Order 12898
Indian Trust Resources	Department of the Interior Secretarial Order No. 3206 and Secretarial Order No. 3175
Public Health and Safety	*National Park Service Management Policies*
Sustainability and Long-term Management	NEPA, 40 CFR 1500 Regulations for Implementing NEPA, *National Park Service Management Policies*
Visitor Use and Experience	Organic Act; *National Park Service Management Policies*

Parties to the Plan

It takes the participation of many parties to formulate a fire management plan that satisfies park goals and objectives, National Park Service policies, laws of the land, local concerns, and other conditions dictated by common sense. The approved plan is the result of work by four broad groups of people.

- *Interdisciplinary team* (IDT): The core IDT is composed of National Park Service staff who are ultimately responsible for carrying out the plan. The team includes expertise in natural and cultural resources, fire operations, fire ecology, park administration, visitor services, visitor and resource protection, and maintenance.
- *Internal review:* Includes expertise from the National Park Service Intermountain Region, the Sante Fe Support Office, and the Western Archaeological Conservation Center.

- *Other consulting Agencies*: Includes expertise from the United States Forest Service, Arizona State land employees, and the United States Fish and Wildlife Service.
- *local Native American tribal Governments*
- *Interested Public*

Impact Topics Developed Through Internal and External Scoping

The IDT drafted the first list of important environmental issues associated with implementation of a new fire management plan at an internal scoping meeting held at Saguaro National Park on January 24, 2002. This list was refined over the succeeding months by the IDT and by members of the public; federal, state, and local agencies; and the National Park Service during two periods of public scoping in October of 2002. The issues identified are summarized in Table I-4. This section introduces the issues and sorts out those deemed irrelevant (see Table I-5 –pg. 18). The impacts tied to important issues are analyzed in Section IV.

Table I-4. Issues Related to Fire Management Planning at Saguaro National Park Derived from Internal and External Scoping Meetings During 2002.

Possible Impact Area	**Issues**
Vegetation	
Composition	• Fire can increase or decrease invasive exotics
Structure	• Stand-replacing fires • Fire is a natural thinning agent • Fire naturally reduces fuel loading • Fire improves forest condition • Frequent fire reduces risk of catastrophic fire
Wildlife	• Edge effects • Potential mortality or injury to individuals • Habitat degradation or improvement • Increased herbaceous layer • Cavity- and ground-nesting birds may be negatively affected in the short term but long-term effects may be beneficial • Wildlife corridors could be altered • Fire and smoke can disrupt cave use
Species of Special Concern	
Plants	• Saguaros, individuals and populations • Rare, protected, or endangered plant species • Old-growth trees, individuals and stands
Wildlife	• Fire can kill or injure wildlife • Rare, protected, or endangered wildlife species can be negatively affected
Physical Environment	
Geological Resources	
Soils	• Crew-based soil disturbance (fire lines, base camps, etc.)

Possible Impact Area	Issues
	• Erosion, sedimentation, and silting-in of tinajas (natural holes) • Release of nutrients from fire
Geo-Hazards	• Mud flows • Rock slides
Water	
Quantity	• Runoff increases post-fire with lack of intercepting and water-consuming vegetation • Soil water holding capacity may decrease immediately post-fire • Tinaja water levels may decrease due to silting
Quality	• Aerial retardant may pollute water sources • Tinaja water quality may be impacted from silting and ash • Seeps and streams may be impacted
Air Quality	
Smoke	• Smoke and particulates can impact visibility and health • With prescribed fire there is more control over where smoke goes and how much particulates go into the air
Cultural Environment	
Archaeological Sites	• Fire may damage or uncover sites and artifacts
Historic Structures/Sites	• Fire has the potential to damage or destroy significant fire-susceptible structures • Tohono O'odam food harvest camp
Pre-Historic Sites	• Fire or fire activities may cause damage to rock art
Visitor Convenience	
Safety	• Fire lines may be confused for trails • Visitors may be exposed to smoke and particulates • Firefighting activities are inherently risky • Park staff may be diverted to fire operations • Fire activities may call for increased law enforcement
Mechanical Noise	• Helicopter noise • Chainsaw noise
Views	• Post-fire scenes may be appealing or not
Recreation Opportunities	• May damage trails, structures, and signs • May cause trail, road, and campsite closures • May create new access by removing vegetation; may cause social trails to develop

Possible Impact Area	Issues
Visitation	• May attract or detract visitors • Increased opportunity to educate the public about fire
Traffic	• Traffic congestion
Local Communities	
	• Small local fire department may be employed • Local food and supply distributors benefit • Local hotels, motels, and schools may be utilized • Potential to decrease tourism in area
Life and Property	
	• Potential for fire to spread to private property • Opportunity to promote fire-wise housing • Opportunity to work with neighboring land agencies and owners
Wilderness	
	• Fire and fire-related activities can have a negative effect on wilderness values
Environmental Justice	
Socioeconomics	• Small local fire department may be employed • Local food and supply distributors benefit • Local hotels, motels, and schools may be utilized • Helicopter and fire crew employment • Water agreements and purchases from local landowners • Employment of local Native American tribal crews • Employment of local inmate crews • Potential to decrease tourism in area • Potential to decrease income from fee demonstration programs and backcountry permits
Energy Consumption	
Resource Consumption	• Fire activities consume resources (gas, diesel, water, energy, food)

The issues listed in Table I-4 have been categorized into twelve impact topics (shown in bold type below). These are the heart of the impact analysis presented in Section IV.

1. **Vegetation — Fire would benefit many species in the long term but would kill and injure some plants in the short term.**
2. **Wildlife — Fire would benefit many species in the long term but would kill and injure some animals in the short term.**
3. **Species of Special Concern — Fire would benefit many species of special concern in the long term but may adversely affect them in the short term.**

4. **Physical Environment — Fire can remove vegetation from slopes and cause increased erosion until plants regrow.**
5. **Air Quality — Smoke from fires can be unhealthful and a regulatory problem.**
6. **Cultural Resources — Historic structures, landscapes, and artifacts may incur fire damage, but fire may help reduce surrounding hazardous fuels and maintain the historic scene.**
7. **Visitor Convenience — Potential restrictions on access to burning areas, road closures, and smoke can alter visitor experience; but the fire program also provides interpretive opportunities.**
8. **Local Community — Local businesses may temporarily suffer if park visitation declines due to fire; however, the opposite may also be true.**
9. **Life and Property — Fire is an effective tool for reducing hazard fuels, but is also a threat to the public, firefighters, park staff, and developed areas.**
10. **Wilderness — Fire can affect wilderness values by altering plant communities, which can affect wildlife populations.**
11. **Environmental Justice — Fire management activities have the potential to affect residents of several communities.**
12. **Energy Consumption — Firefighting consumes resources.**

Table I-5. Issues Dismissed from Further Analysis

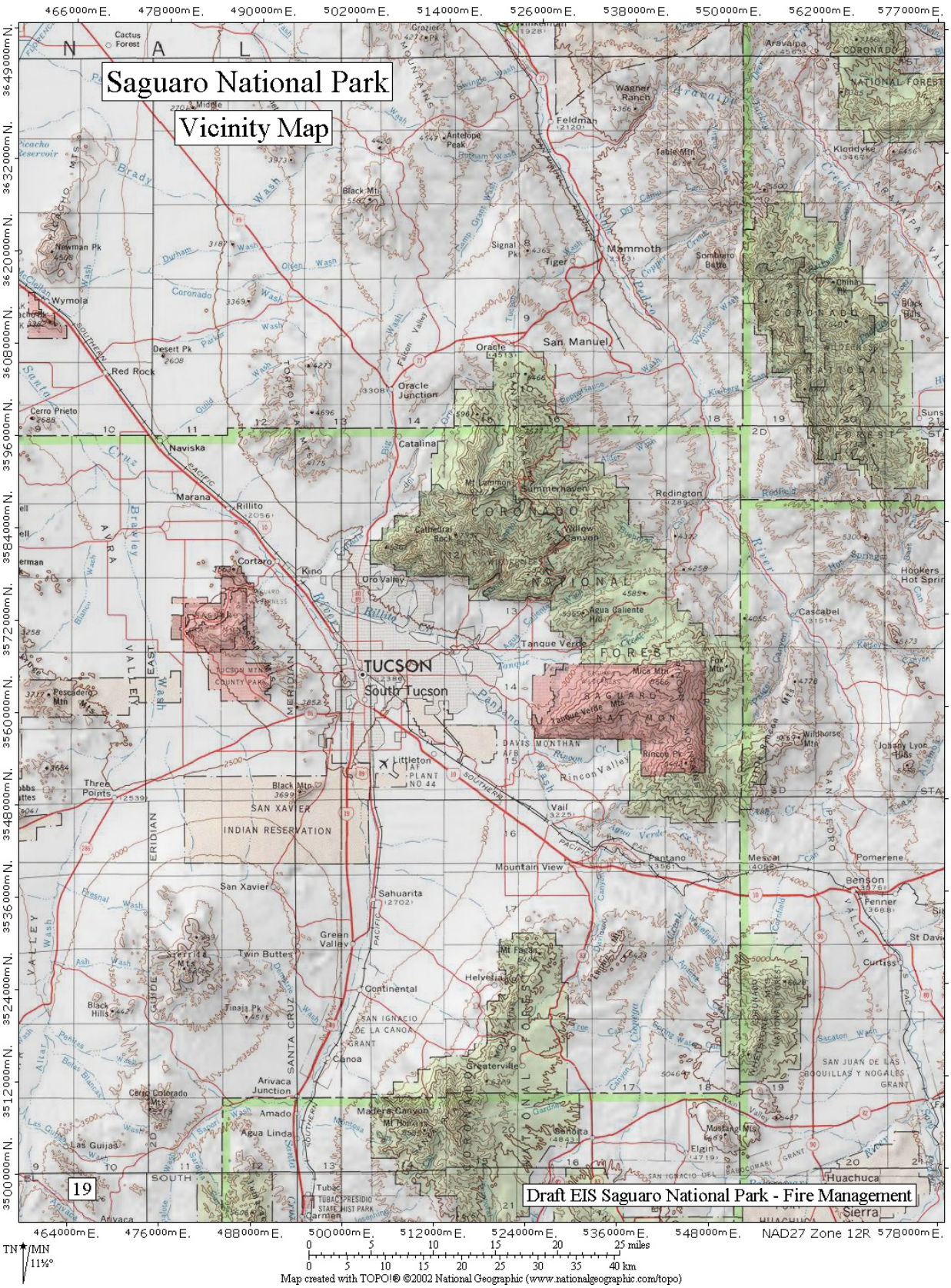
Issue	Reason for Dismissal
Wetlands and Floodplains	Features such as springs, seeps, tinajas, drainages, wet meadows, and riparian areas are scattered throughout the park. Protection of these features is not discussed as a separate impact topic; instead, key features are analyzed in the context of other impact topics.
Wild and Scenic Rivers	No wild and scenic rivers exist within park boundaries.
Prime and Unique Agricultural Lands	No agricultural lands are found within the park, per the Natural Resources Conservation District.
Sacred Sites	No sacred sites are found within park boundaries.
Indian Trust Resources	No Indian Trust resources are found within park boundaries.

Relationship of Saguaro's Fire Management Plan to Other Saguaro National Park Plans

Planning in Saguaro National Park takes two different forms: general management planning and implementation planning. General management plans are required for national parks by the National Park and Recreation Act of 1978. Implementation plans, which tier off of general management plans, focus on "how to implement an activity or project needed to achieve a long-term goal".

Saguaro National Park's *General Management Plan (GMP)*, completed in 1988 and currently being updated (draft due in 2005), is the foundational document for managing the park. The current plan does not specifically address goals related to fire management.

The *Resources Management Plan* for Saguaro National Park was updated in 1997. It describes the natural and cultural resource management programs needed to accomplish the legislated mandates of the National Park Service and Saguaro National Park, and to apply the policies, program emphases, and provisions of related planning documents. The *Resources Management Plan* identifies the need for a fire management program and includes project statements specific to fire management, the restoration and maintenance of natural ecosystems and ecosystem processes, and the maintenance and protection of cultural resources.


Saguaro National Park
Vicinity Map
Draft EIS Saguaro National Park - Fire Management
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NAD27 Zone 12R
578000mE.
TUCSON
South Tucson
Oro Valley
Marana
Catalina
San Manuel
Oracle
Oracle Junction
Mammoth
Redington
Cascabel
Benson
Sahuarita
Green Valley
Continental
Vail
Pantano
Mescal
Pomerene
Elgin
Sierra Vista
Huachuca
Littleton AF PLANT NO 44
DAVIS MONTHAN AFB
SAN XAVIER INDIAN RESERVATION
SAGUARO NATIONAL MONUMENT
CORONADO NATIONAL FOREST
SANTA CRUZ VALLEY
SAN PEDRO VALLEY
RINCON VALLEY
TANQUE VERDE
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Map created with TOPO!® ©2002 National Geographic (www.nationalgeographic.com/topo)

Section II: Alternatives

Introduction

Alternatives are scenarios that are proposed to satisfy park need, purpose, goals, and objectives. This section presents the range of fire management plan alternatives developed by the Saguaro National Park interdisciplinary team (IDT), justifies the exclusion of unreasonable options, and describes alternatives that make sense. The IDT put together fire management plan alternatives after considering National Park Service policies, park fire history, fire literature, the results of Saguaro's existing fire management program, and the experiences and expertise of team members. The short list, and ultimately the Preferred Alternative, was derived by applying ecological, safety-related, administrative, logistic, and economic criteria.

Process for Formulating Alternatives

Saguaro National Park has long recognized that fire management, as a program, should evolve as results from research and monitoring reveal new information about fire ecology, fire behavior, and fuels management. Scientific knowledge and experience have been critical in developing practical, feasible alternative methods to manage fire in the park. In addition, participation from the public and federal, state, and local agencies is an important component in planning processes at Saguaro.

The fire management plan alternatives considered in this document were developed from comments and concerns expressed by the public; input from federal, state, and local agencies; guidance from existing park plans; policy guidance from the National Park Service, the National Fire Plan and 2001 Federal Fire Policy; and research, monitoring, and experience from the existing fire and resource management programs.

The Saguaro fire management staff used the issues first identified in 2002 to begin consultations with fire and resource management specialists at the park, and other fire and land management agencies, to develop goals and objectives for fire management and to evaluate the potential impacts of fire management activities. In December of 2002 the first of two impact analysis meetings was held. Members of the United States Forest Service, United States Fish and Wildlife Service, and the National Park Service identified important mitigation measures for several impacts. It was suggested that the alternatives vary in the following way:

- By the various combinations of wildland fire, prescribed burning, fuel treatments (non-fire treatments), and fire suppression considered for use in the park's fire management program.
- By the definition of Fire Management Units (FMUs). FMUs are areas of the park governed by distinct fire management strategies. Boundaries are clear, and procedures are laid out in detail for each FMU.

The type, amount, location, and boundaries of proposed fire management activities were based on the identification of existing and historic conditions as well as departures from the natural fire return interval. Park staff used policies and planning guidance, the fire management goals and objectives developed in 2002, and public concerns to combine individual actions and thus fully develop the two action alternatives that, along with the No Action Alternative, were analyzed in detail. The IDT and other park and federal agency staff members identified the environmental consequences of the implementation of each alternative.

Ecological Basis for the Alternatives

Section III describes the affected environment (i.e., the resources that would be affected by the alternatives introduced in this section), including the six distinct vegetation types recognized by park fire managers for fire management activities. These are Sonoran desertscrub, desert grassland, woodland, pine-oak forest, pine forest, and mixed-conifer forest. Brief descriptions of these vegetation types can be found in Section III. The following background on the fire history and ecology of the area is provided to explain why the park has a fire program.

Fire History/Ecology

Park records since 1937 show that most natural fires in the area occur during the period June through September, with the peak occurring in July (47%) and August (23%). This is the season of greatest thunderstorm activity, which provides not only the ignition source for fires, but also atmospheric instability, which allows for maximum smoke dispersal. Work by the University of Arizona Laboratory of Tree-Ring Research at Saguaro National Park and elsewhere in the surrounding mountain ranges strongly indicates a late spring/early summer fire season throughout the 300-year record (Baisan 1990). This is the time of year when fires are most likely to spread into larger areas, whereas the former would account for more fires of smaller size due to increased ignition sources (lightning) and monsoon moisture, which helps to put the fires out while they are still small. Thus, the park's fire season can be described as being late spring through mid-summer and caused by lightning.

During the 240-year time span of 1657 to 1900, there is no evidence of any significant change in the fire regime that can be related to anthropogenic influences. For example, analysis of the fire-scar data shows a mean fire return interval of 5.3 years for the period 1657 to 1763, and a mean fire return interval of 5.9 years for the period 1763 to 1900. Thus, no significant change in fire frequency occurred during the latter period, when the human population surrounding the area was in a constant state of flux and under the influence of a variety of cultures.

It was not until the era of Anglo settlement and use of the mountain area that a change in the fire regime occurred. Then, however, the change was both swift and dramatic. Simply put, the more-or-less regular pattern of fire occurrence ceased after 1893. The reason for this abrupt change was not merely the advent of effective fire control—it was the change in land use patterns and different attitude towards wildfire that came with the Anglo settlers. A temporary wet period that coincided with the arrival of organized fire control cemented the change.

Over the last fifty years, lightning ignited an average of nine fires each year in Saguaro National Park; less than five percent of the fires that occurred during this period were human-caused. At least one lightning-caused fire occurred every year for which records are available; some years, fifteen to twenty fires occurred. This fire regime consists of a natural cycle of fuel buildup, ignition, and fuel reduction/nutrient recycling linked to opportune weather conditions. A compilation of all historic fire occurrences in the park is maintained in the Fire Management Office.

Below is a brief description of Saguaro National Park's fire history/ecology by vegetation type.

Sonoran Desertscrub and Desert Grassland 2180 – 3,999 feet)

The lowest number of lightning-ignited fires occurs in the elevational gradient below 4,000 feet, where at the same time the greatest number of human-caused fires occurs. This is directly attributable to high visitor use below 4,000 feet and low visitor use above. Only one lightning-ignited fire has been reported in Sonoran desertscrub, which occupies the lower elevations of this gradient, whereas fourteen are known to have burned in the higher desert grassland. This information indicates that fire plays a minor role, if any, in Sonoran desertscrub, while desert

grassland burns more frequently.

Woodland and Pine-oak Forest (4,000 – 6,999 feet)
Between 4,000 feet and 6,999 feet, the total number of reported fires is 139; of these, lightning ignited 133. Over 130 of the fires in this elevational gradient occurred in what can be considered Woodland or pine-oak forest. This indicates that fire is an important natural process in these vegetation types. Fire-scarred juniper and pinyon provide evidence that fires occurred before and during the period in which records have been kept. Whether the observed long fire-free periods are typical of the plant communities found in these vegetation types or they result from fire suppression activities is not known. It must be assumed that only by allowing natural fire to occur in the pine-oak communities will the natural fire frequency and role of fire be restored.

Ponderosa Pine Forest and Mixed-conifer Forest (7,000 – 8,666 feet)
The park's historic data reveals that sixty percent of reported fires have occurred at elevations of 7,000 feet and above, in ponderosa pine and mixed-conifer forest plant communities. Only two percent of these fires were human-caused.

Assuming that data collected from other southwestern ponderosa pine forests are applicable to Saguaro National Park, we would expect the average interval between fires to range from 4.8 to 11.9 years (Weaver 1951b). On the steeper, drier slopes these intervals might be longer due to the sparser understory available to carry fire.

Baisan's 1990 study revealed a fire cycle in the Ponderosa pine vegetation types that was dominated by a regular pattern of widespread fires. The mean fire return interval calculated for major fires (i.e., fires recorded by more than one group of sample trees and with an estimated minimum size of 500 acres) between 1657 and 1893 was 6.06 years. The shortest interval recorded between major fires was 2 years and the longest was 13. An interval of at least 3 years appears to be necessary to generate enough fuel to carry a fire throughout the study area

In mixed-conifer forest, where it is known that the natural succession from oak to conifer forest after an intense stand-replacing fire requires 50 to 100 years, it can be assumed that it has been at least 50 years since the last intense fire. Such fires are infrequent and dependent on heavy fuel buildup plus a dry year conducive to intense fire. The historic fire return interval recorded in the mixed-conifer forests of the park's North Slope is 9.86 years with a range of 3 to 19 years (Baisan 1990). It is obvious that this interval has not been maintained since the establishment of the park, and as a result there is high fuel buildup in these areas (currently 46.1 tons/acre). Since the necessary heavy fuels are present, an intense fire may occur in Saguaro's mixed-conifer forest areas in the near future such as seen during the Helens2 fire of 2003.

Range of Alternatives

Fire Management Units

I**n the current fire planning effort, the main difference between Alternative C (the No Action Alternative or existing plan) and Alternative D is in the definitions of the FMUs and the tools used for fire management. The main difference between Alternative C and Alternative E (the Preferred Alternative) is in the definitions of the FMUs and the implementation process. Under Alternatives D and E, fire managers are proposing that the current FMUs be grouped into similar management units (units that are managed in the same manner with the same set of tools), and that new policy and knowledge of the park's ecosystems be incorporated in the fire management plan.**

For all alternatives listed below, excluding the No Action Alternative, there would be two FMUs. The park's fire managers are proposing this change from six FMUs to two because of the similarities in treatment recommendations. The six FMUs in the current plan are discussed below under Alternative C. Reducing the FMUs to two makes good operational and ecological sense, as there is a distinct elevation/vegetation zone where it is no longer appropriate to use fire. In the elevational gradient below 4,000 feet or desert grassland and below, either fire was not a process that formed these areas or not enough information on fire's role is known and further investigation is needed before fire is used. Above 4,000 feet or woodland and above, fire is known to have helped form these communities, and the park's goal is to restore historic fire frequencies.

Proposed FMU 1 ranges in elevation from approximately 4,000 feet (the upper portion of Sonoran desertscrub) to 8,666 feet on top of Mica Mountain (Map II-1) and is found exclusively in the Rincon Mountain District. Within this FMU, desert grassland merges with woodland as elevation increases; woodland gives way to pine-oak forest, which then gives way to ponderosa pine and mixed-conifer forest. Elevation increases gradually with many rises and falls from 4,000 to 8,600 feet, leading to many shared species in adjacent plant communities of different vegetation types. Small areas of mixed-conifer forest occupy north-facing slopes at high elevations. Riparian forest and riparian woodland occur locally in canyon bottoms. Wet and dry meadows are found in scattered clearings at high elevations, the former around springs and the latter often on old burned or disturbed sites (Bowers 1987).

National Fire Danger Rating System/Fire Behavior fuel models F/6 (intermediate brush) L&A/1 (western perennial or annual), C/2 (open pine with grass), U/9 (western long-needle pine) and G/10 (short needle, closed, heavy dead) are representative of the area.

Manning Camp and Happy Valley Lookout are found within FMU 1. Manning Camp is on the list of historical structures, creating some unique protection concerns.

Proposed FMU 2 is comprised of two separate tracts of land: the Rincon Mountain District below 4,000 feet, which contains 13,800 acres, approximately one-half of which is designated wilderness (Map II-1); and the entire Tucson Mountain District, which contains 24,034 acres, with wilderness accounting for 13,200 acres (Map II-2). Arizona Upland, a subdivision of Sonoran desertscrub, occurs in the Rincon Mountain District from the base of the mountains at approximately 3,500 feet to approximately 5,200 feet, and encompasses 90% of the Tucson Mountain District (the remaining 10% is rock and a small patch of desert grassland). Arizona Upland vegetation is characterized by a large number of cacti and by the drought-deciduous habit of many of the trees and shrubs. Vegetation within the Arizona Upland subdivision in both the Rincon and Tucson Mountain Districts can further be subdivided into plant associations, depending on species composition. In the Rincon Mountain District, three associations exist within the Arizona Upland area: Bursage-Palo Verde, Bursage-Saguaro-Mixed Scrub, and Creosote Bush. Additionally, several riparian vegetation series are found throughout the area: Mixed Broadleaf (sycamore-velvet ash-cottonwood), Mesquite, Cottonwood-Willow, and Mixed Narrowleaf (buttonbush-seep willow) (Guertin 1998; Brown, Lowe and Pase 1980). In the Tucson Mountain District, six associations exist within the Arizona Upland area: Creosote Bush, Creosote Bush-Bursage, Palo Verde-Saguaro-Ironwood, Palo Verde-Saguaro, Jojoba-Mixed Scrub, and Desert Riparian Scrub (Rondeau et al 1996).

National Fire Danger Rating System/Fire Behavior fuel models F/6 (intermediate brush) and L/1 (western perennial) are representative of the area.

Under all of the action alternatives, any fire occurring in FMU 2 would be aggressively suppressed. Suppression actions, however, must consider values to be protected, cost, resource damage caused by the suppression action, and the first priority at all times—firefighter and public safety.

Strategies Used to Maintain and Restore Ecosystems

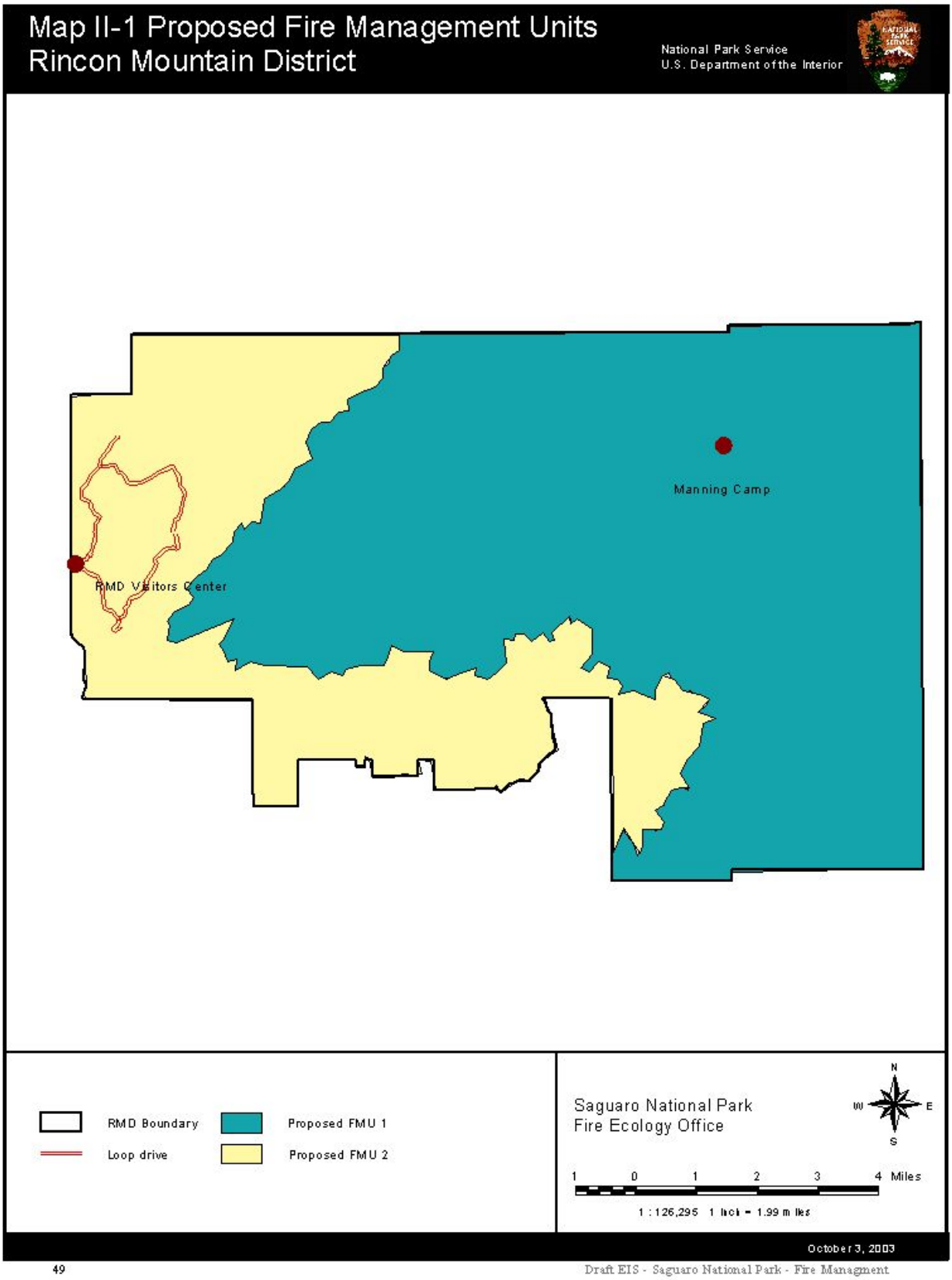
Managed Wildland Fire
(Includes Wildland Fire Use for Resource Benefit and Fire Suppression)

Because fire is a natural process in the Rincon Mountains, allowing wildland fires to burn in the Rincons meets the goal of maintaining a natural environment in Saguaro National Park. Wildland fires in Saguaro have been managed to meet resource objectives since the 1970's.

Wildland fire use for resource benefit is the practice of managing a naturally ignited wildland fire by allowing it to burn while keeping it within a specific area called a maximum manageable area. The safety of firefighters and the public is the number one concern in managing a wildland fire. Through pre-planning, monitoring, and appropriate fire management response, many wildland fires can be managed to protect values at risk as well as to obtain resource benefits. Elements of managing a wildland fire include public information and education, coordination with other agencies, and fire behavior research.

Because fires may burn for varying amounts of time and at different times of the year, the effects of a managed wildland fire on plants, animals, soil, and cultural resources can vary throughout each individual fire. Depending on fuel moisture conditions and loading, within one fire there are areas of very little fuel consumption as well as areas of total fuel consumption. Hotter areas create an arrangement of small to large openings (gaps) in the canopy, which allow light onto the soil to start new plants or restore plants that require more sunlight than is found in dense, overgrown areas. The variability of environmental and wildland fire conditions create a mosaic of effects that can be hard to replicate using prescribed fire.

Suppression involves putting out a wildland fire that is not meeting resource management objectives by using the appropriate management response. Suppression can involve hand crews cutting a line around the fire perimeter to remove fuel; water drops; retardant drops; thinning; "burn out" situations in which fire is used to burn areas to remove fuels and stop the fire; and "cold trailing" in areas of low fuel loads, where crews physically feel the ground and put out "hot spots."


Map II-1 Proposed Fire Management Units
Rincon Mountain District
National Park Service
U.S. Department of the Interior
Manning Camp
RMD Visitors Center
RMD Boundary
Loop drive
Proposed FMU 1
Proposed FMU 2
Saguaro National Park
Fire Ecology Office
N
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1 : 126,295 1 inch = 1.99 miles
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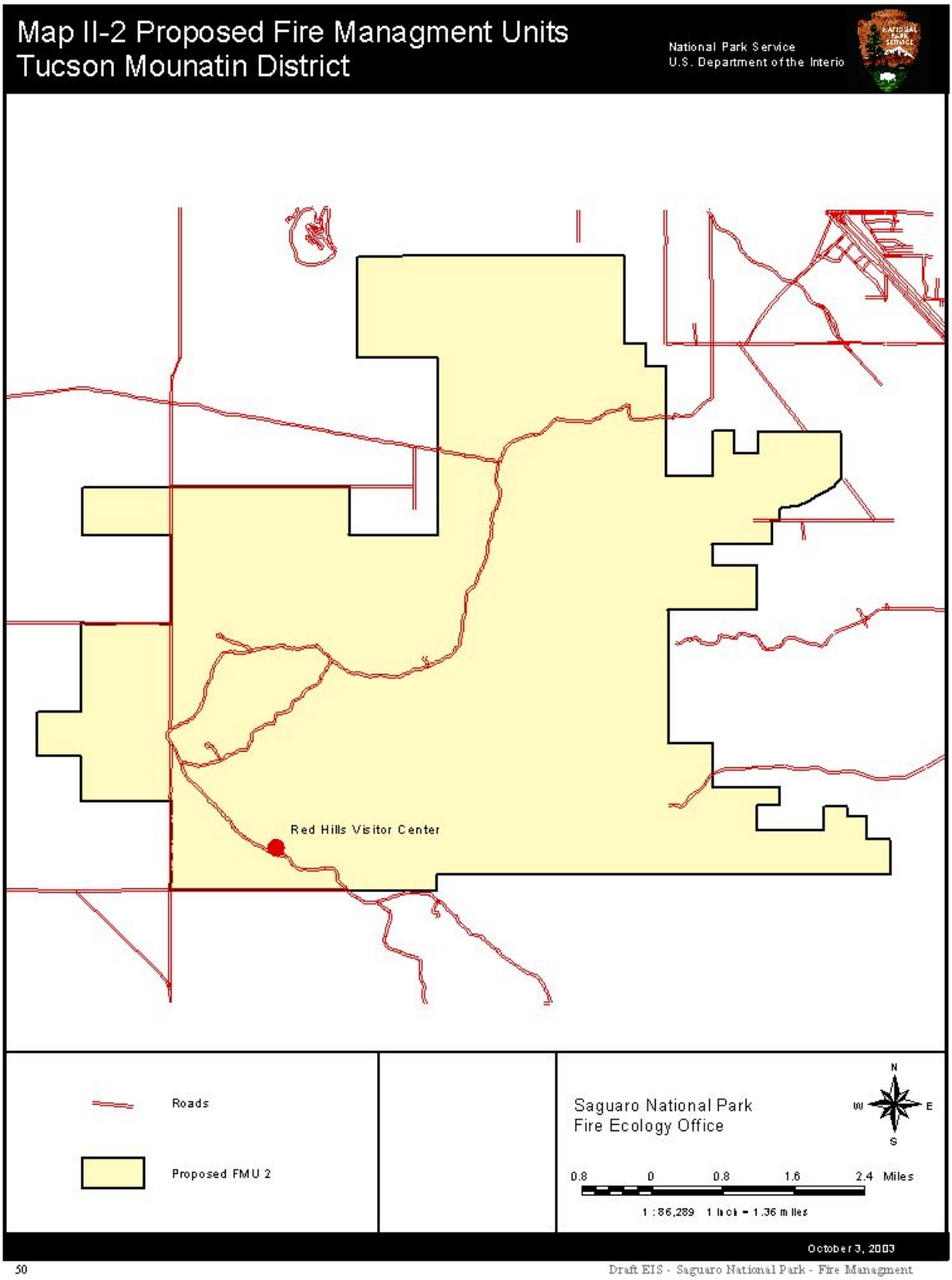
Map II-1


Map II-2 Proposed Fire Managment Units
Tucson Mounatin District
National Park Service
U.S. Department of the Interio
Red Hills Visitor Center
Roads
Proposed FMU 2
Saguaro National Park
Fire Ecology Office
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Map II-2

Internal mop up involves physically putting out any hot spots within the fire's perimeter. This process is limited during all suppression actions, as ground disturbance causes added damage to natural resources. Firefighters refer to the minimum impact suppression tactics guide or consult with a resource advisor.

Prescribed Fire

Prescribed fires are management-ignited fires that are intentionally lit to meet resource objectives when predetermined and approved conditions are met. Prescribed fire has been used in Saguaro National Park since 1985 to meet a variety of resource objectives. Meadows have been burned to remove tree encroachment and promote the growth of grasses and forbs through nutrient recycling. Forested areas have been burned to reduce fuels and create gaps in the canopy to promote growth of understory species. Woodlands have been burned to reduce stem density of manzanita and increase grass production. Prescribed fire has also been used to replicate historic fire frequencies and to restore forests to a condition closer to that of an era when fires were not suppressed.

To provide additional fire protection around significant resource values, prescribed fire can be applied in strategic locations using special techniques. For example, by igniting fires that burn hot enough to create openings in a forest canopy, gaps can be created that would provide protection from unwanted wildland fire. These openings, typical of a fire-influenced forest, can break up crown fires that might approach areas where protection of life and property is critical. Prescribed fire used in this manner provides a fuel-transition area that would help prevent rapid, uncontrolled fire spread. These more lightly fueled areas can also provide locations where suppression tactics can be implemented to stop the spread of a wildland fire.

In Saguaro National Park, fire managers typically allow 5 to 10 years to pass between prescribed burns of a single area. Therefore, when only prescribed fire is used, several decades are needed to restore forests that require multiple burns.

Non-Fire Fuel Treatments (Pre-treatment for Prescribed Fire)

Pre-treatment of prescribed burn units entails removing some small diameter trees, ladder fuels, shrubs, snags, and ground litter to help keep the fire within the designated area or to protect specific resource values. Removal can be accomplished through mechanical equipment such as chain saws or crosscut saws, or the object can have fire line cut around it. Where multiple burns are needed to reduce hazardous levels of fuels, pre-treatments can speed up the process by several years. In addition, pre-treatment greatly increases the protection of life and property from the potentially damaging effects of prescribed burning.

Adaptive Management

Adaptive management is a fusion of science and management used to improve and care for resources. It is also defined as the process of continually adjusting management in response to new information, knowledge, or technologies. Adaptive management at Saguaro would be used to guide fire management activities while drawing on the best available science, monitoring, emergent technologies, and an ever-increasing database on the role and effects of fire on park resources.

The adaptive management cycle includes development of a plan with stated goals and objectives. The cycle is described as implementation of the planned actions, monitoring of results, evaluations of the outcome of the actions, and hypothesis testing to refine prescriptions and methods (Kaufnamm et al. 1994). In Saguaro's fire management program, evaluations would help refine fire management strategies and assess how well the program has met goals and objectives leading to

ecosystem restoration and maintenance, including fuel reduction. After each event, evaluation by fire experts and managers would determine whether the action had the desired effects, whether more information is needed, and whether a change in actions is necessary to meet the objectives.

Alternatives

The IDT agreed on five alternative plans at its internal scoping meeting on January 25, 2002, and finalized them following the October public scoping meetings.

- **Alternative A: Implement a fire management plan that utilizes wildland fire use for resource benefit and prescribed fire (with no suppression or non-fire treatments) in FMU 1, and total suppression in FMU 2.**
- **Alternative B: Implement a fire management plan in cooperation with adjacent land management agencies and landowners that covers the entire landscape. (Landscape Alternative)**
- **Alternative C: Maintain existing fire management plan. (No Action Alternative)**
- **Alternative D: Implement a fire management plan that utilizes prescribed fire and non-fire treatments (with no wildland fire use for resource benefit) in FMU 1, and total suppression in FMU 2.**
- **Alternative E: Implement a fire management plan that utilizes wildland fire use for resource benefit, prescribed fire, non-fire treatments, and suppression to accomplish resource objectives in FMU 1, and total suppression in FMU 2. (Preferred Alternative)**

Alternatives under Consideration

1. **Alternative C: Maintain existing fire management plan (No Action Alternative).**

   Under this alternative, the park would continue using the current fire management plan, developed in 1991.

2. **Alternative D: Implement a fire management plan that utilizes prescribed fire and non-fire treatments (with no wildland fire use for resource benefit) in FMU 1, and total suppression in FMU 2.**

   This alternative would not allow any wildland fires for resource benefit to burn in the park. All non-management-ignited fires, no matter what the cause, would be fully suppressed. Saguaro would become a prescribed fire and non-fire treatments park for the life of this plan.

3. **Alternative E: Implement a fire management plan that utilizes wildland fire use for resource benefit, prescribed fire, non-fire treatments, and suppression to accomplish resource objectives in FMU 1 and total suppression in FMU 2 (Preferred Alternative).**

   This alternative would allow wildland fire for resource benefit, prescribed fire, and non-fire treatments to occur in FMU 1. Fires not meeting resource objectives or that threaten life or property would be subject to suppression. This is the Preferred Alternative for the park.

Alternatives C, D, and E have been retained as "reasonable" alternatives, and are discussed in the following pages with more detail.

Alternative C: Maintain Existing Plan
(No Action Alternative)

Under the No Action Alternative, the existing direction and level of accomplishment of Saguaro National Park's fire management program as described in the 1991 fire management plan would continue. The current plan utilizes a range of fire management strategies that include prescribed fire, wildland fire use for resource benefit, fire suppression, and hand cutting followed by prescribed fire. It allows for interagency cooperation by allowing naturally ignited fires that are meeting resource objectives to cross the boundaries of public lands whose management agencies have similar objectives.

Maps II-3 and II-4 define the six fire management units of the existing fire management plan.

FMU 1 is found above 7,000 feet and encompasses approximately 7,000 acres in the Rincon Mountain District. The unit contains coniferous forest and lies within the designated wilderness area created by Public Law 94-567 of October 20, 1975. This unit is classified as an "appropriate suppression response" unit, in which park policy is to allow wildland fire use for resource benefit and prescribed fire while suppressing fires outside the prescription parameters. All human-caused fires are suppressed.

FMU 2 contains vegetation described as oak and Woodland occupying an area of approximately 34,000 acres in the Rincon Mountain District. This unit is also classified as an appropriate suppression response unit, with park policy allowing wildland fire use for resource benefit and prescribed fire.

FMU 3 encompasses 12,000 acres in the Rincon Mountain District, all designated wilderness. This unit contains vegetation described as Sonoran desertscrub and desert grassland, and is also classified as an appropriate suppression response unit. Park policy in this unit is to allow wildland fire use for resource benefit, but prescribed fire is applied only for restoration of historic plant communities, such as grassland.

In FMUs 1, 2, and 3, lightning-caused fires—except those that threaten human life and property, facilities, cultural resources, threatened and endangered species, or other important resources—are permitted to burn. Other considerations for the prescription include:

- Fire growth predictions
- Energy release component and burning index
- Red flag watch or warning associated with current or forecasted weather
- Air quality restrictions resulting from ventilation conditions or Arizona Department of Environmental Quality smoke curtailment requests
- Proper preparedness level, staffing, and resources in place
- Drought evaluation
- Existing/predicted weather

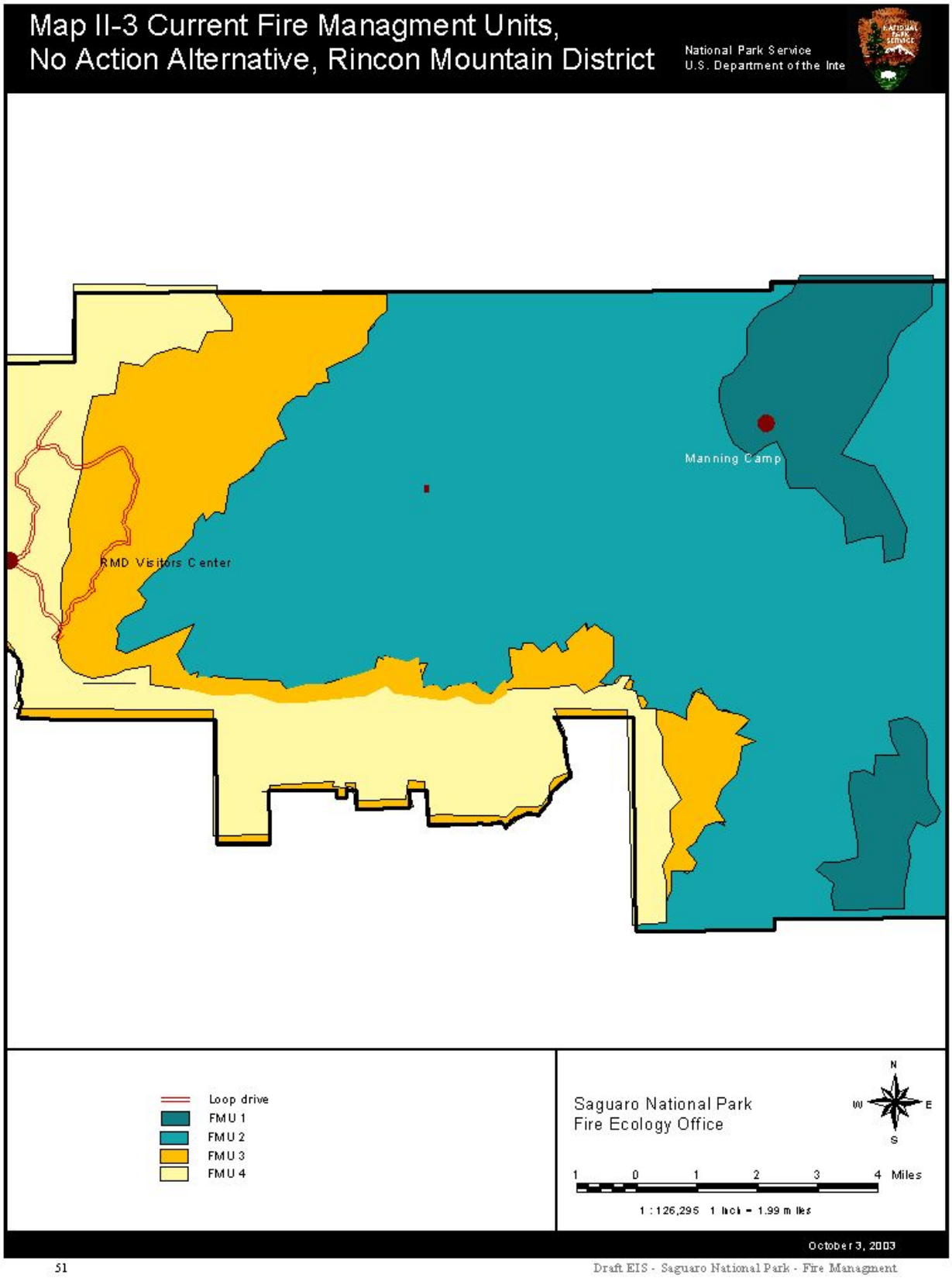
The 1991 fire management plan dictates that the causes of all fires be determined to make proper management decisions. Under this plan, all wildland fires for resource benefit are monitored daily or more frequently in accordance with the *Western Region Fire Monitoring Handbook* (1991) and the Wildland Fire Situation Analysis created for that fire. The park continuously updates information on fire size, location, behavior, smoke dispersal, safety conditions, and effects.

FMU 4 contains 10,000 acres of desert grassland and Arizona Upland vegetation located in the Rincon Mountain District. Approximately half of this unit is designated wilderness. It is classified as a suppression unit—i.e., all fires are suppressed.

FMU 5 contains 8,000 acres of Arizona Upland vegetation located in the Tucson Mountain District, with wilderness accounting for 7,200 acres. It is classified as an appropriate suppression response unit, with park policy allowing wildland fire use for resource benefit with no prescribed burning.

FMU 6 contains 13,000 acres of desert grassland and Arizona Upland vegetation located in the Tucson Mountain District. Approximately 6,000 acres of this unit is designated wilderness. It is classified as a suppression unit.

Since the inception of Saguaro's fire management program, natural fire regimes have begun to be restored at the park and fuel buildup has been reduced in some areas, although not at the rate needed for comprehensive ecosystem maintenance and restoration.


Map II-3 Current Fire Managment Units,
No Action Alternative, Rincon Mountain District
National Park Service
U.S. Department of the Inte
Manning Camp
RMD Visitors Center
Loop drive
FMU 1
FMU 2
FMU 3
FMU 4
Saguaro National Park
Fire Ecology Office
N
W
E
S
1 0 1 2 3 4 Miles
1 : 126,295 1 Inch = 1.99 m iles
October 3, 2003
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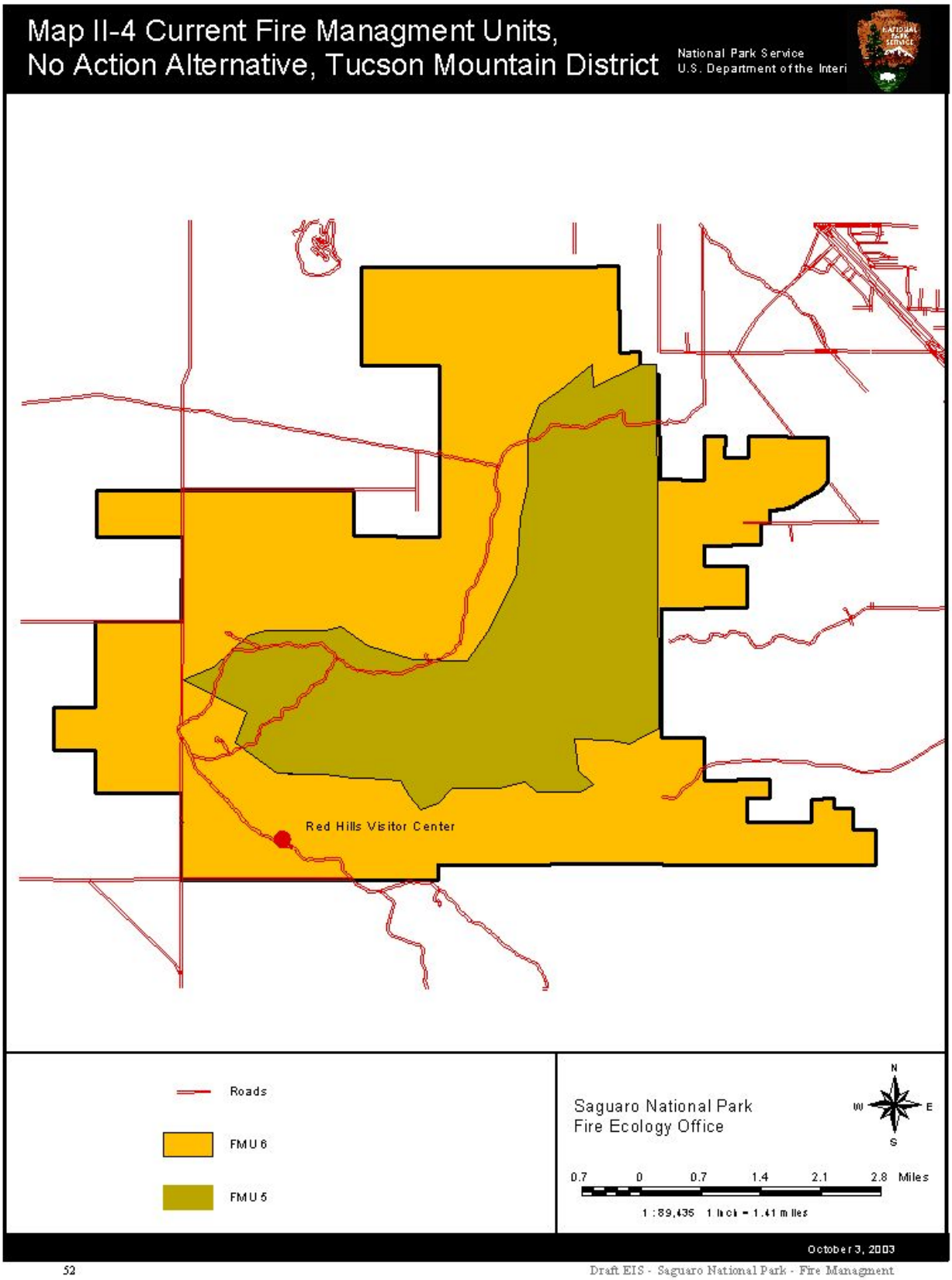
Map II-3



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Map II-4

Alternative D: Implement a fire management plan that utilizes prescribed fire and non-fire treatments (with no wildland fire use for resource benefit) in FMU 1, and total suppression in FMU 2

Maps II-1and II-2 illustrates the layout of the management units defining Alternatives D and E. Alternative D would change how the park manages fire by focusing on prescribed fire and non-fire treatments only, and by reducing the number of fire management units from six to two. It would not allow naturally ignited fires to burn.

Proposed FMU 1 encompasses the area of the park above 4,000 feet in the Rincon Mountain District, and contains five of the six vegetation types outlined for fire management, including desert grassland, Woodland, pine-oak forest, ponderosa pine forest, and mixed-conifer forest. In this FMU, prescribed fires would be initiated in specific areas under conditions that meet resource objectives. The goal of prescribed fire would be to restore fire in an ecologically appropriate manner to fire-prone ecosystems. Non-fire treatments (hand removal of trees for thinning purposes) would also be allowed in this unit. The goal of non-fire treatments in FMU 1 would be to reduce the risk of catastrophic fire, protect sensitive natural and cultural resources, and provide for improved fire lines for prescribed burns. Suppression would be triggered in all cases of non-management ignited fires.

Proposed FMU 2 encompasses the entire Tucson Mountain District as well as everything below 4,000 feet in the Rincon Mountain District. This unit would be classified suppression only and no management ignited fires, with the exceptions being if park managers deem a fire unsafe to suppress, or if new scientific data suggests that fire should be a part of these ecosystems. In the latter scenario, an amendment to the plan would need to be completed before fire is allowed in this FMU.

Alternative D would allow fire management operations to incorporate the National Park Service's new policy direction and terminology as well as new information about threatened and endangered species management and natural and cultural resources. It would also include development of a site-specific fire implementation plan that would incorporate all of this data into a working action plan, which the current plan lacks.

Alternative E: Implement a fire management plan that utilizes wildland fire use for resource benefit, prescribed fire, non-fire treatments, and suppression to accomplish resource objectives in FMU 1, and total suppression in FMU 2 (Preferred Alternative)

Maps II-1 and II-2 illustrate the layout of the fire management units defining Alternatives D and E. Like the No Action Alternative, Alternative E, the preferred alternative, would allow for prescribed fire and wildland fire use for resource benefit in areas above 4,000 feet where saguaros are not present (approximately 53,000 acres of the park) while continuing the appropriate suppression response. The main difference from the No Action Alternative is two fold. First, the number of FMUs would be reduced from six to two in order to simplify fire management processes in areas with similar fire, resource, and general management goals and objectives. Second, it would allow fire management operations to incorporate the National Park Service's new policy direction and terminology as well as new information about threatened and endangered species management and natural and cultural resources. It would also include development of a site-specific fire implementation plan that would incorporate all of this data into a working action plan, which the current plan lacks.

Proposed FMU 1 encompasses the area of the park above 4,000 feet in the Rincon Mountain District, and contains five of the six vegetation types outlined for fire management, including desert grassland, Woodland, pine-oak forest, ponderosa pine forest, and mixed-conifer forest. In this FMU, naturally ignited fires would be allowed to burn (i.e., wildland fire use for resource benefit) and prescribed fires would be initiated in specific areas under conditions that meet resource objectives. Since the elevational limits of Sonoran desertscrub are variable, fires would be allowed to burn in the upper ranges of desertscrub (4,000 – 5,200 feet) as long as saguaros are not present and the fire is not burning in desert grassland. The goal of prescribed fire would be to restore fire in an ecologically appropriate manner to fire-prone ecosystems in FMU 1, and to enhance the opportunity for, and management of, wildland fires that benefit and protect the unit's resources. Under this alternative, suppression would continue in developed areas, near park boundaries with jurisdictions having different fire management objectives, in areas where human life would be placed at risk, for fires not meeting resource objectives, and for fires that run any risk of becoming unnaturally large, high-intensity fires.

Proposed FMU 2 encompasses the entire Tucson Mountain District as well as everything below 4,000 feet in the Rincon Mountain District. This unit would be classified suppression only, with the exceptions being if park managers deem a fire unsafe to suppress, or if new scientific data suggests that fire should be a part of this ecosystem. In the latter scenario, an amendment to the plan would need to be completed before fire is allowed in this FMU.

Like the No Action Alternative, this alternative would allow for interagency cooperation by permitting naturally ignited fires that are meeting resource objectives to cross the boundaries of public lands whose management agencies have similar objectives.

Alternatives Eliminated From Detailed Analysis

1. Alternative A: Implement a fire management plan that utilizes wildland fire use for resource benefit and prescribed fire (with no suppression or non-fire treatments) in FMU 1, and total suppression in FMU 2.

   This alternative would allow all fires to burn naturally in FMU 1.

   Reason for Dismissal: This alternative could gradually accomplish the park's resource objectives in some areas, but management would not have control of the location or time of the fires, which could have detrimental effects on natural and cultural resources.

2. Alternative B: Implement a fire management plan in cooperation with adjacent land management agencies and landowners that covers the entire landscape. (Landscape Alternative)

   Saguaro National Park shares boundaries with the Coronado National Forest, private landowners, the Bureau of Land Management, and the state. Ideally, the National Park Service would work together with these agencies and landowners to formulate a fire management plan that would cover the entire landscape.

   Reason for dismissal: While this alternative will be the long-range goal of both Saguaro National Park and the other surrounding land managers, current differences in land management planning efforts, staffing levels, and land use would more than likely require intervention beyond the National Park Service's ability to accomplish. The Fire Program Analysis (FPA), under development, will eventually be used by all five land management agencies, and will be objective-driven and performance based; designed to analyze fire program needs based on landscape-scale, interagency collaboration, to better incorporate ecosystem management and prioritize protection of the wildland urban interface and other values to be protected. FPA-Preparedness Module will be used to help

formulate the FY 2007 wildland fire budget request in the winter of FY 2005. Park managers view the new plan as a step toward the landscape ideal and a realistic way to satisfy Goal 7 discussed in Section I (maintain cooperative planning with other land agencies and landowners). This intermediate step would continue to give parties time and opportunities to work together, developing the FPA, progressing toward the landscape-level plan while the park continues its fire management program, guided by the fire management plan developed in conjunction with the EIS.

Summary of Reasonable Alternatives

Table II-1 summarizes important features of the three retained alternatives described above, and the degree to which each alternative meets fire management plan purpose, need, goals, and objectives. Table II-2 reviews the impacts of each alternative over the eight areas judged important. Impacts are analyzed in greater detail in Section IV.

Environmentally Preferred Alternative

The environmentally preferred alternative is defined as "the alternative that will promote the national environmental policy as expressed in the National Environmental Policy Act's Section 101. Ordinarily, this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources" (Forty Most Asked Questions Concerning Council on Environmental Quality's National Environmental Policy Act Regulations, 1981).

The goals characterizing the environmentally preferable condition are described in Section 101 of the National Environmental Policy Act: "….it is the continuing responsibility of the Federal Government to …(1) fulfill the responsibilities of each generation as trustee of the environment for succeeding generations; (2) assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings; (3) attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences; (4) preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity, and variety of individual choice; (5) achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities; and (6) enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources."

Alternative C's lack of a site-specific fire implementation plan would increase the chance for adverse effects from wildland fire use for resource benefit as well as from suppression activities. Thus, the No Action Alternative would result in less impact than Alternative D but more than Alternative E to the biological and physical environment; it is moderately effective (between Alternatives D and E) in terms of protecting, preserving, and enhancing historic, cultural, and natural resources. The current fire management plan does, however, do a good job of balancing natural and cultural resource management needs with safety concerns.

Alternative D would have the greatest potential for adverse effects on the biological and physical environment in the long term, along with the most protection in the short term. This is because immediate suppression of all wildland fires would promote the continuation of hazardous fuel accumulation, which could lead to catastrophic fire. Such fire would negatively impact natural and cultural resources and would not ensure safe, healthful, productive, and aesthetically and culturally pleasing surroundings.

Alternative E would best balance natural and cultural resource management needs with safety concerns. The Alternative's timeframe for environmental restoration and hazard reduction, combined with its selective application of both aggressive and passive treatments, and its utilization of a site-specific fire

implementation plan, would create a balance that would minimize damage to the biological and physical environment and that would best protect, preserve, and enhance historic, cultural and natural resources. It would also ensure safe, healthful, productive, and aesthetically and culturally pleasing surroundings.

After careful review of potential resource and visitor impacts of the three alternatives under consideration, and developing proposed mitigation for impacts to natural and cultural resources, it was determined that the environmentally preferred alternative is Alternative E. Although the other alternatives may achieve greater levels of individual protection for cultural resources or natural resources in the short-term, or may better enhance visitor experience in the short-term, Alternative E best realizes the long-term benefits and the full range of national environmental policy goals as stated in Section 101 of the National Environmental Policy Act.

Sustainability and Long-term Management

The most sustainable course of action in the long run is a fire program that maximizes the number of natural fires allowed to burn mixed with prescribed burning (Alternative C or E in this case). Such an approach is envisioned to optimize ecological benefits and minimize economic costs. A program that mixes prescribed burning with wildland fire use for resource benefit would help combat the negative effects of possible cancellations of prescribed burns or the potential no-go decision of wildland fire use for resource benefit by providing more tools for resource managers. Weather, overtaxed regional firefighting resources, and management concerns tend to cause these cancellations or no-go decisions. Lack of low- and moderate-intensity fires would let fuels built up, and catastrophic wildfires would eventually occur. Until National Parks shift resources to "routine" fire events, they will continue to operate non-sustainable fire management programs that incur huge costs to suppress catastrophic wildfires.

Actions Common to All Alternatives

Public Safety

Public and firefighter safety is the number one priority of all alternatives. The Federal Fire Policy states: "Firefighter and public safety is the first priority, and all fire management plans and activities must reflect this commitment." National Park Service Wildland Fire Policy (Director's Order 18) echoes this direction: "The National Park Service is committed to protecting park resources and natural ecological processes, but firefighter and public safety must be the first priority in all fire management activities." The *Saguaro Fire Management Plan*, regardless of which alternative is selected, would enact the following directions to ensure the safety of firefighters and the public:

- Every firefighter and fire line supervisor, the fire program manager, and the park Superintendent would take positive actions to ensure compliance with safe fire management practices.
- Experience, training, physical fitness, and knowledge of safety practices would be required of all people in leadership roles in fire operations.
- All wildland fire safety standards [including the 10 Fire Orders, 18 Watchout Situations, Downhill/Indirect Line Checklist, Four Common Denominators of Fatality Fires, Lookouts-Communications-Escape Routes-Safety Zones (LCES), and Risk Management/Situational Awareness] would be required annual training for all personnel involved in wildland fire operations.
- Annual hands-on fire shelter deployment training would be mandatory.
- The safety training requirements listed in Chapter 3 of *National Park Service Reference Manual 18* (RM-18) (National Park Service 1999b) would be adopted and adhered to.
- Qualification standards for Incident Command System positions as listed in National Wildfire Coordinating Group 310-1 "Wildland Fire Qualification Subsystem Guide" would be adopted.

- All project plans would address safety concerns in an attached job hazard analysis.
- A safety briefing would be given prior to initiating work on any project.
- Every project or incident would have at least one person charged with incident safety oversight; complex situations would require multiple safety officers.
- All personnel would be authorized and obligated to exercise emergency authority to stop and prevent unsafe acts.
- All employees would have the right to turn down unsafe assignments; they would also have the responsibility to identify safe alternatives to accomplish the mission.
- The use of SAFE NET ground-based safety incident reporting system would be adopted and implementation procedures would be included in the employee handbook.
- After Action Reviews would be conducted by the project leader or incident commander after each shift of a project or incident to evaluate safety and effectiveness of work performed and identify and discuss encountered hazards.
- All wildland fire incidents that result in human entrapment, fatalities, or serious injuries, or that have the potential to result in such, would be reported and investigated as required by RM-18, Chapter 3.
- The park Superintendent (or designee) would manage critical incidents following checklists and processes contained in the National Wildfire Coordinating Group's "Agency Administrator Guide to Critical Incident Management."
- All personnel on wildland fires would be equipped with proper personal protective equipment (PPE) as described in Chapter 3 of RM-18. All personnel would carry a fire shelter on wildland fires at all times unless in a designated safety zone.
- All personnel on projects or fire management activities would adhere to special PPE requirements specific to those operations (e.g., power saws, helicopters).
- All visitors to wildland fires in Saguaro would be equipped with Nomex clothing, gloves, hardhat, and fire shelter, and would be accompanied by an operationally qualified person that can maintain communications with the incident management team and recognize potential problem fire behavior.
- All vehicles and drivers engaged in fire management activities would meet Government Services Administration and agency standards, as well as state licensing requirements.
- All personnel engaged in wildland fire activities in Saguaro would adhere to the health screening/medical surveillance and fitness requirements of RM-18, Chapter 3.
- All arduous duty fire management personnel would be provided five hours per week of duty time to achieve and maintain physical fitness levels as prescribed in RM-18, Chapter 3. ¨
- Radios would be assigned to all fire crews and monitors when working on wildland fires. Special permission must be obtained from the incident manager for individuals to work alone on actively burning fires.
- Perimeter control would be assigned on all fire management projects and incidents to prevent non-fire personnel from entering the project/incident area without escort or proper PPE. The intent of perimeter control is to prevent injury to the public from unmitigated hazards of smoke, heat, falling debris, and machinery.
- Trails and roads providing access to mechanical fuel reduction projects, managed wildland fires, unwanted wildland fires, or prescribed fires would be closed if such fires and/or projects present unacceptably hazardous conditions to park visitors. Wilderness permits would not be issued for trailheads leading to hazardous areas. Roads and trails would remain closed until the hazard is abated.
- Smoke warning signs on roadways and/or traffic control would be instituted during wildland fires as conditions warrant and at the direction of the Burn Boss, Incident Commander, Safety Officer, or a visitor protection representative.

- Portions of the park or the entire park may be closed by order of the park Superintendent when there is any threat to the public or firefighter safety from wildland fire or fire management activities. When and if such an action occurs, adjacent agencies and authorities would be notified as soon as possible to help manage or evacuate the closure.
- Areas of hazardous fuels adjacent to publicly or privately owned structures or along likely evacuation routes would be kept clear of debris. This requirement would fall on the owner or the agency having jurisdiction, or the renter. The minimum requirement for creating defensible space is a 30-foot radius around any structure and 10 feet on either side of a roadway.

Public Information and Education

There would be an active partnership among Fire Management, Interpretation, and Resources Management staff to promote fire education among park staff and visitors. Fire education would be a component of interpretive staff training. Throughout the year, interpreters would incorporate wildland fire management and the role of fire in ecosystems into interpretive walks and evening programs when possible.

During fire season, as staffing allows, interpreters would staff significant prescribed fires or managed wildland fires near visitor use areas, to provide educational services. Where fires are particularly visible from major scenic overlooks or traditional high-use visitor areas, a roving Fire Information Officer, qualified personnel, or trained park interpreters would give talks about fire and smoke.

The Fire Management and Interpretation staff would notify adjacent communities by press release before prescribed fires are implemented. Interpretation and fire personnel would work closely with visiting Fire Information Officers, who may be part of an Incident Management Team or Fire Use Management Team, to assure that information is delivered effectively. Prompt reply to all media and public queries would be an essential element of public information. Information about wildland fire and smoke would be readily available, as would information about the fire management plan and ecosystem restoration if appropriate.

During emergency wildland fire situations, park interpretive staff could be brought in from other areas to assist in providing information to visitors and to assist the incident information officer.

Mitigation Measures

Saguaro National Park has a variety of special places and sensitive cultural and natural resources. To ensure that natural and cultural resources and the quality of the visitor experience are protected no matter which action alternative is implemented, a consistent set of mitigation measures would be applied to the actions proposed in this plan.

Successful implementation of the mitigation measures would be facilitated by ensuring that fire management is integrated with all other aspects of park management. Toward this end, fire activities in the park will be directed by the Fire Management Committee under direction of the Superintendent and the Fire Management Officer (FMO). In addition, Fire Management will insure that collaborative planning among park staff is provided during any prescribed and wildland fire projects, and will conduct Pre and Post fire season briefing with park staff.
Management responses to all wildland fires will be determined through the use of the Wildland Fire Implementation Plan (WFIP) Stage I Initial Fire Assessment within 2-hours of the ignition, evaluating public and firefighter safety, fire behavior, values at risk, potential suppression damage, and the availability of fire management resources. Decision criteria and risk factors requiring in-depth analysis for Saguaro often include: off-site impact of air quality, seasonal fire danger/drought and its relation to

fire spread (including chances of fire spreading off-park into jurisdictions lacking fire use capability), availability of resources, on-site impacts to cultural and natural resources, and threats to human life.

Identifying and mapping sensitive cultural and natural resources within the park boundaries which could be negatively affected by fire will help to minimize threats to these resources. If known sensitive natural or cultural resource sites are within any proposed prescribed fire or managed wildland fire area, the area would be evaluated and suitable site-specific mitigation measures would be developed and implemented as necessary. If an incident is projected to last longer than one operational period, a Resource Advisor would be assigned for the duration of the incident.

Around sensitive resources and in sensitive resource areas, fire management will utilize minimum impact tactics. Tactics used at Saguaro will include, but are not limited to:

- Use of water or fugitive retardant.
- Firelines should be kept to the minimum width necessary to stop the fire's spread. Whenever possible, natural barriers should be utilized to avoid unnecessary fireline construction.
- Cold trailing of the fire-edge rather than digging handlines is preferred whenever possible.
- Wetline should be used in lieu of handline construction if water and pumps are available.
- All firelines, spike camps, or other disturbances inside the park should be rehabilitated to maintain a natural appearance.
- Tree felling should be minimized, especially in visually sensitive areas. Later, during rehabilitation, the "slant cut" technique, which faces the cut away from view, or flush cutting stumps is preferred.
- Trees, limbs, brush, and other debris should be scattered and not left in piles. This debris will be used in rehabilitation efforts by placing it over previous constructed firelines.
- Maximize use of long line sling operations to reduce damage to vegetation for construction of helispots.
- Protective tactics should be used in areas identified by the Resource Management Specialist as having cultural significance, either archeological or historical.
- Protective tactics should be used in areas identified as being sensitive for natural resources.
- The Incident Commander is charged with incorporating minimum impact suppression tactics (MIST) into the suppression efforts in all operational plans.
- Heavy equipment, such as dozers, will not be used without approval by the Regional Director.
- No vehicles should be driven off-pavement without the Superintendent's approval.

For future actions not covered in the *Saguaro Fire Management Plan/EIS,* the National Park Service would prepare the appropriate environmental reviews (i.e., those required by NEPA, the NHPA, and other relevant legislation). As part of the environmental review, the National Park Service would avoid, minimize, and mitigate adverse impacts when practicable.

Additional mitigation measures are discussed in the following resource-specific sections.

Protection of Special-Status Species

During the planning phase of any fire management activity, the presence or absence of special-status species in the area would be determined. Park subject matter experts would evaluate existing databases and maps, and, if necessary, request additional surveys or field verification.

Prescribed fires are planned, and normal protocols require that resource specialists be involved in the plan review process. On-the-ground inventories of prescribed fire units (smaller units within an FMU) would

take place if they have not already been completed. If inventories are required, burning would be delayed until the inventory and suitable mitigation is completed.

If a prescribed fire unit has the potential to provide habitat for special-status species, steps would be taken to avoid nesting season and other sensitive periods of time for animals and plants. Altering the time of burning, providing direct protection of certain areas such as nesting trees, or simply not allowing fire into parts of the unit would do this. In addition, thinning may be used during preparation of prescribed burn unit areas where fuel conditions could create unsafe or undesirable conditions during the burning phase of the operation.

With wildland fires, which are unplanned events, the resource advisors would be notified of the intent to manage a fire in a certain part of the park. The location of the ignition would be reported and efforts would be made to get specialists into the area to perform basic inventory work as part of the cost of the incident. If specialists locate features that would require some mitigation, *action points* (geographic locations at which mitigation actions are triggered if reached by the fire) would be established and mitigation plans would be developed. If the fire reaches an action point, the mitigation plan would be implemented. It could take several days to weeks before this happens, or the fire may never reach the identified resource at risk.

Negative effects of fire will be minimized through the ecologically appropriate use of fire to restore and maintain fire adapted ecosystems. Ecologically sound objectives and a range of desired conditions will continue to be developed using the best available scientific data, and will be included in each prescribed fire burn plan. Each burn plan will also include specific burning prescriptions that will insure the fire can be controlled within established boundaries and that the burn will meet the desired fire management objectives for the resource.

Potential impacts to threatened and endangered species are fully analyzed in a Biological Assessment of the proposed action, which is included in the Final EIS as Appendix 7. The resulting Biological Opinion from the U.S. Fish and Wildlife Service will be included with the Record of Decision regarding the Final EIS. The requirements found in these two documents will be directly incorporated into each site-specific fire implementation plan, thereby serving as the primary mitigation measures for protecting threatened and endangered species. If a fire management project could cause an adverse impact on any federally listed species beyond what was considered in the existing Biological Assessment, additional consultation with the U.S. Fish and Wildlife Service is required.

Wildland fire use for resource benefit actions would be constrained if they pose undesirable disturbance to important habitat for special-status wildlife, or if they threaten significant populations of special-status flora.

Non-Native Species

Recognizing that fire management activities cause disturbance, there is potential that fire management activities could result in opportunities for non-native plant species to invade disturbed areas. For example, in some areas the effects of wildland fire use for resource benefit have contributed to the invasion of non-native thistle. Sites would be surveyed before and after prescribed fire and non-fire treatments and after wildland fires to determine the presence or absence of non-native plant species. If non-native plants are discovered on a project site, the park Fire Ecologist and Restoration Ecologist would develop appropriate mitigation measures. As the Resource Management Division identifies practices in the prescribed fire program that require modification, changes would be made.

Fire may also be an effective tool for managing some non-native species. If the park's Resource Management Division prepares a non-native species control plan that recommends the use of fire, the Fire

Management Office would prepare a prescribed fire plan. This plan would include fire prescriptions, site preparation plans, and monitoring needed to help carry out the non-native species control plan.

Snags and Slash

Generally, snags (standing dead trees) and other standing vegetation are not cut during fire management activities unless they present a threat to human life or safety or are a hazard to property or a valued resource. They may also be felled to control a wildland fire. In the event that a snag or live vegetation must be cut down, the stump would be cut flush with the ground (or as close to the ground as possible).

Debris from cut vegetation (slash) would be either lopped and scattered to a depth of no more than 18 inches and burned during a subsequent prescribed fire, or piled and burned outside of fire season.

Wilderness

In wilderness, fire management activities are conducted in accordance with the Wilderness Act (using the Minimum Requirement Decision Analysis) and minimum impact suppression tactics (MIST) are used. Nevertheless, impacts from site preparation for prescribed fires or non-fire treatments are visible to visitors within the immediate area, and this evidence of human activities diminishes the wilderness character of the area. However, other than resultant stumps cut flush with the ground and other visible saw cuts, most activities would be conducted so that effects would be adverse, short term, and minor. Slash and debris would be scattered to reduce visual effects in wilderness.

Soils and Water Quality and Quantity

During any fire management activity, impacts to soils would be minimized by utilizing the best available techniques to minimize soil disturbance and to rehabilitate disturbed soils. Best practices used would include minimizing construction of fireline, locating fireline to minimize erosion, rehabilitating fireline, and restoring slope contour. Areas with a high probability of erosion would be stabilized using best available methods, as determined by the park fire and resource management staff. The least intrusive action, such as natural recovery of native plant species, would be preferred, except in rare circumstances. Soil quality objectives will be incorporated into prescribed burn prescriptions in sensitive areas where negative fire/soil effects are known to have occurred or to have the potential to occur.

Water quality and quantity would be protected largely by employing erosion control methods, which would prevent excessive siltation of tinajas and other wet areas. Water quality would also be protected by keeping any application of fire retardant away from water to the greatest extent possible. Pilots and engine crews would be directed to avoid dropping retardants within 300 feet of springs, streams, and seeps.

Air Quality

Smoke resulting from wildland fires and all prescribed burning and debris disposal would comply with all federal, state, and local regulations, including those contained in the Arizona State Department of Environmental Quality Smoke Management Plan. A site-specific prescribed burn plan would be prepared for each project, and would include all of the required elements listed in RM-18.

One important aspect of smoke mitigation is to limit the number of acres and the amount of fuel burned. When adjacent land management agencies and land owners are managing prescribed fires or wildland fires, cooperation and coordination are initiated to minimize cumulative smoke impacts, including by limiting the number of burns occurring simultaneously.

Smoke movement patterns have a direct relationship to watersheds, especially below 7,500 feet. If several fires were burning simultaneously in the same air-quality watershed, down-valley smoke might be extreme. Because of this, the park would potentially control additional starts within an air-quality watershed that already has a fire burning within it.

Another important element of smoke mitigation is timing prescribed burns to minimize smoke impacts on air quality and visibility. This includes utilizing favorable conditions of atmospheric stability, mixing height, and transport winds. Specifying an acceptable range of moisture content and wind conditions for each prescribed burn, and promptly mopping-up prescribed burns also aid in limiting negative smoke impacts.

Additionally, park staff would monitor air quality adjacent to project areas and within developed areas of the park. Unhealthy or hazardous accumulations of smoke would trigger an aggressive suppression action that includes mop-up and that would persist until the air quality is no longer unhealthy or hazardous.

Cultural Resources

Also see Appendix 2, The Cultural Resource Component of the Fire Management Plan.

Pre-Incident Planning

- Planning for fire management actions would include protection of known cultural resources.
- Known cultural resources would be assessed for hazardous fuels, which would be reduced as part of ongoing fuel reduction programs.
- The National Park Service would continue to consult with park-associated Native American tribes about fire management planning and specific fire management actions in order to identify issues and resources of concern and to implement the most appropriate treatments.
- In traditional use areas, fire managers would consider the needs of cultural practitioners to access and use traditional resources.
- In fire management units lacking cultural resource inventory data, consultation, background research, or inventory would be conducted to identify resources that may be important and are susceptible to adverse impacts from fire or fire management actions.
- Cultural resources typical of those found at Saguaro would be included in long-term research and experimentation about the effects of fire on cultural resources.

Incident Response

- Fire management teams would solicit the advice of archaeologists, cultural resource specialists or resource management staff on cultural resource issues and concerns.
- To avoid damage to cultural resources, archaeologists, cultural resource specialists, or resource management staff would, whenever possible, aid in positioning crew camps, holding lines, spike camps, helispots, drop zones, and other fire suppression related facilities in culturally sensitive areas that were not located during pre-planning activities.
- Archaeologists, cultural resource specialists, or resource management staff would advise fire management teams of known significant cultural resources in areas where potential impacts of fire could be reduced or avoided through emergency fuel reduction.
- Wherever possible, archaeologists, cultural resource specialists, or resource management staff would document significant cultural resources prior to a burn.

Visual Impacts

Aesthetic impacts would be judged on a case-by-case basis; the park Superintendent would approve any mitigation measures.

Safety and Human Impacts

Impacts to visitors, employees, and park residents would be minimized by planning fire management activities during daylight hours and on workdays whenever possible. Before starting any project, the public and employees would be notified of proposed activities through road signs, trail signs, and postings at visitor centers, entrance stations, post offices, or other areas of frequent use.

Communication/Coordination

Communication, cooperation, and collaboration with neighboring agencies and communities, park partners, visitors, residents, and employees would be an essential component of all plans for fire management activities. Communication with adjacent agencies and landowners would be conducted when projects occur at or near their boundaries or there is an identified impact that might or would affect park neighbors. Identifying and mapping county, state, federal, and private lands within one mile of the park's designated boundary will help to minimize threats of unacceptable effects of fire to property outside the park.

Monitoring

Fire Monitoring

Monitoring of fires, both wildland and prescribed, involves the systematic collection and recording of data on fuels, topography, weather, air quality, and fire behavior. Monitoring at Saguaro National Park would generally follow the protocols outlined in the *National Park Service Fire Monitoring Handbook*. A fire-monitoring plan is a required element in National Park Service fire management plans. The *Saguaro Wildland and Prescribed Fire Monitoring Plan* (Appendix 3) provides detailed descriptions and additional protocols for wildland and prescribed fires. The fuels and ecology group within the park's branch of fire and aviation would complete this monitoring; assistance would be provided by other park staff as needed.

Short- and long-term vegetation monitoring objectives applicable to a specific burn area would be stated in the prescribed fire plan. At a minimum, monitoring would comply with the protocol identified in the *National Park Service Fire Monitoring Handbook*. Data collected from short-term monitoring would be attached to the fire report along with any narrative completed by the prescribed fire monitors.

Cultural Resources Monitoring

The National Park Service recognizes that the effects of fire and the thresholds for unacceptable damage to some types of cultural resources (e.g., archaeological resources) are not well understood. An ongoing effort to obtain baseline information and develop this understanding would make it possible to refine sound risk management for fire planning. Monitoring the effects of fire in field situations would be an important component of this work. However, until systematic laboratory experiments can be conducted, field-based fire effects monitoring would be limited to empirical observations. For resources such as cultural landscapes, systematic fire effects research and monitoring would focus on indicators or criteria for landscape restoration and maintenance. Outlined below is the minimum level of effort for monitoring the effects of fire on cultural resources. This monitoring would provide feedback on the effectiveness of current resource protection measures, such as site avoidance and pre-burn fuel load reduction. It would be designed to document pre- and post-burn resource conditions that are readily observable, such as preservation of flammable historic fabric, preservation of milling slicks on archaeological sites, visually identifiable changes in surface artifacts and surface conditions, and changes in landscape conditions in historic districts and cultural landscapes.

As systematic processes for evaluating fire effects evolve, monitoring would be revised to support field evaluation. In the interim, cultural resource specialists (usually archaeologists from the National Park Service's Western Archaeological Conservation Center) would identify any necessary pre-burn mitigation for prescribed fires, resource protection measures, and the most appropriate monitoring strategy for planned and unplanned burns. In general, these would consist of the following:

Pre-burn
Known cultural resources would be relocated and current conditions would be assessed using standard operating procedures (Appendix 2). This would include documentation of current fuel loads, likely duration and intensity of a fire, threats to features and artifacts, and potential for subsurface impacts through burning roots and stumps. These data would be assessed to determine: (1) which protection measures should be implemented (if any); (2) the potential for fire effects studies; and (3) additional monitoring needs.

During Burn
For all fires, a Resource Advisor or Technical Specialist would provide recommendations to park managers. Although this would be primarily for resource protection, it would also provide documentation of fire behavior and immediately observable effects of fire in and adjacent to cultural resources. If suppression or holding actions were to be taken, the Resource Advisor would monitor as needed to advise on site-specific actions.

Post-burn
An archaeologist would revisit known cultural resources in burn areas to document any changes in condition and assess post-burn protection needs. Fire effects on cultural resources would be documented and subsequently added to the park's database on the effects of fire and fire management activities on cultural resources. Burn prescriptions and techniques used to protect cultural resources would also be refined.

Research

The need for better data on fire effects is a nationwide issue. All efforts to conduct fire effects research at Saguaro National Park would be coordinated with the Intermountain Region, other National Park Service Units, and other federal, state, and local agencies.

Fire Research Program

Saguaro National Park's current fire management program is based on more than 30 years of scientific studies and research. As the program continues to mature, additional information would be needed to refine objectives and meet new challenges. New research needs and priorities would be identified by the Fire Management Office in conjunction with Saguaro's Resource Management Division. Information gaps in several areas have already been identified. For example, the National Park Service needs to continue to improve its understanding of Saguaro's fire history. Data on the fire return interval, season of burning, and fire severity is needed for vegetation types other than mixed-conifer and ponderosa pine forests. Research that leads to an understanding of the structural component of lower elevation vegetation types is needed to provide a basis for target conditions. These structural features include gap distributions, species composition, and density. In addition, a fuel model map for the park needs to be developed and the park's vegetation map needs to be updated and verified. Finally, additional information on the effects of fire on invasive species, air quality, water quality, and sensitive species habitats would improve Saguaro's fire management program.

Cultural Resource Research

In order to determine the most effective techniques for cultural resource protection and preservation, park researchers must first find out more precisely how heat affects archaeological objects; how fire was used by indigenous people in managing specific plant resources and the pre-contact and prehistoric landscapes; and how fire can be used to restore and maintain historic and traditional cultural landscapes. These data could then be used to develop protocols to avoid or mitigate the potentially damaging effects of burning.

Table II-1. Summary of Alternatives

		Alternative C (No Action Alternative)	Alternative D (Prescribed Fire and Non-fire Treatments Alternative)	Alternative E (Variable Action Alternative — Preferred Alternative)
Theme of the alternative		**Continue current fire management programs and activity level.**	**Restore fire to ecosystems and reduce risk of catastrophic fire over the long term. Fuel reduction strategies limited to prescribed fire and non-fire treatments.**	**Variable approach to restoring fire to ecosystems and reducing risk of catastrophic fire. A full range of fuel-reduction strategies would allow flexibility in achieving habitat restoration goals. Would accomplish these goals more quickly than Alternative D.**
Fire management strategies that would be used	**Wildland fire use for resource benefit**	**In current Fire Management Unit (FMU) 1,2,3,5**	**No.**	**In proposed FMU 1 only.**
	Prescribed fire	In current FMU 1,2,3.	**In proposed FMU 1 only.**	**In proposed FMU 1 only.**
	Non-fire treatments	Yes, for burn preparation only in FMU 1,2,3.	**In all proposed FMUs at any time.**	**In all proposed FMUs at any time.**
	Suppression	**In all current FMUs at any time.**	**In all FMUs at any time.**	**In all FMUs at any time.**
Degree to which the alternative would meet the park's eight fire management objectives (see Section I)	**#1 Safety** **#2 Property** **#3 Restore fire** **#4 Research & monitoring** **#5 Integration** **#6 Education** **#7 Cooperation** **#8 Cultural resources**	**This alternative would meet all objectives and would meet them to the same degree as Alternative E. However, it would not allow for integration of monitoring and research data into a new site-specific fire implementation plan nor would it meet the new National Park Service guidelines for fire management plans.**	**This alternative would meet all objectives except #3. Restoring fire in an ecologically appropriate manner would entail allowing wildland fires to burn naturally—the fire management staff could not restore all of the natural fire regimes quickly enough using prescribed fire and non-fire treatments only. Thus, the degree to which it meets these objectives is less than in Alternatives C and E.**	**This alternative would meet all objectives and would meet them to the same degree as Alternative C. However, it would have the added benefit of allowing for integration of monitoring and research data into a new site-specific fire implementation plan and it would meet the new National Park Service guidelines for fire management plans.**
Degree to which the alternative meets the purpose and need for action (see Section I)		**Would satisfy the need to have a fire management program but not the purpose of updating the existing**	**Would satisfy the need to have a fire management program and the purpose of updating the existing plan with new**	**Would satisfy the need to have a fire management program and the purpose of updating the existing plan with new**

	Alternative C (No Action Alternative)	Alternative D (Prescribed Fire and Non-fire Treatments Alternative)	Alternative E (Variable Action Alternative — Preferred Alternative)
	plan with new knowledge and capabilities that justify greater use of fire.	**knowledge and capabilities that justify greater use of fire. However, would not allow for the greatest use of fire.**	**knowledge and capabilities that justify greater use of fire. Would allow for the greatest use of fire.**
Main difference from No Action Alternative	**N/A**	**Difference lies within the treatment options, FMU descriptions, and ability to integrate current data on fire effects/behavior in a site-specific fire implementation plan.**	**Difference lies within the FMU descriptions and the implementation plan discussed under Alternative D.**

Table II-2. Summary of Environmental Consequences: Overall Impacts by Topic
(Note: More in-depth analysis and definitions of the type, duration, and intensity of impacts for each impact topic can be found in Section IV.)

Impact Topic	Alternative C (No Action Alternative)	Alternative D (Prescribed Fire and Non-fire Treatments Alternative)	Alternative E (Variable Action Alternative — Preferred Alternative)
Vegetation			
	Impacts from Alternative C on park vegetation would generally be beneficial, long term, and minor to moderate. Prescribed fire and wildland fire use for resource benefit would help restore fire to fire-adapted vegetation types, as well as reduce fuel buildup throughout the park, which would decrease the chance for catastrophic fire. However, continued use of fire in Sonoran desertscrub and grasslands could have adverse effects. Continued use of an outdated fire management plan (FMP) without a site-specific fire implementation plan could also have adverse effects. Overall, impacts would have the potential to be adverse, long term, and minor to major.	Under Alternative D, impacts on park vegetation in specific areas targeted for prescribed burns would be beneficial, long term, and minor to moderate, as the risk of high severity fires in those areas is reduced. Maximum suppression would minimize death and injury to plants (and animals) in the short run and favor late seral species. However, the risk of high-severity fire that would lead to lower overall diversity would be the highest under this alternative, following buildup of fuels caused by suppression of all wildland fires. There would also be greater impacts from fire suppression activities. Overall, impacts would have the potential to be adverse, long term, and minor to major.	Under Alternative E, prescribed fire and wildland fire use for resource benefit would help restore fire to fire-adapted vegetation types as well as reduce fuel buildup throughout the park, which would decrease the chance for catastrophic fire. Fire would be suppressed in non fire-adapted vegetation types. An updated FMP would allow managers to make better-informed decisions that take into account new, site-specific data on resources and fire behavior. Overall, impacts would have the potential to be beneficial, long term, and negligible to moderate.
Wildlife			
	Alternative C, which does not have a site-specific fire implementation plan and allows for the occurrence of some wildland fire use for resource benefit in the upper elevations of Sonoran desertscrub, would have relatively high potential (i.e., higher than Alternative E but less than Alternative D) to adversely affect wildlife resources in the park. Impacts would be adverse, long term, and moderate to major.	Impacts of Alternative D on wildlife would be adverse, long term, and moderate to major due to the continuation of the direct effects of high fuel loading on habitat structure and quality in some areas, and the continued threat of catastrophic fire from fuel buildup caused by suppression of all wildland fires.	Alternative E, which would allow wildland fire use for resource benefit and prescribed fire above 4,000 feet within the constraints of the implementation plan, would reduce fuel loads (and thus the risk of catastrophic wildfire) while minimizing adverse impacts on sensitive resources. Potential adverse impacts on wildlife species would therefore be minimized as well. Overall, impacts on wildlife from the

Impact Topic	Alternative C (No Action Alternative)	Alternative D (Prescribed Fire and Non-fire Treatments Alternative)	Alternative E (Variable Action Alternative — Preferred Alternative)
			Preferred Alternative would be beneficial, long term, and minor to major.
Species of Special Concern			
Gila Topminnow	Alternative C, which would not have a site-specific fire implementation plan and would allow for the occurrence of some wildland fire use for resource benefit in the upper elevations of Sonoran desertscrub, would have potential to adversely affect the park's Gila topminnow habitat/reintroduction site. Overall, impacts could be adverse, long term, and minor to major.	Under this alternative, there would be considerable risk of catastrophic fire due to fuel buildup caused by suppression of all wildland fires, and so, like Alternative C, it has potential to adversely affect the park's Gila topminnow habitat/reintroduction site. Overall, impacts could be adverse, short or long term, and negligible to major.	This alternative would provide the park's Gila topminnow habitat/reintroduction site with the most protection by reducing fuel loads with both wildland fire for resource benefit and prescribed fire and by the implementation of a site-specific fire implementation plan. Overall, impacts from this alternative should be beneficial, long term, and negligible to moderate.
Lesser Long-nosed Bat	As Alternative C is the only one that would allow wildland fire use for resource benefit and prescribed fire in the Sonoran desertscrub and desert grassland. It would have the most potential to adversely affect lesser long-nosed bats in the short or long term with minor to moderate impacts due to the bat's major food source being located in the Sonoran desertscrub.	Under this alternative, there would be considerable risk of catastrophic fire above 4,000 feet due to fuel buildup caused by suppression of all wildland fires. It therefore would have intermediate potential (i.e., between Alternatives C and E) to adversely affect lesser long-nosed bats. Adverse impacts would be short or long term, and minor to moderate.	This alternative would provide the most protection for lesser long-nosed bats by decreasing the likelihood of catastrophic fire and by not using wildland fire use for resource benefit in non-fire-adapted ecosystems. Overall, impacts would be beneficial, long term, and negligible to minor.
Cactus ferruginous pygmy-owl	Because this alternative is the only one that would allow wildland fire use for resource benefit in Sonoran desertscrub, it has the most potential to adversely affect cactus ferruginous pygmy-owls. Depending on how a fire affects habitat components, impacts would have the potential to be adverse, short or long term, and negligible to moderate.	Under this alternative there is considerable risk of catastrophic wildfire above 4,000 feet (due to suppression of all wildfires and the lack of wildland fire use for resource benefit). However, this alternative does not allow fire in the habitats of the cactus ferruginous pygmy-owls; and so it has intermediate (i.e., between Alternatives C and E) potential to affect cactus ferruginous pygmy-owls. Impacts could be beneficial or adverse, short or long term, and negligible to moderate.	The greatest potential fire-related threat to cactus ferruginous pygmy-owls in the park is from fire that destroys or degrades their habitat/components, particularly riparian or xeroriparian resources, and mesquite bosque below 4,000 feet. This alternative would provide the most protection from such adverse impacts. Impacts would be beneficial, short or long term, and negligible to

Impact Topic	Alternative C (No Action Alternative)	Alternative D (Prescribed Fire and Non-fire Treatments Alternative)	Alternative E (Variable Action Alternative — Preferred Alternative)
			minor.
Peregrine Falcon	Catastrophic fire would be no more likely to occur under Alternative C than under Alternative E, and would be less likely than under Alternative D. However, without a site-specific fire implementation plan, fire would be more likely to cause adverse impacts to resources important to peregrine falcons under this alternative than under Alternative E. Overall, impacts could be adverse, short term, and negligible to moderate.	Peregrine falcons could be adversely impacted in a minor to major way in the short and long term by catastrophic fire, which would be most likely under this alternative due to fuel buildup caused by the lack of wildland fire use for resource benefit.	Impacts on peregrine falcons under Alternative E would be essentially the same as under Alternative C. However, catastrophic fire with the potential to harm resources essential to peregrine falcons would be least likely under this alternative due to the development of a site-specific fire implementation plan. Thus, the likelihood of adverse impacts would be less under Alternative E than under Alternative C.
Mexican Spotted Owl (MSO)	The current prescribed burn program does offer some short-term moderate benefits to the owls and their habitats. However, under this alternative, there would be the potential for major adverse effects from catastrophic fire in the short and long term. These risks would stem in part from the decision-making process under the current fire management plan, and from park managers' inability to apply prescribed burning and wildland fire use for resource benefit in Mexican spotted owl protected activity centers.	There would be greater potential for major adverse impacts on MSOs from catastrophic fire in the short and long term under this alternative than under the others. However, the park would be able to conduct prescribed burns in MSO PACs to reduce fuel loads, and thus the vulnerability of MSO roost and nest trees to fire. Therefore, there would be more opportunity to protect MSOs and their habitats under Alternative D than under Alternative C, offering the owls some long- as well as short-term benefits.	Under Alternative E, there would be the opportunity to take advantage of naturally ignited fires to reduce fuel loads throughout the park using an updated, site-specific fire implementation plan, and to conduct prescribed burns, including within PACs. This latter treatment would reduce fuel loads and the vulnerability of MSO roost and nest trees to fire. Therefore, this alternative offers the most options and the best strategy for protecting MSOs and their habitats in the park, and offers them major long- as well as short-term benefits.
Plant Species of Special concern found below and above 4,000 feet in elevation. Pima Indian Mallow, Trelease Agave, Needle-	The No Action Alternative would allow for the occurrence of some wildland fire use for resource benefit and prescribed fire in the upper elevations of Sonoran desertscrub and in the desert grassland, which comprise much of these species and their habitat. This treatment would potentially have adverse	Due to the lack of wildland fire use for resource benefit, the chance for catastrophic fire would increase throughout the park due to fuel buildup mostly at elevations above 4,000 feet. Although these species are potentially found at elevations and in vegetation types where fire is uncommon (below 4,000 feet), catastrophic	Alternative E provides the greatest opportunity, when compared to the No Action Alternative and Alternative D, to reduce the risk of catastrophic fire throughout the park by using wildland fire use for resource benefit, prescribed fire, and non-fire treatments. In

Impact Topic	Alternative C (No Action Alternative)	Alternative D (Prescribed Fire and Non-fire Treatments Alternative)	Alternative E (Variable Action Alternative — Preferred Alternative)
spine pineapple cactus, and Needle-spine pineapple cactus	effects on desertscrub, which is an non-fire-adapted vegetation type and desert grassland, which needs further study. Since The No Action Alternative would not have a site-specific fire implementation plan that would allow park managers to properly consider these species and mitigate these effects by avoidance, it would have the potential to adversely affect them. Overall, impacts could be adverse, long term, and minor to major.	fires could more readily spread to those elevations through the buildup of fuels at higher elevations. Impacts would be adverse, long term, and negligible to major	addition the site-specific fire implementation plan and the elimination of fire from non-fire adapted vegetation types provides the best protection for the population of these species. Overall, impacts would be beneficial, long-term, and minor to moderate.
Plant Species of Special concern found below and above 4,000 feet in elevation. Desert night-blooming cereus, Thornber pincushion cactus, and Tumamoc globeberry	The No Action Alternative would allow for the occurrence of some wildland fire use for resource benefit and prescribed fire (in the Rincon Mountain District) in the upper elevations of Sonoran desertscrub and in the desert grassland. This treatment would potentially have adverse effects on these species that are found in the desertscrub, which is a non-fire-adapted vegetation type and desert grassland, which needs further study. Since The No Action Alternative would not have a site-specific fire implementation plan that would allow park managers to properly consider these species and mitigate these effects by avoidance, it would have the potential to adversely affect them. Overall, impacts could be adverse, long term, and minor to major.	Due to the lack of wildland fire use for resource benefit, the chance for catastrophic fire would increase throughout the park due to fuel buildup mostly at elevations above 4,000 feet. Although these species are potentially found at elevations and in vegetation types where fire is uncommon (below 4,000 feet), catastrophic fires could more readily spread to those elevations through the buildup of fuels at higher elevations. Impacts would be adverse, long term, and negligible to major.	Alternative E provides the greatest opportunity, when compared to the No Action Alternative and Alternative D, to reduce the risk of catastrophic fire throughout the park by using wildland fire use for resource benefit, prescribed fire, and non-fire treatments. In addition the site-specific fire implementation plan and the elimination of fire from non-fire adapted vegetation types where these species are located provides the best protection for these species. Overall, impacts would be beneficial, long-term, and minor to moderate.
Physical Environment — Watersheds, Soils, and Water Quality/Quantity			
	Alternative C would have adverse or beneficial, long-term, and moderate to major impacts on the physical environment. This conclusion is weighed on a	**This alternative would have adverse, long-term, and moderate impacts on the physical environment. This conclusion is based on combining the beneficial, long-term,**	Overall, impacts on soil and watershed conditions under Alternative E would be beneficial, long term, and minor to moderate. High-severity fires could

Impact Topic	Alternative C (No Action Alternative)	Alternative D (Prescribed Fire and Non-fire Treatments Alternative)	Alternative E (Variable Action Alternative — Preferred Alternative)
	combination of beneficial, long-term, moderate impacts with the proper use of wildland fire for resource benefit and prescribed fire, and the potential for adverse, long-term, and major impacts without an updated, site-specific fire implementation plan.	**moderate to major impacts in treatment areas with the potential for areas of adverse, long-term, and major impacts due to the lack of wildland fire use for resource benefit and increased fuel loads. This lack would increase the chance for large, high-severity fires in a greater area than Alternatives C and E, which would likely occur during the life of the plan.**	occur during the life of this plan, but the treatments proposed would reduce fire size and effects on soils and watersheds, including the potential for adverse impacts on water yield, peak flow, nutrient yield, sediment yield, and stream system response.
Air Quality			
	Emissions under the No Action Alternative would be greater than under Alternative D in the short run (due to more fire), but through continued use of prescribed fire and wildland fire use for resource benefit that would result in decreased fuel loads, the chance of long-duration catastrophic fire events would decrease. Therefore, impacts would be adverse, short term, and negligible to minor.	**Alternative D would cause the least amount of emissions in the short run. However, with continued suppression and increased fuel loads, the chance for long-duration catastrophic fire would increase, which would increase emissions over the long run. Minor to moderate changes in air quality measurements (from current conditions) that could be attributed to park's fire activity would be expected in the long run. Overall, impacts would be adverse, short term, and minor to moderate.**	**The impacts of this alternative would, for the most part, be the same as Alternative C. However, with a new site-specific fire implementation plan that takes into account new information on fire behavior and air quality issues, adverse impacts would likely be lessened.**
Cultural Resources			
	The majority of the park's significant cultural resources are located primarily in Sonoran desertscrub areas. Alternative C would allow wildland fire use for resource benefit in the higher elevations of Sonoran desertscrub, and could therefore have more adverse impacts on cultural resources than the other alternatives (although most of the cultural resources are found in the lower elevations of Sonoran desertscrub). Historic Manning Cabin would have the	This alternative would effectively protect cultural resources in the short run, as treatments would be under management control. However, it would be the least effective alternative in the long run due to increased fire suppression and consequent fuel buildup that would increase the likelihood of catastrophic fire. Alternative D would have moderate short-term beneficial impacts with long-term adverse impacts varying from minor to Major.	**Alternative E would be the most effective at protecting cultural resources in the long run, as hazardous fuel loads would be reduced using wildland fire for resource benefit as well as prescribed fire, with the added benefit of an updated FMP that would include a cultural resource component (CRC). The CRC would help managers with mitigation measures and treatment options that**

Impact Topic	Alternative C (No Action Alternative)	Alternative D (Prescribed Fire and Non-fire Treatments Alternative)	Alternative E (Variable Action Alternative — Preferred Alternative)
	same protection under Alternatives C and E. Overall, impacts would be "not adverse," long term, and negligible to minor.		**protect cultural resources. Overall, impacts would be "not adverse," long term, and negligible to minor.**
Visitor Convenience			
	Alternative C would have adverse, short-term, and negligible to minor impacts on visitor convenience due to short-term closures and restrictions because of fire management activities. The chance for large catastrophic fires would continue to decrease due to the use of both wildland fire for resource benefit and prescribed fire.	This alternative would have the most potential for adverse, long-term, and minor to major impacts on visitor convenience. This would be due to short-term closures and restrictions because of fire management activities, and longer-term closures and impacts from the increased chance for large catastrophic fires due to increased fuel loads brought about by the lack of wildland fire use for resource benefit.	The impacts of Alternative E on visitor convenience would, for the most part, be the same as Alternative C. However, the ability to integrate new knowledge of fire history, behavior, and ecology into a site-specific fire implementation plan would reduce the risk of potential adverse, long-term impacts by giving managers better site specific guidance for managing fires.
Local Communities			
	Alternative C could have economic benefits for the local communities by using local resources during fire activities (e.g. food, lodging). Since fire activities occur during the lowest visitor-use months and in the lowest visitor-use areas, the benefits through spending in the local communities would outweigh the minor impacts that temporary closures could have. In general, impacts would be beneficial, short term, and negligible.	**This alternative would have the potential to benefit the local communities' economies through increased suppression activities, which would use local resources, as well as through increased likelihood of catastrophic fire events, which would also use local resources. Increased suppression would have a negative effect on local community members who live close to the park boundary, due to increased air and ground traffic and noise. In general, impacts would be beneficial, short term, and negligible to minor.**	The impacts of Alternative E on local communities would be the same as Alternative C.
Life and Property			
	With continued use of wildland fire use for resource benefit and prescribed fire, short-term adverse impacts on life and property would be reduced by decreasing fuel loads and the risk of high-intensity catastrophic	**This alternative would place firefighters and the public at risk more often than Alternatives C and E due to the high level of suppression activities. In the long run, there would be the potential for moderate to**	This alternative would be the most effective at protecting life and property in the long run. Hazardous fuel loads would be reduced as in Alternative C, and lessons learned, new data on fire

Impact Topic	Alternative C (No Action Alternative)	Alternative D (Prescribed Fire and Non-fire Treatments Alternative)	Alternative E (Variable Action Alternative — Preferred Alternative)
	fire. Negligible to minor, long-term, beneficial impacts on life and property would accrue as management objectives are met. However, the current plan does not incorporate lessons learned, new data on fire behavior and effects, and new policy guidelines in a site-specific fire implementation plan, which would provide for even more protection of life and property. Overall, impacts would be beneficial, long-term and negligible to minor.	**major adverse impacts on firefighter and public safety and property during periods of severe fire conditions.**	behavior and effects, and new policy guidelines would be integrated into fire management, which would have the potential to provide for more protection of life and property. With continued use of wildland fire for resource benefit and prescribed fire with appropriate protective measures, impacts to public safety and property would be negligible, short-term, and adverse. Minor, long-term, beneficial impacts to life and property would accrue as management objectives are met.
Wilderness			
	Fire management activities under the No Action Alternative would affect wilderness resources in generally beneficial ways, through actions that would maintain plant communities within their natural range of variability, and thus maintain wilderness values. Effects in wilderness areas that are not adapted to fire would be dependent on how quickly fires could be suppressed. In wilderness, helicopter and chainsaw noises would continue to introduce short-term intrusions, with adverse and moderate effects. Overall, these impacts would be beneficial, long term, and minor to moderate. However, the No Action Alternative would not include an updated, site-specific fire implementation plan with current scientific data to help guide managers in making effective, informed decisions with regard to suppression and	Alternative D would have adverse, long-term, and moderate to major impacts on wilderness due to the increased likelihood of large catastrophic fires caused by fuel buildup from increased suppression activities.	The impacts of Alternative E on wilderness would be the same as Alternative C, with the added benefit of utilizing an updated plan with more current and site-specific knowledge of resources, fire effects, and fire behavior, which would reduce the chance for adverse impacts.

Impact Topic	Alternative C (No Action Alternative)	Alternative D (Prescribed Fire and Non-fire Treatments Alternative)	Alternative E (Variable Action Alternative — Preferred Alternative)
	wildland fire use for resource benefit in wilderness areas. Thus, the chance of adverse impacts would exist.		
Environmental Justice			
	Fire management activities at Saguaro National Park have not targeted one or more areas as more important than other. The impacts of Alternative C upon minority and low-income populations in local communities would therefore be beneficial, short term, and negligible to minor.	The Impacts of Alternative D upon minority and low-income populations in local communities would be the same as Alternative C.	The Impacts of Alternative E upon minority and low-income populations in local communities would be the same as Alternative C.
Energy Consumption			
	Under Alternative C, energy would be consumed during all fire activities. Typically, more than 7,000 gallons of various fuels would be consumed per year. The impacts of the fire management program's energy demand would continue to be adverse, short term, and negligible.	Under Alternative D, energy would be consumed during all fire activities. Typically, more than 6,000 gallons of various fuels would be consumed per year. This alternative would use an estimated 1,000 gallons of fuel less than either Alternative C or E. However, impacts of the program's energy demand would be expected to be the same as the other alternatives (adverse, short term, and negligible).	The impacts of Alternative E's energy demand under would be the same as discussed under Alternative C.

Section III: Affected Environment

Introduction

This section describes the environmental, cultural, and social context for the alternatives introduced in Section II. It describes only those resources that may experience or cause impact or be affected if the proposed alternatives are implemented. Specific resources that would not be affected are listed in the issues discussion found in Section I. The Council on Environmental Quality requires that NEPA documents "succinctly describe the environment of the area(s) to be affected or created by alternatives under consideration (1502.15)."

Biological Environment

Vegetation Types

Fire managers recognize six structurally distinct vegetation types for fire management at Saguaro National Park (Map 111-1 and 2): Sonoran desertscrub, desert grassland, Woodland, pine-oak forest, ponderosa pine forest, and mixed conifer forest. Map III-1 is the most current vegetation map for The Rincon District of Saguaro, and is derived from a 1930's vegetation map of the park. Since plant communities have been altered since the 1930's due to disturbances (primarily fire) and climate change (from global warming), fire managers should rely heavily on local knowledge while referencing this map.

Sonoran Desertscrub – Rincon Mountain District (RMD)
Sonoran desertscrub occurs from the base of the mountains to about 5,200 feet. This vegetation type is characterized by the large number of cacti present and by the drought-deciduous habit of many of the trees and shrubs.

Sonoran Desertscrub – Tucson Mountain District (TMD)
This vegetation type also occurs in the Tucson Mountains from roughly 2,133 to 4,757 feet.

Desert Grassland – RMD
Patches of grassland occur from roughly 4,000 to 5,000 feet. It is unclear whether there are any "true" desert grasslands in Saguaro National Park (i.e., large areas of open rolling hills of grass). There are several small patches of grassland in the Rincon Mountains that are slowly being encroached upon by shrub and tree species. These patches vary greatly in species composition but are characterized by the presence of numerous perennial grasses.

Desert Grassland – TMD
Similar patches of desert grassland are found at elevations above Sonoran desertscrub in the Tucson Mountains from 3,691 to 4,692 feet.

Woodland – RMD
Woodland occurs from 4,400 to 6,100 feet. The trees often form open woodlands and grow up to 10 to 20 feet in height, although at some locations the vegetation type becomes more dense and chaparral-like. This vegetation type is the most variable in species composition and structure in the Rincon Mountains and covers a wider elevational belt than any other Vegetation type in the range.

Pine-Oak Forest – RMD
Pine-oak forest occurs from 5,300 to 8,000 feet. Pine-oak forest blends into pine forest at its upper elevational limit and into Woodland at its lower elevational limit. It can be distinguished

from either of these vegetation types by the larger number of oak present and by the presence of Chihuahua pine. Tree height in pine-oak forest is intermediate between pine forest, where trees are typically greater than 80 feet tall, and Woodland, where trees are less than 20 feet tall.

Ponderosa Pine Forest – RMD
This vegetation type occurs from 7,600 to 8,666 feet. Ponderosa pine is the dominant species in the overstory, with southwestern white pine and Gambel's oak as subdominants.

Mixed-Conifer Forest – RMD
Mixed-conifer forest occurs from 7,001 to 8,666 feet. Douglas fir is the dominant species in the overstory, with ponderosa pine, southwestern white pine, Gambel's oak, New Mexican locust, and white fir as subdominants.

Mixed in with these major vegetation types are:

Mountain Wet Meadow – RMD
Mountain wet meadow occurs near springs from 7,402 to 8,666 feet. Dominant species are largely various species of sedges, grasses, and rushes.

Mountain Dry Meadow – RMD
Mountain dry meadow occurs at 8,497 feet. Grasses, including *Muhly, drop seed, brome, bent, needle, and blue grass* species dominate this vegetation type. Many annual forbs and bracken fern can also be found, along with western sneezeweed.

Riparian Woodland and Riparian Forest – RMD
Riparian forest occurs at high elevations (above 5000 feet) and is characterized by Arizona alder, boxelder, and coyote willow. Riparian woodland is highly variable in species composition. It typically supports not only riparian obligate species but also non-riparian species normally found at higher elevations.

Desert Riparian Scrub – RMD and TMD
This vegetation type is generally found in lower elevation drainages, and is linear in structure because it follows drainageways, and, as such, is somewhat more mesic than immediately adjacent vegetation types. This vegetation type is characterized by overstory vegetation consisting of velvet mesquite, desert hackberry, whitethorn and catclaw acacia, and blue paloverde. The intermittent availability of water and denser linear cover for movement in this vegetation type make it important wildlife habitat.

Wildlife

Wildlife resources at Saguaro National Park are diverse, reflecting the park's ecologically strategic location. The park's RMD lies at the interface of the Sonoran and Chihuahuan Deserts, and is part of the chain of scattered "sky-island" mountaintops in southeastern Arizona that connect the Rocky Mountains to the north with the Sierra Madre Mountains to the south. Faunal elements from both of these biomes are represented in the Rincon Mountains. In addition, the district ranges in elevation from 2,700 to 8,666 feet, and encompasses six life zones, from Sonoran desertscrub to mixed-conifer forest. The San Pedro River, just east of the RMD, and the major drainages of the Rincons, which form the headwaters of Tanque Verde Creek and Pantano Wash, add riparian components to the park's faunal diversity, as well as provide wildlife movement corridors that link mountain ranges through the surrounding desert lands. Overall, the park supports a unique and diverse assemblage of thousands of invertebrates, and over 325 vertebrates, including approximately 70 mammals, 200 birds, 50 reptiles, and 8 amphibians. The challenge in maintaining this biodiversity is underscored by the fact that since the turn of the last century, desert bighorn (*Ovis canadensis*), Mexican gray wolves (*Canis lupus mexicanus*), jaguars (*Panthera onca*) grizzly *bears (Ursus horribilus*), and Gila topminnows (*Poeciliopsis occidentalis occidentalis)* have been extirpated from the RMD, while the TMD has lost desert bighorn and white-tailed deer (Odocoileus virginianus).

RMD High Country

Southeastern Arizona is largely desert and desert grassland. The tops of the scattered high mountain ranges (over 6,000 feet), including the Rincons, support forests that provide habitat for a suite of wildlife species that otherwise seem incongruous to the region. Examples include black bear, white-tailed deer, porcupine, tree squirrel, eastern cottontail, Mexican spotted owl, northern goshawk, and a host of neotropical migratory bird species. Due to their limited and disjunct habitat in the region, these species are of special management concern, particularly those federally listed as threatened or endangered, such as the Mexican spotted owl.

Riparian Areas/Corridors

Riparian areas are crucial in the desert southwest not only for the precious resources they provide and protect, but also for providing dispersal "corridors" between mountain ranges for large terrestrial vertebrates. Species that rely on these areas, particularly at the lower elevations, include all of the park's aquatic species (e.g., Sonoran mud turtle, leopard frog), and animals that must drink water on a regular basis, such as mountain lions, bobcats, coyotes, javelinas, foxes, skunks, bats, and many birds. Riparian areas in the RMD also support many sensitive species, including lowland leopard frog, canyon whiptail, many neotropical migratory bird species including gray hawk and yellow-billed cuckoo, and possibly Mexican garter snake and the endangered cactus ferruginous pygmy owl. These species are all of special management concern nationally, statewide, and/or locally, primarily due to dwindling numbers and habitat.

Water sources in the RMD that continue to contain water during drought periods (generally a few tinajas within larger drainages, but also some short reaches of Chimenea and Rincon Creeks) are crucial to wildlife, and in some cases are essential to the persistence of a species in an area. Disturbance to or loss of these resources, which can be caused by erosion from wildfires or suppression activities, could be disastrous for wildlife.

RMD Desertscrub

Wildlife in the lower elevations of the RMD is comprised of species typical of the Arizona Upland subdivision of the Sonoran Desert, including over 230 vertebrate species. Resident fauna includes such well-known and conspicuous species as mule deer, coyote, javelina, western diamondback rattlesnake, roadrunner, Gambel's quail, and many lizard and bird species, as well as rarer and more reclusive animals, such as the golden eagle, mountain lion, Sonoran desert tortoise, and Gila monster.

TMD Desertscrub

Overall, the fauna of the TMD is similar to the wildlife found in the lower elevations of the RMD. However, the TMD is lower in elevation, flatter, and sandier than the RMD, and thus contains some faunal elements associated with the Lower Colorado subdivision of the Sonoran Desert—such as kit fox, desert iguana, and sidewinder—that the RMD does not have.

Urbanization and development increasingly surround both districts. Insularization is a threat to the long-term viability of larger terrestrial vertebrate populations, TMD has already lost desert bighorn and white-tailed deer.

Wildlife – Rare and Protected Species
Wildlife – Threatened and Endangered Species

Potential impacts to threatened and endangered species are fully analyzed in a Biological Assessment of the proposed action (see Appendix 7. of the Final EIS).

Gila topminnow (Poeciliopsis occidentalis occidentalis)

The endangered Gila topminnow is a small live-bearing minnow in the family Poeciliidae. This fish historically occupied larger streams and rivers throughout the Gila River Basin, where they were found in the shallow margins of main river channels or backwaters, since they prefer quiet, warm waters with slow currents and abundant aquatic vegetation. In the past hundred years, human changes to the environment—particularly dams; the dewatering of cienegas, swamps, springs, and streams; and introductions of exotic, predatory fish and other aquatic fauna—have reduced the distribution of Gila topminnow to about 10 disjunct remnant populations (Weedman and Young 1997).

The Gila topminnow is considered extirpated in Saguaro National Park (Weedman and Young 1995). However, the one site at which they were known to occur in the past through an unofficial, undocumented stocking is recommended for potential "additional management action or restocking" (U.S. Fish and Wildlife Service (USFWS), Arizona Ecological Services Field Office, correspondence dated August 7, 1997). This site is a series of pools in the Wildhorse Drainage on the north slope of Tanque Verde Ridge in the RMD. Although these pools dry out/silt in intermittently, generally they do not all dry up at the same time. Presumably there was some thought that a (micro) meta-population could possibly be reintroduced at this site. It should be noted, however, that in 2000, after the Box Canyon wildfire and heavy summer rains, the tinajas in this drainage underwent significant siltation that dramatically reduced their water retaining capacity. Subsequently, in 2002, a drought year, every tinaja in the entire drainage dried up by mid-June (Don Swann, pers. com.). This series of events documents the important and dynamic relationship between fire, erosion, and surface water in the park, and emphasizes the need for understanding, predicting, and managing this phenomenon.

Lesser long-nosed bat (Leptonycteris curasoae yerbabuenae)

The lesser long-nosed bat is a nectar-feeding bat that migrates between its wintering grounds in the drier parts of Mexico and its breeding/summering grounds in northern Mexico, including Baja California, and southern Arizona and New Mexico in the United States (USFWS 1995a). Lesser long-nosed bat migrations coincide with the availability of the pollen and fruit of columnar cactus (cardon and saguaro) and the nectar and pollen of blooming agaves (*Agave palmeri*). In its summer range the species usually forms large maternity colonies where females give birth to their young; these maternity roosts are typically in caves or abandoned mines. These roosts are found in "lower elevations near concentrations of flowering columnar cacti" (USFWS 1995a). The bat was listed by the USFWS as federally endangered, primarily due to loss of roosting habitat and vulnerability to disturbance of maternity colonies and other roosting sites (Shull 1988).

Bat surveys in Saguaro National Park have confirmed a small colony of lesser long-nosed bats (less than five bats since 1991, when they were discovered) in the RMD (Sidner 1991, Sidner & Davis 1994). It is presumed that this species is foraging in the dense saguaro stands of the RMD early in the summer, and perhaps using agave flowers found at higher elevations in this district (3,000 to 7,000 feet) later in the year (Bowers and McLaughlin 1987). Fire management policy not to burn in desertscrub would protect saguaros; however, burning in the mid-elevation grasslands could affect agaves.

Cactus ferruginous pygmy-owl (Glaucidium brasilianum cactorum)
The cactus ferruginous pygmy-owl is a small (about 6.5 inches long), long-tailed, earless owl federally listed as endangered due to a dramatic decline in its abundance and distribution in the United States in the last 50 years (Abbate et al. 1996). Loss of habitat is suspected as the major cause of its decreased numbers (USFWS 1993). The cactus ferruginous pygmy-owl is the northernmost subspecies of the wide-ranging but tropically based ferruginous pygmy-owl (Phillips et al. 1964). Although historic accounts associated this subspecies with riparian woodlands and mesquite bosques in Arizona (Phillips et al. 1964, USFWS 1993), recent sightings of cactus ferruginous pygmy-owls in the state have generally been in the Arizona Upland subdivision of the Sonoran Desert and in the paloverde-cacti-mixed scrub series (Abbate et al. 1996). Both districts of Saguaro National Park contain potential pygmy-owl habitat—virtually all of the TMD, and the RMD below 4,000 feet, some 40,000 acres total. Currently, however, almost all of the TMD is designated critical habitat for cactus ferruginous pygmy-owls.

Unconfirmed records from the past twenty years indicate that these owls inhabit(ed) both districts of Saguaro National Park (Saguaro National Park files). From 1994 to the present, park staff, Arizona Game and Fish Department (AGFD) biologists, private contractors, and volunteers have surveyed for pygmy-owls within and nearby the park. These surveys (about 300 in the RMD and 3,000 in the TMD) have been about equally divided between inventory efforts and clearance surveys. All of these surveys followed protocols specified by the AGFD and USFWS at the time. To date there has been only one confirmed cactus ferruginous pygmy-owl detection in Saguaro resulting from these surveys; it occurred in 1995 in the RMD. Fire management policy that precludes fires in desertscrub and riparian areas should protect this species and its habitat.

American peregrine falcon (Falco peregrinus anatum)
This impressive bird was delisted from endangered status by the USFWS in August 1999; however, their numbers are still to be monitored through 2004 to ensure their recovery. This large, striking falcon is primarily a hunter of small to medium-sized birds often associated with water (e.g., waterfowl, shorebirds, swallows, etc.). Along with a proximity to water, the most important habitat characteristic needed by this species is the presence of tall cliffs (typically over 150 feet but sometimes as low as 60 feet). Within this habitat, peregrines nest on ledges, in potholes, or in small caves that are relatively inaccessible to mammalian predators and that also provide protection from weather extremes.

In Arizona, peregrine falcon breeding activity was documented at 179 locations in 1992 (Ward 1993). Within Saguaro National Park, peregrines are known to nest at four locations. Two of these eyries are on Mica Mountain, and have been occupied continuously since at least 1992 (Berner and Mannan 1992, Bailey 1993, Kline 1994, SNP unpublished data).

Mexican spotted owl (Strix occidentalis lucida)
The Mexican spotted owl is one of three spotted owl subspecies, and is listed as threatened by both the USFWS and AGFD (USFWS - 58 FR 14248, AGFD 1988). Spotted owls are large (relative to other North American owls), dark-eyed owls that lack ear tufts, and are generally brown with heavy white to beige spotting. The Mexican subspecies is disjunctly distributed from southern Mexico northward into southern Utah and central Colorado (USFWS 1995b). Mexican spotted owls occupy a variety of habitat

types ranging from dense mixed conifer forests to steep-walled, rocky canyons (USFWS 1995b). In southern Arizona they typically occur in mixed-conifer, Madrean pine-oak, and Arizona cypress forests; encinal oak woodlands; and riparian forests (USFWS 1995b). Nest sites are generally located in closed-canopy forests or steep-walled canyons. Occupied forest habitats generally contain mature old-growth stands and uneven-aged stands that are vertically complex with dense canopies (USFWS 1995b). Little published data exists concerning foraging habitat for Mexican spotted owls; however, it appears that foraging habitats generally have big logs, dense canopies, and large, densely distributed trees and snags (USFWS 1995b).

Mexican spotted owl surveys in Saguaro National Park since 1992 have documented five owl territories within the park (Berner and Mannan 1992, Bailey 1993, Kline 1994, Willey 1997, Knipps 1999, Jurgensen 2002). These territories are consistently occupied every year, though sometimes only by one bird or a non-breeding pair. Protected activity centers (PACs) have been established for each of these territories.

Reproductive chronology varies across the subspecies range, with eggs generally being laid in early April and hatching in early May, and young birds fledging in mid-June and dispersing in mid-September to early October (USFWS 1995b). In the Rincon Mountains, young owls leave their nests from mid-June through July, though they are not truly volant (able to fly) until later in July or August. They leave their home ranges in September or early October (Willey 1997, Knipps 1999).

Plants – Threatened, Endangered, and Sensitive Plants, and Plant Species of Concern

There are no plant species currently listed as threatened or endangered, nor are there candidates for threatened or endangered status. There are a number of USFWS "Species of Concern," an informal designation for species in need of concentrated conservation actions, depending on the health of the population and the type and degree of threats.

Pima Indian mallow (Abutilon parishii)
Pima Indian mallow is known from the Santa Catalina and Mazatzal Mountains (Kearney and Peebles 1960). This species is rare, occurring on rocky slopes and among boulders in steep canyons from 3,000 to 4,100 feet (Rondeau et al. 1996). About 12 individuals were found clustered on the RMD expansion parcel during a summer 1998 vegetation survey. [USFWS Species of Concern listed 1996]

Trelease agave (Agave schottii var. treleasei)
Trelease agave is known from one location on the southern Catalina Mountains at 6,500 feet (Kearney and Peebles 1960), and is potentially found in both the RMD and TMD. A similar species, Schott's agave (*Agave schottii*, also called shin dagger and amole) is widespread in both districts of the park between 3,000 and 5,600 feet (this species is not listed). [USFWS Species of Concern listed 1996]

Needle-spine pineapple cactus (Echinomastus erectocentrus var. erectocentrus)
Needle-spine pineapple cactus is generally found in Pima County up to 4,500 feet (Kearney and Peebles 1960), and is potentially found in the RMD. [USFWS Species of Concern listed 1996]

Desert night-blooming cereus (Cereus greggii var. greggii)
Desert night-blooming cereus is found on flats and in washes at TMD around 2,450 and 2,600 feet (Rondeau et al. 1996), and is difficult to locate because it grows into shrubs and resembles one of the stems of the shrub. A sub-species, *Cereus greggii* var*. transmountanus*, is found in the RMD, but is not listed. [USFWS Species of Concern listed 1996]

Pringle lipfern (Cheilanthes pringelei)

Pringle lipfern is found in the mountains of Pima County at the base of cliffs from 3,000 to 5,000 feet (Kearney and Peebles 1960) and is common but scattered in the Tucson Mountains on rhyolitic slopes, cliff faces, and under boulders (Rondeau et al. 1996). It also potentially occurs in the Rincon Mountains. [USFWS Species of Concern listed 1996]

Thornber pincushion cactus (Mammillaria thornberi)
Thornber pincushion cactus is an uncommon small cactus found from 2,200 to 2,350 feet on fine-soiled lower bajadas (Rondeau et al. 1996), and is unusual in that its clumps are actually single non-branching stems. It was found scattered on the west side bajadas of TMD during summer 1998 vegetation surveys. [Arizona Salvage Restricted]

Tumamoc globeberry (Tumamoca macdougalii)
Tumamoc globeberry is an uncommon and scattered vine in the Tucson Mountains, 2,150 to 2,600 feet, but it is easily missed because it climbs into trees and shrubs (Rondeau et al. 1996). [Arizona Salvage Restricted]

Invasive Exotics

Saguaro National Park has approximately 1,000 plant species, of which 75 are non-native. Of the non-native plant species, approximately 10 are considered invasive. Saguaro currently has a control program for buffelgrass (*Pennisetum ciliare*) and fountain grass (*Pennisetum setaceum*). Other invasive exotic plants that are of concern include red brome (*Bromus rubens*), Lehmann lovegrass (Eragrostis *Lehmanniana*), Russian thistle (*Salsola iberica*), tamarisk (*Tamarix* sp.), malta starthistle (*Centaurea melitensis*), and Saharan mustard (*Brassica tournefortii*).

Cultural Environment

Archaeological Resources

A combination of intensive and reconnaissance archaeological surveys has provided us with a good understanding of the location of archaeological sites in Saguaro National Park. The prehistoric sites include camps, villages, agricultural sites, quarries, rock art sites, and rock shelters. These resources are generally confined to fire management units where all fires are suppressed or to areas where fires are infrequent and natural. Since it has been determined that most damage to cultural resources occurs during suppression actions (Traylor, 1979), care must be taken when initiating suppression in areas containing archaeological resources.

Historic Resources

There are a number of historic structures and sites in Saguaro National Park. Manning Cabin, at 8,000 feet in the Rincon Mountains, is on the National Register of Historic Places. The Freeman Homestead and the LimeKilns, also in the RMD, are on the State Register of Historic Places. The distinctive stone masonry seen in the TMD picnic areas and along the roads in both park districts is the work of the Civilian Conservation Corps. Other historic resources include mining and ranching sites as well as historic trash deposits. All identified historic resources are located in fire management units where full protection is assured by fire management practices.

Cultural Resources and Fire Management Planning

Working with an archaeologist to understand the cultural resources identified at Saguaro National Park, park fire and cultural resource managers have developed procedures for both prescribed fire and wildland

fire, which are described in an appendix in the 1991 fire management plan. Approximately 95% of the cultural resources within the park are located in proposed FMU 2, the full suppression unit. Since most damage to cultural resources is caused by suppression activities, specific mitigation measures were developed and can be found in the above-mentioned plan or in Appendix 2 (The Cultural Resource Component of the Fire Management Plan and Cultural Resource Matrix).

For the 5% of cultural resources found within proposed FMU 1, an archaeological clearance—required for compliance with Section 106 of the National Historic Preservation Act—will be requested prior to each prescribed fire and included in the prescribed fire planning package. Reference maps will be available for the Resource Advisor assigned to wildland fire operations.

Physical Environment

Soils

Because of the region's semi-arid climate, soils are not well developed in Southern Arizona. The ground surface of most of the Rincon Mountains consists of bedrock or regolith. A thin veneer of alluvium covers pediment surfaces along the margins of the range. This alluvial fill thickens to tens of feet along larger drainages, such as Rincon Creek, and has been cut into terraces by stream entrenchment in places. Aridisols with calcium carbonate (caliche) concentrations have developed on this deeper alluvium. At the highest elevations, where the natural vegetation is coniferous forest, thin soils with distinctive soil horizons have developed.

The Tucson Mountains themselves are composed of intrusive plugs, flow and welded tufts, and sedimentary rocks; the lower slopes of the mountains are covered by terrace deposits or other alluvium, sometimes up to 400 feet thick (NPS 1995). The soils of TMD mountain slopes are shallow, coarsely textured and well-drained, and soils of the *bajadas* are alluvial (NPS 1995). Soils become progressively finer with more sand and clay from bedrock to bajada to flats. Granite weathers rapidly into gruss forming "plant friendly" soils.

Hydrology

Watersheds in Saguaro National Park are generally small with first, second, and third order drainages (Mott 1997). In the TMD, these drainages are strictly ephemeral, flowing primarily in response to summer "monsoon" storm events that bring brief but substantial precipitation. Unlike the summer storms that commonly lead to flash flooding, winter precipitation tends to be gentler and longer in duration; this rainfall better infiltrates the soil with minimal surface flow. This district receives about 11.8 inches of precipitation annually, fairly equally divided between winter and summer. No perennial water or wetlands are present in the district, although a few small natural intermittent seeps occur near King Canyon. Additionally, 3 windmills provide supplemental water for wildlife, drawing water from wells into man-made catchments. Two of these are maintained to mitigate the loss of wildlife access to water sources along Brawley Wash, which was isolated from the TMD by the Central Arizona Project canal. The third windmill was originally built for watering stock on the east side of the Tucson Mountains.

The RMD has much higher elevation watersheds than the TMD, reaching over 8,000 feet compared to the TMD, whose highest peak is 4,700 feet. This difference means that larger amounts of precipitation are collected at the RMD. Annual rainfall in the lower elevations averages 11 inches, like the TMD, but annual precipitation near Mica Mountain can exceed 30 inches, and the snow pack can be heavy in the winter months. In average years, snowmelt in winter and spring leads to the majority of the annual surface flow. Summer conditions are similar to the TMD, where surface flow occurs exclusively after large storm events. Streams are perennially interrupted, intermittent or ephemeral, but pools of water often remain

year round. Several springs and seeps occur throughout the upper elevations.

Air Quality

By virtue of its 1976 wilderness designation, Saguaro National Park is officially designated a Class I airshed under the Clean Air Act Amendments of 1977. This most stringent air quality classification is aimed at protecting national parks and wilderness areas from air quality degradation. The goal of preventing deterioration of air quality in this area, however, faces the practical considerations that result from adjoining the Tucson metropolitan area, which significantly impacts air quality throughout the Tucson Basin. Smoke resulting from wildland and prescribed fires will be managed to comply with all local, state, and federal air quality regulations. Prescribed burns and wildland fire use for resource benefit fires proceed only after obtaining a permit from the Arizona Department of Environmental Quality (ADEQ). The park controls smoke emissions and direction during prescribed fires through ignition patterns; wildland fires are suppressed if smoke impacts would be adverse to local human populations. Due to the location of proposed FMU 1, smoke from this unit would generally move away from the Tucson Basin. However, proposed FMU 2's proximity to the city means smoke from some areas could settle in Tucson before firefighters can fully suppress the fire.

Wilderness

Most of the land base in Saguaro National Park has been formally designated as wilderness in accordance with the provisions of the Wilderness Act. There are 13,470 acres of wilderness in the TMD and 57,930 acres in the RMD (Map III-3&4).

Social Environment

Visitor Use

Visitor use in the two districts of the park exceeds 3 million visitors per year. 2.2 million of these visitors are commuters using Picture Rocks Road to get to and from Tucson; the rest are recreational visitors. Two-thirds of the recreational visitors arrive during the cooler months of October through April. Use of the park is primarily front-country, including traveling on scenic roads and using picnic areas and trails. Major user groups are from the Tucson Basin and include senior citizens (seasonal residents), athletically inclined recreationists, and family groups. Jogging, bicycling, horseback riding, and hiking are popular activities, particularly among local visitors. Local recreationists, foreign visitors, and vacationing families are typical of the summer visitors to Saguaro.

Two picnic sites are located in the RMD and five in the TMD. These sites are usually filled to capacity during winter and spring weekends. There are approximately 43 miles of trails in the TMD and 125 miles in the RMD. In 2002, 1,424 camper nights were recorded for six backcountry campgrounds in the RMD (Douglas Spring, Juniper Basin, Grass Shack, Manning Camp, Happy Valley, and Spud Rock).

Socioeconomics

The affected environment includes Pima and Cochise Counties. The main access roads—Old Spanish Trail for the RMD and Picture Rocks Road and Kinney Road for the TMD—are located in Pima County. Tucson is the largest community in the area; others are listed in the next section. Travel, lodging, and retail sales expenditures in the two counties are not likely Saguaro-related, as the park is not the dominant tourist destination in the area.

Local Communities

Saguaro National Park is located in eastern Pima County, Arizona, and is composed of two disjunct districts separated by the Tucson metropolitan area. The TMD encompasses 24,033 acres extending west into Avra Valley from the Tucson Mountains, whereas the RMD occupies 67,294 acres on the eastern edge of Tucson, including most of the Rincon Mountains. The affected environment is the Tucson metropolitan area including Marana, Avra Valley, South Tucson, and Vail in Pima County, and Benson, Pomerene, and Cascabel in Cochise County.

Environmental Justice

Demographics for the Tucson area are shown below.

Income Statistic	**Income**
Personal Income, 2001 Projection	$22.639 billion
Per Capita Income	$25,445
Median Family Income, 1999	$41,079
Median Household Income, FY2000	$45,100
Average Annual Pay in Pima County, 1998	$26,773
Annual Earnings per Worker, 2001 Projection	$30,239

Ethnicity	**Percent**
White, non-Hispanic	62.7%
Hispanic	29.6%
Black	3.1%
Native American	2.5%
Asian or Pacific Islander	2.1%
Other	.01%

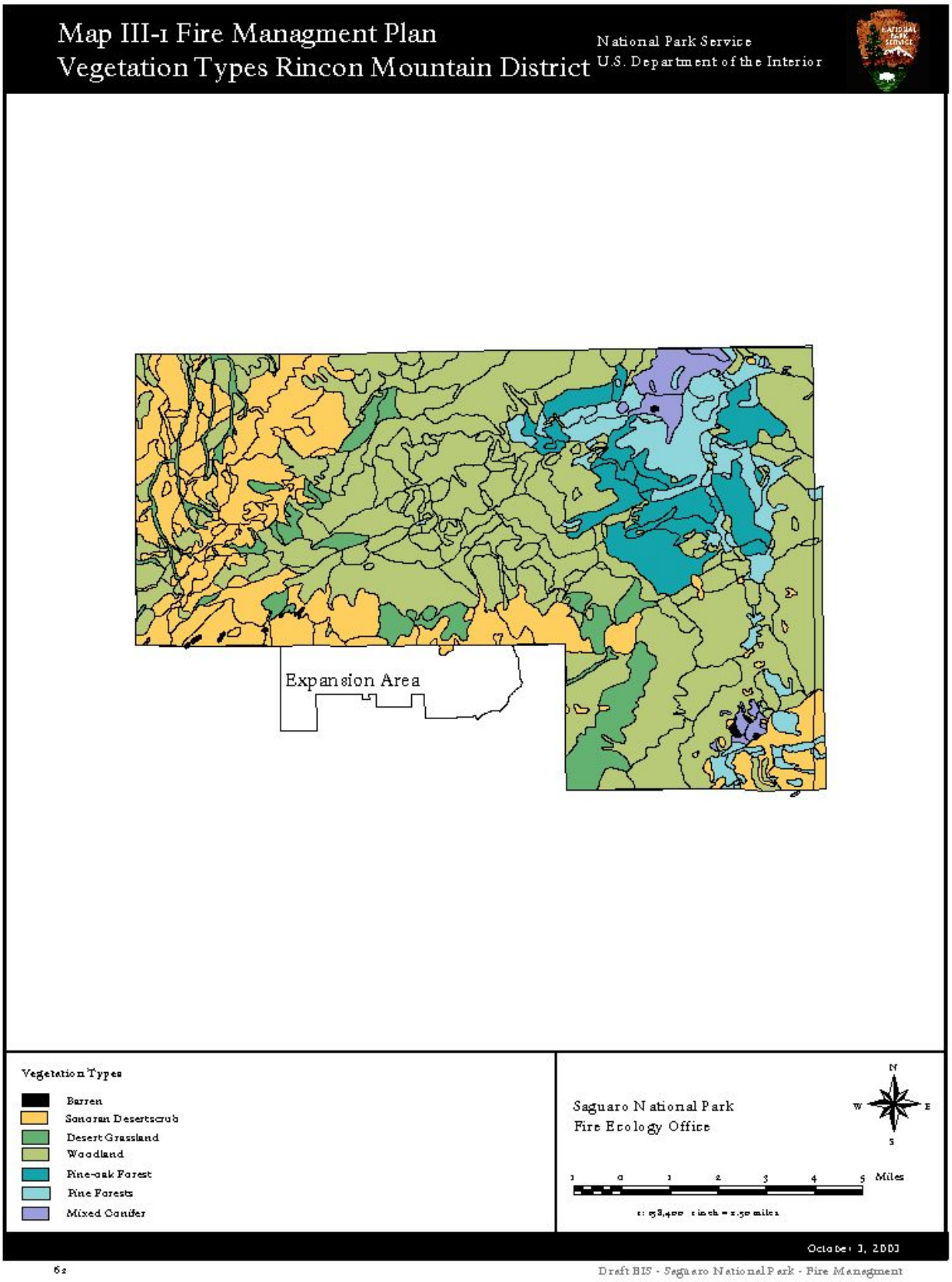
Metro Employment by Sector (2001 forecast)	**Total #**	**%**
Manufacturing	39,100	10%
Mining	1,900	.5%
Construction	22,600	6%
Transportation, Communications, Public Utilities	14,500	4%
Trade	78,100	21%
F.I.R.E.	15,100	4%
Services	123,700	33%
Government	77,500	21%

Year	**Population**
1995	758,585
1999	842,289
2000	861,383
2005	952,636
2010	1,047,607

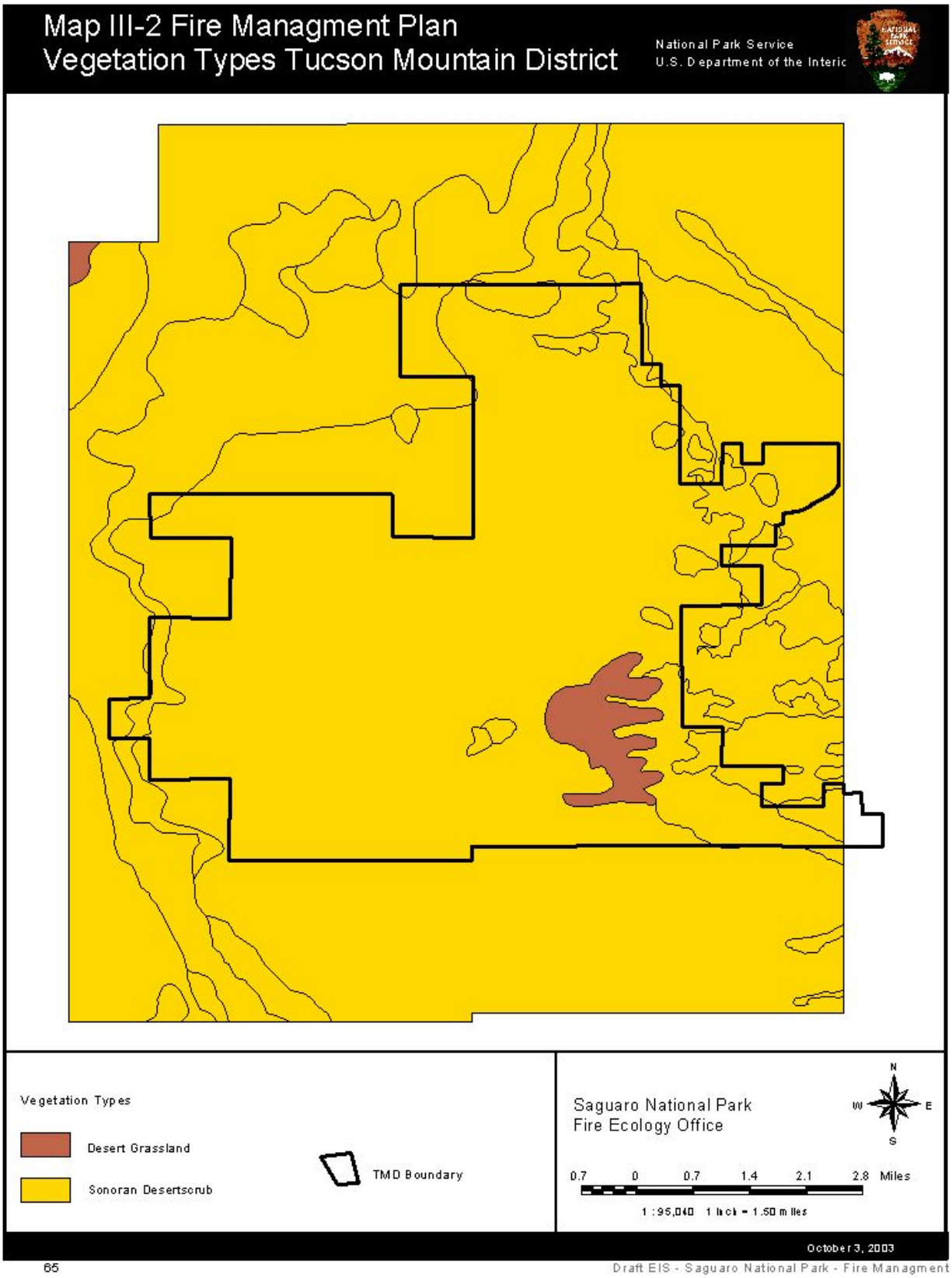
Life and Property

Fire is a threat to the public, firefighters, park staff, and developed areas, but fire is also an effective tool for reducing hazardous fuels. Threats to life and property from fire peak in the late spring and early summer pre-monsoon summer months. Impacts are immediate when there is a fire; threats exist during

fires and persist through high fire danger seasons. Fires of similar size and intensity in different locations pose very different threats to life and property. Developed areas exist at lower elevations where historically fire has not played a major role. Fires in the lower elevations of Sonoran desertscrub are infrequent and short-lived as sufficient fuels do not exist at this time to carry a fire (this could change due to increased chance of exotic grasses moving in and creating a greater fuel load).


Map III-1 Fire Managment Plan
Vegetation Types Rincon Mountain District
National Park Service
U.S. Department of the Interior
Expansion Area
Vegetation Types
Barren
Sonoran Desertscrub
Desert Grassland
Woodland
Pine-oak Forest
Pine Forests
Mixed Conifer
Saguaro National Park
Fire Ecology Office
N
W
E
S
0 1 2 3 4 5 Miles
October 1, 2003
62
Draft EIS - Saguaro National Park - Fire Management

Map III-1


Map III-2 Fire Managment Plan
Vegetation Types Tucson Mountain District
National Park Service
U.S. Department of the Interic
Vegetation Types
Desert Grassland
Sonoran Desertscrub
TMD Boundary
Saguaro National Park
Fire Ecology Office
N
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E
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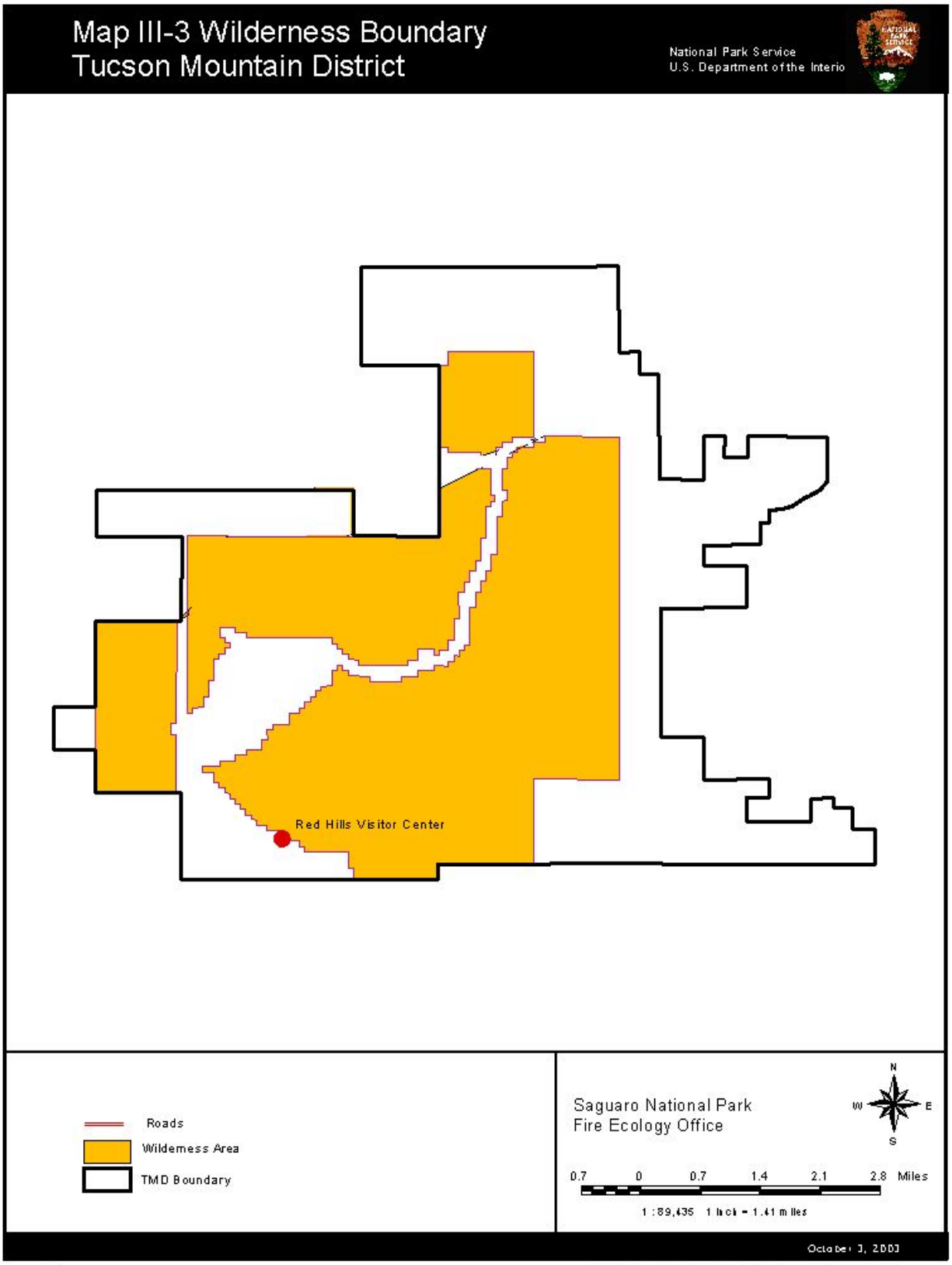
0.7 0 0.7 1.4 2.1 2.8 Miles
1 :95,040 1 Inch = 1.50 miles
October 3, 2003
65
Draft EIS - Saguaro National Park - Fire Managment

Map III-2


Map III-3 Wilderness Boundary
Tucson Mountain District
National Park Service
U.S. Department of the Interio
Red Hills Visitor Center
Roads
Wilderness Area
TMD Boundary
Saguaro National Park
Fire Ecology Office
N
W
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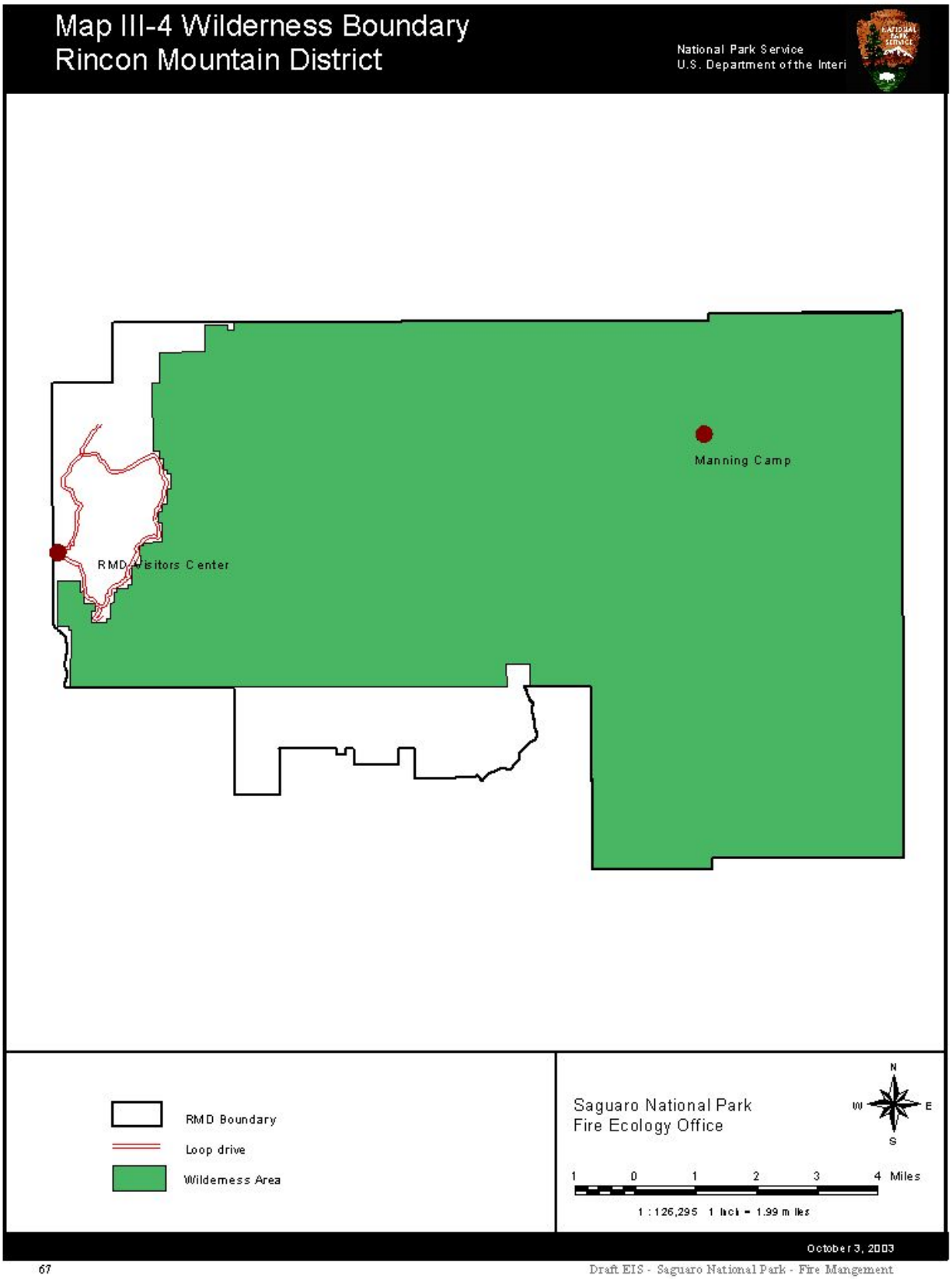
S
0.7 0 0.7 1.4 2.1 2.8 Miles
1 : 89,435 1 Inch = 1.41 miles
October 1, 2003
66
Draft EIS - Saguaro National Park - Fire Managment

Map III-3


Map III-4 Wilderness Boundary
Rincon Mountain District
National Park Service
U.S. Department of the Interi
Manning Camp
RMD Visitors Center
RMD Boundary
Loop drive
Wilderness Area
Saguaro National Park
Fire Ecology Office
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W
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1 0 1 2 3 4 Miles
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October 3, 2003
67
Draft EIS - Saguaro National Park - Fire Mangement

Map III-4

Section IV: Environmental Consequences

Methodology

In analyzing the environmental consequences of the alternatives proposed in the *Saguaro Fire Management Plan/Environmental Impact Statement* (EIS), three factors are looked at for each resource: type of impact, duration of impact, and intensity of impact. After the environmental consequences of each alternative are examined for separate topics, the impact of implementing the alternative is considered along with the impacts of other relevant actions in the area. This is the cumulative impact analysis (explained below). Whether or not an impact will cause impairment is also included for each resource (also explained below).

The type of impact describes a relative measure of beneficial or adverse effects on biological or physical systems, cultural resources, or the social environment. For example, adverse impacts on ecosystems might be those that would degrade the size, integrity, or connectivity of a specific habitat. Conversely, beneficial impacts would enhance ecosystem processes, native species richness, or native habitat quantity or quality.

Because impacts could have short-term adverse effects while having long-term beneficial impacts, it is important to look at the duration of the effect of an impact. Effects from fire management activities described within this document are likely to occur within nested long- and short-term time scales. For example, on a small scale, after a fire some burned areas are likely to begin to resemble pre-fire conditions within one or two growing seasons, while, on a landscape scale, the benefits from a change in forest condition and restoration of the fire regime may take years.

Examining the type and duration of an impact is not enough because impacts are of varying intensities from small and imperceptible to large and substantial. An impact could have little effect or it could cover a large area or a large portion of a population, be highly noticeable, or even be irreversible. Measures of intensity consider whether an impact would be negligible, minor, moderate, major, or in some cases irreversible. These designations are used to describe both beneficial and adverse impacts.

A cumulative impact is described in the Council on Environmental Quality regulations (1508.7) as: “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions.” Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Cumulative actions considered in this analysis include the development of a new general management plan for Saguaro National Park, fire activities that may be conducted by state and other federal agencies, past fire suppression, grazing and logging, and local development/construction.

This document also evaluates whether resources might suffer impairment. Impairment is not a National Environmental Policy Act (NEPA) issue, but instead relates to the National Park Service Organic Act (1916). Impairment that is prohibited by the Organic Act is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. Nonetheless, an impact is less likely to constitute impairment if it is an unavoidable result of an action necessary to preserve or restore the integrity of park resources or values.
According to National Park Service policy, “An impact would be more likely to constitute an impairment to the extent that it affects a resource or a value whose conservation is: a) Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park; b) Key to the natural or

cultural integrity of the park or to opportunities for enjoyment of the park; or c) Identified as a goal in the park's general management plan or other relevant National Park Service planning documents." (*National Park Service Management Policies*, Part 1.4.5, 2001). Impairment determinations will be given in the conclusion for each alternative under the appropriate impact topic section.

Mitigation measures common to all alternatives for impacts were discussed in Section 2. If a mitigation measure is unique to an alternative for an impact discussed below, it will be mentioned in this section.

Impact Topics Analyzed in this Environmental Analysis

Vegetation

The direct effects of fire on vegetation result from combustion of plant material and litter and from the immediate effects of heat on plants and soil. Grasses and forbs generally recover quickly from fire by either resprouting or establishing new seedlings, and because they grow rapidly and often reach reproductive maturity within one season. Woody plants that can resprout also tend to survive fires. Fire generally reduces non-sprouting woody plant numbers, since their regenerative capabilities are limited to establishment by seed.

The impacts of the alternatives on park vegetation were analyzed by looking at the structure and composition of the vegetation, and at fuels.

Type of Impact

- Adverse: Moves the system outside of or away from the natural range of variability for vegetation (structure, composition, and fuels).
- Beneficial: Moves the system inside of or toward the natural range of variability for vegetation (structure, composition, and fuels).

Duration of Impact

- Short-term: Can be reversed within one or two fire return intervals.
- Long-term: Requires three or more fire return intervals to reverse effects, or plant community is predicted to stay the same or improve in the long run.
- Irreversible: Fire alone will not be able to reverse the effects.

Intensity of Impact

- Negligible: Imperceptible or undetectable effects upon vegetation communities.
- Minor: Slightly perceptible and localized effects upon vegetation communities.
- Moderate: Apparent change in plant community structure, composition, or fuels that would result in a change in the role of fire on a small scale.
- Major: Substantial change in plant community structure, composition, or fuels that represents a change in the role of fire, ecological function, vegetation type, or fire return interval on a landscape scale.

Fire Ecology of the Park's Vegetation Types

Within Saguaro National Park, there are six distinct vegetation types used for fire planning: Sonoran desertscrub, desert grassland, Woodland, pine-oak forest, ponderosa pine forest, and mixed-conifer forest. All six types are represented in the Rincon Mountain District, whereas only Sonoran desertscrub and desert grassland are represented in the Tucson Mountain District. At least four of these vegetation types—Woodland, pine-oak forest, ponderosa pine forest, and mixed-conifer forest—require the influence of fire to maintain their natural character. The role of fire in desertscrub and desert grassland is not completely understood, although fire occasionally occurs in these vegetation types.

Sonoran Desertscrub. Plants in this vegetation type have not evolved with fire and fire effects have been detrimental to some of the cactus species found here. Fuel loads and vegetation structure and composition are close to or within their natural range of variability. However, with increasing numbers of non-native plants adding to the flammability of this vegetation type, it could be argued that fuel loads are no longer within their natural range of variability. Fire is not the cause of this effect, yet fire behavior and fire effects may not track the historical norms and the potential for non-native plant establishment could increase post-fire.

Desert Grassland. Fire regimes in desert grasslands have been altered considerably since the late 1800's, with fires becoming less frequent due to suppression (Bahre 1991). However, little is known about the extent, composition, or ecology of this vegetation type in Saguaro National Park. It appears as though there is little desert grassland left, which could be due to lack of fire resulting in woody plant encroachment, or perhaps historically there was little of this vegetation type in the park. Either way, fire has historically been common in most desert grasslands and several lines of indirect evidence suggest that fires occurred at least every 10 years (McPherson 1995).

In general, desert grassland's response to fire (primarily which species come back after fires) depends much more on the season and frequency of the fires than on fire behavior. Non-native species have been known to invade desert grasslands following prescribed and wildland fires at lower elevations in southeastern Arizona. In areas with, or in proximity to, Lehmanns lovegrass (the most common of the introduced non-native desert grassland species), there is evidence that a positive feedback pattern of lovegrass→fire→ increased lovegrass→increased fire may develop (McPherson 1995).

Woodland. Tree species in this vegetation type are difficult to analyze for fire scars. Historic data on fire frequency has been gathered from the park's fire atlas as well as historic records in other similar areas of the Southwest. Woodland shows a departure from the normal fire return interval, evidenced by the increase in woody species and subsequent decrease in herbaceous species. The presence of Arizona white oak and Emory oak is indicative of no recent fire history (Carmichael et al. 1978); both of these species are prominent in Woodlands in the Rincon Mountains. There should be grassland areas intermingled throughout this vegetation type; a fire return interval of every 10 to 30 years can control invasion of grassland by the Woodland species. Other evidence shows that prior to 1900, widespread fires in Woodland occurred every 8 years, on average, and fire return intervals as short as 2 years have been recorded (Swetnam and Baisan 1996).

Pine-Oak Forest. Studies conducted by Fulé (1998) on pine-oak forests in northern Mexico concluded that without fire suppression these forests had become more open and uniform. They had fewer small sprouting tree species and more older pine species. This suggests that at one time, they may have better represented pine forests, but through fire exclusion, they have now become more pine-oak intermixed like what we see in the Rincons. Fulé also concluded that the mean fire return interval was 5.1 to 6.6 years. This is comparable to the fire return interval of every 5 to 7 years for the ponderosa pine forests in the Rincon Mountains. This study is relevant to Saguaro National Park because of the similarity in vegetation, climate, and physical attributes of the mountains in northern Mexico to the sky islands of southeastern Arizona. Thus, this vegetation type should be a more open pine forest with an understory of fewer oak species. Pine-oak forest in Saguaro shows a departure from the normal fire return interval. This indicates that stand structure, composition, and fuel loads are not within their natural range of variability, and the potential for catastrophic fire is increasing. In 1994, prior to an active prescribed fire program, Saguaro experienced the largest wildfire in its history. Parts of this fire burned moderately to severely through pine-oak forest stands. Seven years later these areas are thick with sprouting oak species and juniper seedlings, and very few large conifers exist.

Ponderosa Pine Forest. Fire history studies show a fire return interval of every 5 to 7 years for the ponderosa pine forests in the Rincon Mountains (Baisan 1990). However, analysis of fire history scars and the Saguaro National Park fire atlas reveals that these forests show a departure from the normal fire return interval. This indicates that most of these stands are not within their normal range of variability for stand structure, composition, and fuel loads. Most of the work with prescribed fire in Saguaro has been focused on these stands. During the past 10 years, almost all ponderosa pine stands have been burned in the park; some areas are on their second-entry burn. However, prior to this effort, several fire intervals were missed. Thus, it will take more than one or two burns to bring the forests back to a more natural, pre-suppression, structure and composition state.

Mixed-conifer Forest. Analysis of fire history scars and the Saguaro National Park fire atlas, as well as vegetation characteristics (e.g., tree density, fuel loads, insects, and disease), reveal that the park's mixed-conifer forests show a departure from the normal fire return interval. This indicates that most of these stands are not in their normal range of variability for stand structure, composition, and fuel loads. Dead and down fuel loading in excess of the 44 tons per acre reported as average for natural loading by Sackett (1979) were found in proposed Fire Management Unit 2 (Saguaro National Park fire effects data [SNPFED] 2002). An increase in insect and disease occurrence has also been observed and recorded. Past fire suppression activities have contributed to this condition, an indication that natural fire must be allowed to return and function in its role of reducing fuels and maintaining diversity in plant communities.

The mixed-conifer associations in the southern Rocky Mountains were most probably established after fire (Moir and Ludwig 1979). The natural succession from oaks to conifers is very slow: it takes 50 to 100 years before conifers dominate. Natural fires were probably light, erratic, and infrequent, but stand-replacing crown fires occurred during exceptionally dry years (Moir and Ludwig 1979). The historic fire return interval recorded in the mixed-conifer timber of the park's North Slope was 9.86 years with a range of 3 to 19 years (Baisan 1990). However, some mixed conifer stands in the Rincon Mountains have not experienced fire in over 70 years as evidenced by the fire history atlas.

Potential Effects of Related Fire Management Actions on Vegetation

Related fire management actions include water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up (see Glossary for definitions). The effects of these actions would be expected to be the same for all vegetation types, so they were grouped for this analysis to avoid redundancy (i.e., there will not be a separate section for each vegetation type, rather there will be a summary for each alternative). Hand line, helispots, spike camps, and mop up would disturb surface vegetation and soils, potentially opening micro-sites for invasion by non-native species. Snagging and hand thinning could lead to unnaturally high concentrations of fuels. The effects of these activities would generally be local, and would rarely have landscape-scale implications. Water and retardant drops release liquids onto burning or unburned areas. Vegetation can be physically damaged from the impact of the liquid, but the areas tend to be small and the effects relatively local. Most fire retardant contains fertilizer-type compounds, including ammonia, nitrogen, and phosphorous, that can affect native vegetation, especially in areas low in nitrate/ammonia-type nutrients. Added nutrients can lead to a decrease in growth of native vegetation and a proportionate increase in the establishment of non-native species that favor higher nutrient levels. However, the chemical components of retardant remain for only a few months at most, and long-term, chemical alteration of the soil would not occur.

Alternative C – No Action Alternative

Potential Impacts on Vegetation from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Sonoran Desertscrub. Catastrophic fire would adversely affect this non-fire-adapted vegetation type. The No Action Alternative would not call for immediate suppression in the upper elevations of Sonoran desertscrub in the Rincon Mountain District. Thus, it would not decrease the chance of catastrophic fire in this type and impacts would be adverse, long term, and minor to moderate.

Desert Grassland. Catastrophic fire in desert grassland could result in a conversion to non-native species depending on what season the fire occurred in. The No Action Alternative would allow wildland fire use for resource benefit as well as prescribed fire in the park's desert grasslands, and would have varying effects on the chance of catastrophic fire depending on the seasonality. Impacts would be beneficial or adverse, depending on whether a site is invaded by exotic species; short term or irreversible, again depending on potential invasion by exotics; and minor to major.

Woodland. The No Action Alternative would allow prescribed fire and wildland fire use for resource benefit in Woodland, which would decrease the chances of catastrophic fire by reducing fuel loads. Impacts would be beneficial, long term, and minor to moderate.

Pine-Oak Forest. The No Action Alternative would allow prescribed fire and wildland fire use for resource benefit in pine-oak forest. The chance of catastrophic fire would decrease as fuel loads are reduced, and impacts would be beneficial, long term, and minor to moderate.

Ponderosa Pine Forest. The No Action Alternative would allow prescribed fire and wildland fire use for resource benefit in ponderosa pine forest. The chance of catastrophic fire would continue to decrease as fuel loads are reduced, and impacts would be beneficial, long term, and negligible to minor.

Mixed-conifer Forest. This alternative would allow prescribed fire and wildland fire use for resource benefit in mixed-conifer forest; however, under the No Action Alternative, the park would continue to be very constrained in burning in the Mexican Spotted Owl protected activity centers found in the mixed-conifer forests and surrounding areas (the protected activity centers make up an area of 600 acres around an established nesting site). This would provide some short-term protection for the owls by eliminating fire from their immediate activity centers, but would greatly increase the chance of catastrophic fire in the long term since fuel loads would continue to accumulate. Impacts would be adverse, long term, and major to irreversible.

Related Fire Management Actions

Under the No Action Alternative, the effects of helispots, hand line, spike camps, hand thinning, snagging, and mop up would all be mitigated through avoidance and/or rehabilitation measures, as they would under the other alternatives. Impacts from water and fire retardant drops in high-elevation, low-nitrogen areas would be mitigated if needed by avoiding use of retardant or by using "clear" retardant that minimizes active nutrients within the mix. Physical damage to vegetation from drops can be avoided by requesting that pilots fly aircraft quickly enough to dissipate the water and retardant over larger, more linear areas. Overall, the impacts of these related fire management actions on vegetation under the No Action Alternative would be adverse, short term, and minor.

Wildland Fire Use for Resource Benefit

Sonoran Desertscrub. The No Action Alternative would allow wildland fire use for resource benefit in the higher elevations of Sonoran desertscrub in the Rincon Mountain District. The impacts in these non-fire-adapted areas would be adverse, long term or irreversible, and major.

Desert Grassland. The No Action Alternative would allow wildland fire use for resource benefit in desert grassland. Until the park learns more about the extent and effects of fire for this vegetation type, the potential for adverse, short to long-term, and minor to major impacts from this treatment will exist due to the potential for invasion of non-native species. However, the potential for beneficial impacts also exists by reducing woody species encroachment into these grasslands. These beneficial impacts would be long-term and moderate.

Woodland. The No Action Alternative would allow wildland fire use for resource benefit in Woodland, which would reduce fuel loads and open up the canopy to allow for an increase in herbaceous species. However, without an updated site-specific fire implementation plan, the chance of adverse, long-term and moderate impacts on this vegetation type would exist.

Pine-Oak Forest. The No Action Alternative would allow wildland fire for resource benefit in pine-oak forest, which would reduce the fuel load and thin the stands to allow more understory vegetation to grow. Impacts would be beneficial, long-term and minor to moderate. However, without an updated site-specific fire implementation plan, the chance of adverse, long-term and moderate impacts on this vegetation type would exist.

Ponderosa Pine Forest. The No Action Alternative would allow wildland fire for resource benefit in ponderosa pine forest, and would therefore continue to decrease fuel loads, thin stands, and allow for more understory vegetation to grow. Impacts would be beneficial, long-term and minor to moderate. However, without an updated site-specific fire implementation plan, the chance of adverse, long-term and minor to moderate impacts on this vegetation type would exist.

Mixed-conifer Forest. The No Action Alternative would allow wildland fire for resource benefit in some mixed-conifer forest, which would decrease fuel loads, thin stands, and allow for more understory vegetation to grow. However, under this alternative the park would continue to be very constrained in burning in the Mexican Spotted Owl protected activity centers found in the mixed-conifer forests and surrounding areas. This would provide some short-term protection for the owls by eliminating fire from the immediate activity center, but would greatly increase the chance of catastrophic fire in the long term since fuel loads would continue to accumulate. In addition, without a site-specific fire implementation plan, the chance of adverse impacts on mixed-conifer forest would exist. Overall, impacts would be adverse, long term to irreversible, and major.

Prescribed Fire

Sonoran Desertscrub. The No Action Alternative would allow prescribed fire in the higher elevations of Sonoran desertscrub in the Rincon Mountain District for the purpose of restoring historic plant communities. However, since fire is not and has not been a major force in forming these communities, and since most of the plants found here are not adapted to fire, the impacts of applying fire to these areas would be adverse, long term and major to irreversible.

Desert Grassland. The No Action Alternative would allow prescribed fire in desert grassland at any elevation for the purpose of restoring historic plant communities. By reducing woody species encroachment, impacts could be beneficial, long-term and minor to moderate. However, until the park learns more about the extent and effects of fire for this vegetation type (i.e., potential invasion of exotic species and extent of grassland in the Park) the potential for adverse, long-term, and minor to major impacts from prescribed fire will exist.

Woodland. The No Action Alternative would allow prescribed fire in Woodland, which would reduce fuel loads and open up the canopy to allow for an increase in herbaceous species, as seen in the park's fire effects plots (SNPFED 2002). Impacts would be beneficial, long term, and negligible to moderate.

Pine-Oak Forest. The No Action Alternative would allow prescribed fire in pine-oak forest, which would reduce the forest's fuel load and thin the stands to allow more understory vegetation to grow, as seen in the park's fire effects plots (SNPFED 2002). Impacts would be beneficial, long term, and negligible to moderate.

Ponderosa Pine Forest. The No Action Alternative would allow prescribed fire in ponderosa pine forest, and therefore would continue to decrease fuel loads, thin stands, and allow for more understory vegetation to grow, as seen in the park's fire effects plots (SNPFED 2002). Impacts would be beneficial, long term, and negligible to moderate.

Mixed-conifer Forest. The No Action Alternative would allow prescribed fire in most of this vegetation type. Impacts of using prescribed fire in these areas would be beneficial, long term, and minor to moderate. However, under the No Action Alternative, the park would continue to be very constrained in burning in the Mexican Spotted Owl protected activity centers found in the mixed-conifer forests and surrounding areas. This would provide some short-term protection for the owls eliminating the direct effects of fire, but would greatly increase the chance of catastrophic fire in the long term since fuel loads would continue to accumulate. Impacts in this case would be adverse, long-term and moderate to major.

Cumulative Impacts

A number of foreseeable projects/management actions that could affect vegetation at Saguaro National Park are currently being addressed in the park's general management plan (GMP) update (draft expected in 2005). Specific management issues included in the GMP that would potentially impact vegetation are: wilderness management, the park's packing operation, backcountry trails and campsite planning, and Manning Camp. These present and reasonably foreseeable future actions would contribute to reversing the adverse impacts of past actions in the park.
Past suppression activities have contributed to the accumulation of fuels and has altered plant community composition and structure.

The continuing growth of Tucson and ongoing efforts by the Tucson Chamber of Commerce to promote visitation to the Tucson area will ultimately result in increased impacts on the park's vegetation and other natural and cultural resources. These impacts will primarily result from increased permitted visitor use at frontcountry interpreted sites and trails in the form of illegal, off-trail use by hikers, bikers, and/or horseback riders, although impacts in backcountry locations will likely increase as well. Off-trail use can cause vegetation damage ranging from trampling to breaking off parts of plants. Continued growth in Tucson is also likely to result in significant development of private lands near the park boundaries, which will probably cause increased unpermitted visitation to backcountry areas within the park, and lead to more off-trail use.

Within the Tucson area generally, construction of new roads, housing subdivisions, and other developments will continue to cause destruction of vegetation. As the population of Tucson grows, recreational impacts on federal and state lands and resources will continue to increase, resulting in additional degradation of vegetation. As vegetation is degraded and destroyed outside the park, the relative rarity and importance of the protected vegetation within the park will increase.

Overall, the impacts of these projects on vegetation would be beneficial or adverse, short term or long term, and minor to moderate. In combination with the impacts of the No Action Alternative, these effects would have no effect on these impacts with the exception of reducing fuel loads. Thus, result would be beneficial, long-term, and minor to moderate.

Conclusion

Fire management activities under the No Action Alternative would affect vegetation in generally beneficial ways, through actions that would maintain and restore plant communities. The No Action Alternative would allow fire managers to continue working toward the resource management goal of restoring fire in an ecologically appropriate manner through the use of prescribed fire, wildland fire for resource benefit, and appropriate suppression response. Continuing an active managed wildland fire program would keep fuel loading down, which would reduce the risk of catastrophic fire. Protection of non-fire-adapted species would continue in the suppression units. The impacts of these actions would generally be beneficial, long term, and minor to moderate.

However, continued use of fire in the Sonoran desertscrub and desert grasslands would have the potential for adverse impacts and may not be ecologically appropriate. Also, without a current, site-specific fire implementation plan, resources would be at a higher risk for adverse impacts. Finally, this alternative would continue to be very restrictive with regard to burning in or near sensitive species habitat, and continued fire suppression in these areas would likely have adverse impacts in the long run. Overall, the impacts of the No Action Alternative on vegetation have the potential to be adverse, long term, and minor to major. The No Action Alternative would not produce any impairment of vegetation whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Alternative D – Prescribed Fire and Non-Fire Treatments

Potential Impacts on Vegetation from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Sonoran Desertscrub. Alternative D would neither increase nor decrease the chance of catastrophic fire in Sonoran desertscrub, as full suppression (no fire) is mandated for this non-fire-adapted vegetation type. Thus, impacts would be beneficial, long term, and negligible.

Desert Grassland. Catastrophic fire in desert grassland could result in a conversion to non-native species depending on what season the fire occurred in. Alternative D would not allow fire of any type in desert grassland. Thus, this alternative would not decrease or increase the risk of catastrophic fire. Impacts would be beneficial, long term, and negligible. However, without the use of fire, grasslands could be invaded by woody species, which could result in the loss of this type. Thus, impacts could be adverse, long-term and major to irreversible.

Woodland. Alternative D would allow prescribed fire and non-fire treatments in Woodland. The small annual average number of acres treated with prescribed fire or non-fire treatments would allow the potential for catastrophic fire to increase in the many untreated areas. Impacts for untreated areas would be adverse, long term, and moderate to major and in treated areas impacts would be beneficial, long-term and moderate.

Pine-Oak Forest. Alternative D would allow prescribed fire and non-fire treatments in pine-oak forest. However, the effects of not allowing wildland fire for resource benefit, coupled with the inability of the staff to treat large areas with prescribed or non-fire treatments in ecologically appropriate frequencies, essentially would not reduce the chance of catastrophic fire. Impacts in untreated areas would be adverse,

long term, and moderate to major. Impacts in the treatment areas would be beneficial, long-term and moderate.

Ponderosa Pine Forest. Alternative D would allow prescribed fire and non-fire treatments in ponderosa pine forest. The small annual average number of acres treated with prescribed and non-fire treatments would not reduce the chance of catastrophic fire in a timely manner. Impacts would be adverse, long term, and moderate to major in untreated areas and beneficial, long-term and moderate in treated areas.

Mixed-conifer Forest. This alternative would allow prescribed fire and non-fire treatments in mixed-conifer forest. If treatment units could be treated frequently enough to reduce fuel loads, impacts would be beneficial, long term, and minor. However, this is not feasible since the mountains in their entirety (excluding the Sonoran Desert areas) need treatments of varying intensity and frequency, and park staff cannot meet this need. Without the advantage of wildland fire use for resource benefit, the risk of catastrophic fire would increase. Therefore, impacts would be adverse, long term, and moderate to major.

Related Fire Management Actions

The effects of helispots, hand line, spike camps, hand thinning, snagging, and mop up would all be mitigated through avoidance and/or rehabilitation measures under Alternative D, as they would under the other alternatives. Impacts from water and fire retardant drops in high-elevation, low-nitrogen areas would be mitigated if needed by avoiding use of retardant or by using "clear" retardant that minimizes active nutrients within the mix. Physical damage to vegetation from drops can be avoided by requesting that pilots fly aircraft quickly enough to dissipate the water and retardant over larger, more linear areas. There would be more of these types of activities under Alternative D than the other alternatives due to the increase in suppression activities. However, overall, the impacts of related fire management actions on vegetation would be the same under Alternative D as Alternatives C and E—adverse, short term, and minor.

Wildland Fire Use for Resource Benefit

Wildland fire use for resource benefit would not be used under Alternative D.

Prescribed Fire

Sonoran Desertscrub. Prescribed fire would not be used in this non-fire-adapted vegetation type under Alternative D.

Desert Grassland. Prescribed fire would not be used in desert grassland under Alternative D.

Woodland. Alternative D would allow prescribed fire in Woodland, which would reduce fuel loads and open up the canopy to allow for an increase in herbaceous species, as seen in the park's fire effects plots (SNPFED 2002). Impacts would be beneficial, long term, and negligible to moderate in treatment areas.

Pine-Oak Forest. Alternative D would allow prescribed fire in pine-oak forest. Prescribed fire would reduce the fuel load and thin the stands to allow more understory vegetation to grow, as seen in the park's fire effects plots (SNPFED 2002). Impacts would be beneficial, long term, and negligible to moderate in treatment areas.

Ponderosa Pine Forest. Alternative D would allow prescribed fire in ponderosa pine forest. Prescribed fire would to decrease fuel loads, thin stands, and allow more understory vegetation to grow, as seen in the park's fire effects plots (SNPFED 2002). Impacts would be beneficial, long term, and negligible to moderate in treatment areas.

Mixed-conifer Forest. This alternative would allow prescribed fire in mixed-conifer forests, which would reduce fuel loads in treatment areas. The impacts of using prescribed fire in these areas would be beneficial, long term, and minor to moderate.

Cumulative Impacts

Other foreseeable projects/management actions that could affect vegetation at Saguaro National Park under Alternative D would be the same as discussed under the No Action Alternative.

Conclusion

Fire management activities under Alternative D would affect vegetation in generally beneficial ways, through actions that would maintain and restore plant communities (i.e., prescribed fire and non-fire treatments). Protection of non-fire-adapted species would continue in the suppression units.

However, Alternative D would not allow fire managers to continue working toward the resource management goal of restoring fire in an ecologically appropriate manner. This would require the use of natural ignitions under the proper prescriptions to aid in returning natural fire regimes to the different fire-adapted vegetation types. The size of the fire management staff is not sufficient to keep up with all the work required to return these ecosystems to a more natural state following decades of fire suppression if they are limited to prescribed fire and non-fire treatments. By eliminating the active wildland fire for resource benefit program, fuel loading and woody plant densities would continue to increase in some areas, which would increase the risk of catastrophic wild fires. Overall, impacts would be adverse, long term, and minor to major. Alternative D would not produce any impairment of vegetation whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Alternative E – Prescribed Fire, Non-Fire Treatments, and Wildland Fire Use for Resource Benefit (Preferred Alternative)

Potential Impacts on Vegetation from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Sonoran Desertscrub. Impacts on Sonoran desertscrub would be the same as under Alternative D.

Desert Grassland. Impacts on desert grassland would be the same as under Alternative D.

Woodland. Like the No Action Alternative, Alternative E would allow prescribed fire and wildland fire use for resource benefit as well as non-fire treatments, all of which would reduce the risk of catastrophic fire. Impacts would be beneficial, long term, and minor to moderate. Beneficial impacts would be more likely in Alternative E than in the No Action Alternative due to the addition of a current, site-specific fire implementation plan. This plan will allow managers to make better informed decisions on the management of fire in Saguaro National Park which will also reduced the risk of catastrophic fire.

Pine-Oak Forest. Alternative E would be very similar to the No Action Alternative, where prescribed fire, wildland fire for resource benefit, and non-fire treatments would be allowed in these areas, which would reduce the risk of catastrophic fire. Impacts would be beneficial, long term, and minor to moderate. Beneficial impacts would be more likely in Alternative E than in the No Action Alternative due to the

addition of a current, site-specific fire implementation plan. This plan will allow managers to make better informed decisions on the management of fire in Saguaro National Park which will also reduced the risk of catastrophic fire.

Ponderosa Pine Forest. Like the No Action Alternative, Alternative E would allow prescribed fire, wildland fire for resource benefit, and non-fire treatments in this vegetation type, all of which would reduce the risk of catastrophic fire. Impacts would be beneficial, long term, and negligible to minor. Beneficial impacts would be more likely in Alternative E than in the No Action Alternative due to the addition of a current, site-specific fire implementation plan. This plan will allow managers to make better informed decisions on the management of fire in Saguaro National Park which will also reduced the risk of catastrophic fire.

Mixed-conifer Forest. When compared with the No Action Alternative, Alternative E will allow park managers to more effectively apply prescribed fire, wildland fire for resource benefit, and non-fire treatments to mixed-conifer forest due to the updated site-specific fire implementation plan that would be in place. Under this alternative the potential to burn within the Mexican Spotted Owl protected activity centers is greater due to the formal consultation with the U.S. Fish and wildlife Service (USFWS) that would accompany the plan. This would reduce fuel loads and the risk of catastrophic fire. Impacts would be beneficial, long term, and minor to moderate.

Related Fire Management Actions

The effects of helispots, hand line, spike camps, hand thinning, snagging, and mop up would all be mitigated through avoidance and/or rehabilitation measures under Alternative E, as they would under the other alternatives. Impacts from water and fire retardant drops in high-elevation, low-nitrogen areas would be mitigated if needed by avoiding use of retardant or by using “clear” retardant that minimizes active nutrients within the mix. Physical damage to vegetation from drops can be avoided by requesting that pilots fly aircraft quickly enough to dissipate the water and retardant over larger, more linear areas. The impacts of related fire management actions on vegetation would be the same under Alternative E as under Alternatives C and D—adverse, short term, and minor.

Wildland Fire Use for Resource Benefit

Sonoran Desertscrub. Wildland fire use for resource benefit would not be used in desertscrub under Alternative E.

Desert Grassland. Wildland fire use for resource benefit would not be used in desert grassland under Alternative E.

Woodland. Like the No Action Alternative, Alternative E would allow wildland fire use for resource benefit in Woodland, which would reduce fuel loads and open up the canopy to allow for an increase in herbaceous species (SNPFED 2002). In addition, an updated site-specific fire implementation plan would be in place, reducing the chance of adverse effects that could otherwise be caused by ill-informed management decisions due to lack of knowledge of current site-specific conditions. Overall, impacts would be beneficial, long term, and minor to major.

Pine-Oak Forest. Like the No Action Alternative, this alternative would allow wildland fire for resource benefit in pine-oak forest, which would reduce the fuel load and thin the stands to allow more understory vegetation to grow (SNPFED 2002). In addition, an updated site-specific fire implementation plan would be in place, reducing the chance of adverse effects as discussed under Woodland. Overall, impacts would be beneficial, long term, and minor to major.

Ponderosa Pine Forest. Like the No Action Alternative, Alternative E would allow wildland fire for resource benefit in ponderosa pine forest, which would continue to decrease fuel loads, thin stands, and allow for more understory vegetation to grow (SNPFED 2002). In addition, an updated site-specific fire implementation plan would be in place, reducing the chance of adverse effects as discussed under Woodland. Overall, impacts would be beneficial, long term, and negligible to minor.

Mixed-conifer Forest. This alternative would allow wildland fire for resource benefit in mixed-conifer forest, which would reduce fuel loads and the risk of catastrophic fire. In addition, an updated site-specific fire implementation plan and formal consultation with the USFWS would be in place, increasing park managers' ability to effectively use fire in this vegetation type (including potentially within Mexican Spotted Owl protected activity centers), which would reduce the chance of adverse effects. Overall, impacts would be beneficial, long term, and minor to moderate.

Prescribed Fire

Sonoran Desertscrub. Prescribed fire would not be used in this non-fire-adapted vegetation type under Alternative E.

Desert Grassland. Prescribed fire would not be used in desert grassland under Alternative E.

Woodland. Like the No Action Alternative, Alternative E would allow prescribed fire in Woodland, which would reduce fuel loads and open up the canopy to allow for an increase in herbaceous species, as seen in the park's fire effects plots (SNPFED 2002). Impacts would be beneficial, long term, and negligible to moderate.

Pine-Oak Forest. Alternative E would allow prescribed fire in fine-oak forest, which would reduce the fuel load and thin the stands to allow more understory vegetation to grow, as seen in the park's fire effects plots (SNPFED 2002). Impacts would be beneficial, long term, and negligible to moderate.

Ponderosa Pine Forest. Alternative E would allow prescribed fire in ponderosa pine forest. It would therefore decrease fuel loads, thin stands, and allow for more understory vegetation to grow, as seen in the park's fire effects plots (SNPFED 2002). Impacts would be beneficial, long term, and negligible to moderate.

Mixed-conifer Forest. Like the No Action Alternative, Alternative E would allow prescribed fire in mixed-conifer forest, which would reduce fuel loads and the risk of catastrophic fire. However, unlike the No Action Alternative, the park would potentially be less constrained in burning in the Mexican spotted owl protected activity centers found in the mixed-conifer forests and surrounding areas due to the formal consultation with the USFWS that would occur under this alternative. Impacts of using prescribed fire in mixed-conifer forest under Alternative E would be beneficial, long term, and minor to moderate.

Cumulative Impacts

Other foreseeable projects/management actions that could affect vegetation at Saguaro National Park under Alternative E would be the same as discussed under the No Action Alternative.

Conclusion

Under Alternative E, the Preferred Alternative, fire management activities would affect vegetation in generally beneficial ways, through actions that would maintain and restore plant communities. Continuing

an active managed wildland fire use for resource benefit and prescribed fire program would keep fuel loading down which would reduce the risk of catastrophic wild fires. Protection of non-fire-adapted species would continue in the suppression units.

Like the No Action Alternative, Alternative E would allow fire managers to continue working toward the resource management goal of restoring fire in an ecologically appropriate manner through the use of prescribed fire, wildland fire use for resource benefit, and appropriate suppression response, as well as non-fire treatments. This alternative would be better than the No Action Alternative because it would include formal consultation with the USFWS and development of a new site-specific fire implementation plan that would incorporate new policy direction, lessons learned, and updated knowledge on fire effects/ecology and threatened and endangered species. This additional information would help the fire and resource management staff better manage fire in an ecologically sound manner at Saguaro National Park. Overall, impacts would be beneficial, long term, and negligible to moderate. Alternative E would not produce any impairment of vegetation whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Wildlife

Saguaro National Park is home to about 70 species of mammals, 50 species of reptiles, 8 species of amphibians, and 200 species of birds. The abundance and distribution of many of these species are related to the occurrence and intensity of fire. Some wildlife species—mainly woodland and forest species—depend on the periodic occurrence of fire; others—specifically desert animals—can be negatively impacted by fire.

The effects of fire on wildlife vary greatly depending on the species of concern; the size, location, and severity of the fire; and the temporal and spatial scales considered. Even for one animal species, the direct and indirect impacts of a given fire can be beneficial and/or adverse in the short and/or long term, and vary from negligible to major. There are however, two major concerns regarding the impacts of fire on wildlife in Saguaro National Park, both of which are indirect; these are: 1) impacts on surface water; and 2) loss of significant portions of vegetation/cover, especially in rare and/or non-fire-adapted vegetation types (such as desert riparian vegetation and Sonoran desertscrub). Some fires can dramatically reduce the overall productivity of a landscape, as well as its native biodiversity.

In addition, there are wildlife species in the park with natural history characteristics that make them more likely to be impacted by fire than others. Such species include: 1) aquatic vertebrates (e.g., leopard frog); 2) animals whose local populations are susceptible to impact from small-scale disturbance and habitat change (mainly reptile and amphibian species including the Sonoran desert tortoise, Gila monster, Sonoran desert toad, and tiger rattlesnake); and 3) rare species, particularly if they are habitat specialists or dependent on a particular, limited resource (e.g., kit fox, Mexican spotted owl, and black bear).

Fauna fall into four main categories: invertebrates, birds, herpetofauna and mammals. The short-term impact of fire on the park's animal community is species specific, depending on their habitat requirements. The long-term impact of fire on the animal community depends on the availability of sufficient numbers of suitable habitat patches capable of supporting viable populations of numerous species. Therefore, greater numbers of small-sized fires or patchy large fires, which are more cost effective, are preferable to assure that this mosaic of habitats is available across spatial and temporal scales.

Intense wildfires that burn over large areas—i.e., catastrophic fires—cause adverse impacts on wildlife species at all temporal and spatial scales. As mentioned above, of particular concern are fires that result in the destruction of large areas of native vegetation and/or impacts on surface water. The resulting loss of habitat and degradation/loss of water sources can cause major short- and long-term adverse impacts on many wildlife species. Such events have already caused local extirpations of wildlife species in Saguaro National Park (e.g., lowland leopard frogs from certain drainages and Gila topminnows).

Fire suppression activities in the twentieth century have dramatically changed fire patterns, and thus vegetation, in southwestern grasslands, woodlands, and forests. These practices have resulted in changes to some plant communities in Saguaro National Park, with some communities becoming denser and more prone to catastrophic fire. Such changes in native plant communities have also affected the diversity, abundance, and distribution of wildlife in the upper elevations (above 4,000 feet) of the park. Conversely, an increase in human-caused fires in the lower elevations of the park may be negatively impacting desert wildlife species (Esque ref). Both suppression efforts and prescribed burning can cause direct and indirect impacts on wildlife and the resources they depend on. With these factors in mind, the following parameters were used to analyze the effects of the various alternatives on the park's wildlife.

Type of Impact

- Adverse: Likely to result in unnatural changes in the abundance, diversity, and distribution of wildlife species. Changes would occur through direct disturbance or mortality, or through destruction or alteration of habitat.
- Beneficial: Likely to protect and/or restore the natural abundance, diversity, and distribution of wildlife species. This would occur through protection and restoration of the natural structure, succession, and distribution of habitat.

Duration of Impact

- Short-term: Would cause immediate changes in the abundance, diversity, and distribution of wildlife species, but a return to the original condition would occur within 20 years, without further impacts.
- Long-term: Would cause changes in the abundance, diversity, and distribution of wildlife species that would persist for more than 20 years.

Intensity of Impact

- Negligible: Would have imperceptible or undetectable effects on wildlife.
- Minor: Effects would be slightly perceptible and limited in extent. Without further impacts, adverse effects would reverse and the resources would recover.
- Moderate: Effects would be readily apparent, but limited in extent. Without further impacts, adverse effects would eventually reverse and the resources would recover.
- Major: Effects would be substantial, highly noticeable, and affecting a large area. Changes would not reverse without active management.

Alternative C – No Action Alternative

Potential Impacts on Wildlife from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Although catastrophic fire would be no more likely to occur under the No Action Alternative than under Alternative E (both would reduce fuel loads with wildland fire use for resource benefit, prescribed fire, and non-fire treatments), and would be less likely than under Alternative D, adverse impacts on wildlife from catastrophic fire, if it were to occur, would be more likely under the No Action Alternative than Alternative E due to the lack of a site-specific fire implementation plan that would take the current wildlife situation into consideration. Depending on the size, location, and severity of fires, adverse

impacts on wildlife from wildfires in the park under this alternative would be short and/or long term, and range from negligible to major in severity.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Under the No Action Alternative, fire management actions that could adversely impact wildlife species would generally be limited to prescribed burn preparation (e.g., hand thinning) and suppression activities (e.g., large-scale operations that might increase erosion, such as establishing a holding line; or slurry drops, which could contaminate surface water), particularly if they occur in sensitive habitat/vegetation types (e.g., riparian areas). Such actions could cause short- to long-term adverse impacts, ranging from negligible to major in severity.

Wildland Fire Use for Resource Benefit

This alternative would allow for the occurrence of some wildland fire for resource benefit in certain areas of the park, including the upper elevations of Sonoran desertscrub. By allowing wildland fire use for resource benefit in this non-fire-adapted ecosystem, the No Action Alternative would have the potential to adversely affect wildlife species in those plant communities. In the fire-adapted communities found in the woodland and forest areas, adverse effects on wildlife still exist due to the lack of a site-specific fire implementation plan that would aid managers in making decisions specifically related to Saguaro's wildlife issues. Overall, impacts would be adverse or beneficial (depending on fire size, location, and severity), short or long term, and minor to major.

Prescribed Fire

Prescribed burns would not be expected to cause large-scale loss of native vegetation or appreciable erosion. Thus, unless a prescribed burn were to escape and convert to wildfire (see discussion of catastrophic fire above), neither the No Action Alternative nor the other alternatives would pose a major and/or long-term threat to wildlife species in the park resulting from prescribed fire. To the degree that prescribed burning would reduce the potential for catastrophic fire, it would, in fact, provide major short- and long-term benefits to wildlife.

Cumulative Impacts

Other foreseeable projects/management actions that could affect wildlife at Saguaro National Park are currently being addressed in the park's GMP update (draft expected in 2005). Specific management issues included in the GMP that would be expected to potentially impact wildlife are wilderness management and backcountry trails and campsite planning. Impacts from these operations, along with implementation of the fire management plan, are likely to have mixed results depending on their temporal and spatial scale. Since the development of Saguaro's GMP is in process, these cumulative impacts will be better covered in the draft EIS for the GMP.

The continuing growth of Tucson and ongoing efforts by the Tucson Chamber of Commerce to promote visitation to the Tucson area will ultimately result in increased impacts on the park's vegetation and other natural and cultural resources. These impacts will primarily result from increased permitted visitor use at frontcountry interpreted sites and trails in the form of illegal, off-trail use by hikers, bikers, and/or horseback riders, although impacts in backcountry locations will likely increase as well. Continued growth in Tucson is also likely to result in significant development of private lands near the park boundaries, which will probably cause increased unpermitted visitation to backcountry areas within the

park, and lead to more off-trail use. This increased human presence/disturbance could have adverse, short or long-term, negligible to major impacts on wildlife.

Conclusion

The No Action Alternative, which would not have a site-specific fire implementation plan and would allow the occurrence of some wildland fire use for resource benefit and prescribed fire in the upper elevations of Sonoran desertscrub and desert grasslands, has the potential to adversely affect wildlife resources in the park with long-term and moderate to major impacts. The No Action Alternative would not produce any impairment of wildlife whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Alternative D – Prescribed Fire and Non-Fire Treatments

Potential Impacts on Wildlife from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

The chance of catastrophic fire would be greatest under Alternative D, since without wildland fire use for resource benefit, only a small number of acres could be treated to reduce fuel buildup. Thus, impacts on wildlife would be adverse, long term, and moderate to major.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Impacts would be the same as discussed under the No Action Alternative.

Wildland Fire Use for Resource Benefit

Wildland fire use for resource benefit would not be used under Alternative D.

Prescribed Fire

Impacts of prescribed fire would be the same as discussed under the No Action Alternative.

Cumulative Impacts

Cumulative impacts would be the same as discussed under the No Action Alternative.

Conclusion

The impacts of Alternative D on wildlife would be adverse, long term, and moderate to major because of the continuation of the direct effects of high fuel loading on habitat structure and quality in some areas and the continued threat of catastrophic fire, both due to the lack of wildland fire use for resource benefit. High-intensity fire has the potential to cause wide-scale, long-term changes in park habitats as well as large-scale changes in wildlife abundance and diversity in those areas affected. Impacts from suppression activities would be most intense under this alternative but of shorter duration than under the two that

would utilize wildland fire use for resource benefit. Alternative D would not produce any impairment of wildlife whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Alternative E – Prescribed Fire, Non-Fire Treatments, and Wildland Fire Use for Resource Benefit (Preferred Alternative)

Potential Impacts on Wildlife from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Alternative E, like the No Action Alternative, would decrease the chance of catastrophic fire more than Alternative D due to the increase in acreage treated with wildland fire use for resource benefit and prescribed fire. However, unlike the No Action Alternative, the establishment of a site-specific fire implementation plan would aid managers in making decisions that directly relate to the current wildlife populations found in Saguaro National Park. Thus, although the potential would still exist for catastrophic fires, adverse effects on wildlife would be minimized and overall impacts would be beneficial, long term, and moderate to major.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Impacts would be the same as discussed under the No Action Alternative.

Wildland Fire Use for Resource Benefit

This alternative would allow wildland fire use for resource benefit above 4,000 feet within the constraints of a site-specific fire implementation plan. This strategy would reduce fuel loads (and thus the risk of catastrophic wildfire) while minimizing adverse impacts on sensitive resources. Therefore, Alternative E would minimize potential adverse impacts on wildlife species. Overall, impacts on wildlife from this treatment would be beneficial, long term, and minor to major.

Prescribed Fire

Impacts would be the same as discussed under the No Action Alternative.

Cumulative Impacts

Cumulative impacts would be the same as discussed under the No Action Alternative.

Conclusion

Alternative E, which would allow wildland fire use for resource benefit, prescribed fire and non-fire treatments above 4,000 feet within the constraints of the implementation plan, would reduce fuel loads (and thus the risk of catastrophic wildfire) while minimizing adverse impacts on sensitive resources. Potential adverse impacts on wildlife species would therefore be minimized as well. Overall, impacts on wildlife from the Preferred Alternative would be beneficial, long term, and minor to major. Alternative E would not produce any impairment of wildlife whose conservation is to fulfill specific purposes identified

in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Species of Special Concern – Wildlife

Like most wildlife in the sky islands of the Sonoran Desert region, species of special concern have adapted to natural fire regimes. In many areas, however, including Saguaro National Park, a history of fire suppression has led to dense, overgrown stands, with high accumulations of forest fuels. This affects special-status species by altering their habitats and placing them and their habitats at risk for high-intensity, stand-replacing fire. Stand-replacing fire can create unsuitable habitat conditions that last for many years. In addition, fire control activities can adversely affect species of special concern through direct disturbance of animals and habitats. Even management actions designed to benefit habitat, such as prescribed fire, can have inadvertent adverse effects on special-status species (e.g., human activity during a prescribed burn that reduces fuel loads and helps protect Mexican spotted owls from catastrophic fire can also disturb the owls). With these factors in mind, the following parameters were used to analyze the effects on wildlife species of special concern from the various alternatives proposed in the *Saguaro Fire Management Plan/EIS*.

Type of Impact

Adverse: Would result in detrimental changes to the abundance or distribution of threatened and endangered wildlife species. This could occur through direct disturbance or mortality, or through destruction or alteration of habitat.

Beneficial: Would protect and/or enhance threatened and endangered wildlife species abundance and distribution. This would occur through protection and restoration of habitat structure, succession, and distribution.

Duration of Impact

Short-term: Would cause immediate changes in the abundance and distribution of threatened and endangered wildlife species, but a return to the pre-fire condition would occur within two years, without further impacts.

Long-term: would cause changes in the abundance and distribution of threatened and endangered wildlife species that would persist for more than two years.

Intensity of Impact

Negligible: Effects on wildlife species of special concern would be imperceptible or undetectable.

Minor: Effects would be slightly perceptible and/or limited in extent. Without further actions, adverse impacts would reverse, and the resources would recover.

Moderate: Effects would be readily apparent but limited in extent. Without further actions, adverse impacts would eventually reverse, and the resources would recover.

Major: Effects would be substantial, highly noticeable, and/or affecting a large area. Changes would have the potential to be irreversible or would not reverse without active management.

SPECIES: Gila topminnow (*Poeciliopsis occidentalis occidentalis*)

Gila topminnows were known to occur at one location in Saguaro National Park (probably from an unofficial, undocumented stocking). They were extirpated in 1989, when sediment eroded from the Chiva Fire filled in most of the tinajas (natural holes) in the Wildhorse Drainage where they were living. These

sites continue to be degraded (i.e., filled in with sediment) as a result of the Chiva Fire. Nevertheless, the Arizona Game & Fish Department considers certain tinajas in this drainage as potential habitat/reintroduction sites for replicate Gila topminnow populations. As seen from the Chiva Fire, wildfires that destroy vegetation and/or destabilize soils over large portions of individual watersheds have the potential to cause massive erosion that can fill drainages with sediments. These events can have catastrophic impacts on hydrologic, aquatic, and riparian resources, including Gila topminnows.

Alternative C – No Action Alternative

Potential Impacts on Gila Topminnows from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Although catastrophic fire would be no more likely to occur under the No Action Alternative than under Alternative E (both would reduce fuel loads with wildland fire use for resource benefit, prescribed fire, and non-fire treatments), and would be less likely than under Alternative D, adverse impacts on the potential Gila topminnow habitat/reintroduction sites from catastrophic fire, if it were to occur, would be more likely under the No Action Alternative than Alternative E due to the lack of a site-specific fire implementation plan that would take the topminnows into consideration. Depending on the size (fires that impact a large area of the species habitat or fires that impact a small area), location (in areas used by the species or not), and severity of fires (severe fires that degrade habitat or fires that enhance habitat), adverse impacts on the potential Gila topminnow habitat/reintroduction sites from wildfires in the park under this alternative would be short and/or long term, and range from negligible to major in severity.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Under the No Action Alternative, fire management activities that could impact the potential Gila topminnow habitat/reintroduction sites would primarily be limited to suppression activities (e.g., large-scale operations that might increase erosion, or slurry drops, which could contaminate water holes). These actions could have short- to long-term adverse impacts ranging from negligible to moderate in severity. However, they would be generally easily mitigated by avoidance and strategic placement of control lines, helispots, and spike camps.

Wildland Fire Use for Resource Benefit

The No Action Alternative would allow for the occurrence of some wildland fire use for resource benefit in the upper elevations of Sonoran desertscrub, which is where the potential Gila topminnow habitat/reintroduction sites are located. This alternative would lack a site-specific fire implementation plan that would help managers make decisions regarding specific wildlife concerns, such as the Gila topminnow, and thus would have the potential to adversely affect the potential Gila topminnow habitat/reintroduction sites. Overall, impacts could be adverse, short or long term, and negligible to major.

Prescribed Fire

Prescribed burns would not be expected to cause appreciable erosion, especially at a watershed scale. Thus, unless a prescribed burn were to escape and convert to wildfire (see the discussion of catastrophic fire above), neither the No Action Alternative nor the other alternatives would pose a threat to the Gila topminnow habitat/reintroduction sites from prescribed fire. Prescribed burning would help decrease the chance of catastrophic or high-intensity fires, which are the major cause of erosion and sedimentation.

Impacts on the Gila topminnow habitat/reintroduction sites from prescribed fire would be beneficial, long term, and negligible to moderate.

Cumulative Impacts

Currently there are no specific foreseeable projects and management actions/issues included in the park's GMP update (draft expected in 2005) that would be expected to potentially impact the potential Gila topminnow habitat/reintroduction sites.

The continuing growth of Tucson and ongoing efforts by the Tucson Chamber of Commerce to promote visitation to the Tucson area will ultimately result in increased impacts on the park's vegetation and other natural and cultural resources. These impacts will primarily result from increased permitted visitor use at frontcountry interpreted sites and trails in the form of illegal, off-trail use by hikers, bikers, and/or horseback riders, although impacts in backcountry locations will likely increase as well. Continued growth in Tucson is also likely to result in significant development of private lands near the park boundaries, which will probably cause increased unpermitted visitation to backcountry areas within the park, and lead to more off-trail use. This increased human presence/disturbance could have adverse, long-term and minor to moderate impacts on wildlife, including the potential Gila topminnow habitat/reintroduction sites.

Conclusion

The No Action Alternative would allow for the occurrence of some wildland fire use for resource benefit and prescribed fire in the upper elevations of Sonoran desertscrub, where the potential Gila topminnow habitat/ reintroduction sites are located. This treatment would potentially have adverse effects on desertscrub, which is a non-fire-adapted vegetation type. Since The No Action Alternative would not have a site-specific fire implementation plan that would allow park managers to properly consider Gila topminnows and mitigate these effects by avoidance, it would have the potential to adversely affect the Gila topminnow habitat/reintroduction sites. Overall, impacts could be adverse, long term, and minor to major. The No Action Alternative would not produce any impairment of species of special concern whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Alternative D – Prescribed Fire and Non-Fire Treatments

Potential Impacts on Gila Topminnows from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Alternative D would not allow wildland fire use for resource benefit, and with only prescribed fire and non-fire treatments, park staff could not keep up with the treatments required to reduce fuel loads and decrease the chance of catastrophic fire in the park. Depending on the size, location, and severity of fires, adverse impacts on the potential Gila topminnow habitat/reintroduction sites from catastrophic or high-severity wildfires in the park would be short and/or long term, and range from negligible to major in severity.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Impacts would be the same as under the No Action Alternative.

Wildland Fire Use for Resource Benefit

Alternative D would not allow wildland fire use for resource benefit.

Prescribed Fire

Impacts would be the same as under the No Action Alternative.

Cumulative Impacts

Cumulative impacts would be the same as under the No Action Alternative.

Conclusion

Under Alternative D, there would be considerable risk of catastrophic fire due to lack of wildland fire for resource benefit and the inability of park staff to keep up with the prescribed fire treatments that would be required to reduce fuel loads. Therefore, like the No Action Alternative, Alternative D could affect the potential Gila topminnow habitat/reintroduction sites. Depending on the size, location, and severity of fires, adverse impacts could be short or long term, and negligible to major. Alternative D would not produce any impairment of species of special concern whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Alternative E – Prescribed Fire, Non-Fire Treatments, and Wildland Fire Use for Resource Benefit (Preferred Alternative)

Potential Impacts on Gila Topminnows from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Although the likelihood of catastrophic fire would be reduced under both Alternatives C and E (both would reduce fuel loads with wildland fire use for resource benefit, prescribed fire, and non-fire treatments), adverse impacts on the potential Gila topminnow habitat/reintroduction sites from wildfires would be minimized under Alternative E when compared to the No Action Alternative due to the establishment of a site-specific fire implementation plan that takes the topminnows into consideration. Depending on size, location, and severity of fires, adverse impacts on the potential Gila topminnow habitat/reintroduction sites from wildfires in the park under this alternative would be short or long term, and negligible to moderate.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Impacts would be the same as under the No Action Alternative.

Wildland Fire Use for Resource Benefit

This alternative would allow wildland fire use for resource benefit above 4,000 feet within the constraints of the site-specific fire implementation plan. This strategy should reduce fuel loads (and thus the risk of catastrophic wildfire) while minimizing adverse impacts on sensitive resources. Thus, Alternative E would be expected to minimize possible adverse impacts on the potential Gila topminnow habitat/reintroduction sites. Overall, impacts would be beneficial, long term, and minor to moderate.

Prescribed Fire

Impacts would be the same as under the No Action Alternative.

Cumulative Impacts

Cumulative impacts would be the same as under the No Action Alternative.

Conclusion

Alternative E would provide the most protection for the potential Gila topminnow habitat/reintroduction sites from the adverse impacts of large wildfires by reducing fuel loads through wildland fire use for resource benefit, prescribed fire, and non-fire treatments and by establishing a site-specific fire implementation plan to guide park managers in making decisions regarding the specific resources found in Saguaro such as the Gila topminnow. Overall, impacts on Gila topminnows from Alternative E would be beneficial, long term, and negligible to moderate. Alternative E would not produce any impairment of species of special concern whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

SPECIES: Lesser long-nosed bat (*Leptonycteris curasoae yerbabuena*)

Lesser long-nosed bats are known to occur in small numbers at one roost in the Rincon Mountain District of the Saguaro National Park; however, they probably forage throughout the park below 5,000 feet wherever saguaros and agaves, their food sources, are found. Because they are so rare and their potential habitat is so widespread in the park, this species is not likely to be affected by fire or fire management activities. However, if a fire occurred at the roost site during the summer months, it would have the potential to adversely impact the bats. Wildfires that destroy or degrade large areas of Sonoran desertscrub or desert grassland would also have the potential to adversely affect lesser long-nosed bats, since saguaros and agaves grow in these vegetation types.

Alternative C – No Action Alternative

Potential Impacts on Lesser Long-nosed Bats from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Although catastrophic fire would be no more likely to occur under the No Action Alternative than under Alternative E (both would reduce fuel loads with wildland fire use for resource benefit, prescribed fire, and non-fire treatments), and would be less likely than under Alternative D, adverse impacts on the Lesser Long-nosed Bats from catastrophic fire, if it were to occur, would be more likely under the No Action Alternative than Alternative E. This is due to the lack of a site-specific fire implementation plan that would take the Bat's into consideration. Depending on the size (fires that impact a large area of the species habitat or fires that impact a small area), location (in areas used by the species or not), and severity of fires (severe fires that degrade habitat or fires that enhance habitat), adverse impacts on the Bat's from wildfires in the park under this alternative would be short and/or long term, and range from negligible to major in severity.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Fire management activities are not likely to impact the nocturnal lesser long-nosed bat. Under the No Action Alternative, actions that could impact the park's known population of bats would probably be limited to suppression activities to contain wildfire below 5,000 feet. If these activities were to occur at the bats' roost site, they would have the potential to adversely impact the bats in the short and/or long term, with negligible to major intensity. To the extent that such activities were to impact saguaros or agaves throughout the park, fire management actions could have short- to long-term adverse impacts ranging in severity from negligible to minor.

Wildland Fire Use for Resource Benefit

This alternative would allow for the occurrence of some wildland fire use for resource benefit in the upper elevations of Sonoran desertscrub and the desert grasslands. Thus, it would have the greatest potential of the three alternatives to adversely affect lesser long-nosed bats or their food base (saguaros and agaves). This is due to the application of fire in non fire-adapted vegetation types. Although wildland fire use for resource benefit in the higher elevations would reduce the threat of catastrophic fire in the park, when weighed against the adverse impacts of it in desertscrub, overall impacts would be adverse, long-term and minor to major.

Prescribed Fire

Under the No Action Alternative, prescribed fire would be allowed in the upper elevations of Sonoran desertscrub and in the desert grasslands. Thus, this alternative would be the most likely to affect the bats. There is not enough evidence to predict an effect on the bats from prescribed burning in the desert grasslands of Saguaro National Park. However, fire effects in Sonoran desertscrub are known to be adverse to saguaros. Depending on the severity of fire effects on saguaros, impacts on the park's lesser long-nosed bats would be adverse, short term or long term, and minor to major.

Cumulative Impacts

Other foreseeable projects/management actions that could affect the lesser long-nosed bats at Saguaro National Park are currently being addressed in the park's GMP update (draft expected in 2005). Specific management issues included in the GMP that would be expected to potentially impact the bats are wilderness management and backcountry trails and campsite planning. Impacts from these operations, along with implementation of the fire management plan, are likely to have mixed results depending on their temporal and spatial scale. Since the development GMP update is in process, these cumulative impacts will be better covered in the draft EIS for the GMP.

The continuing growth of Tucson and ongoing efforts by the Tucson Chamber of Commerce to promote visitation to the Tucson area will ultimately result in increased impacts on the park's vegetation and other natural and cultural resources. These impacts will primarily result from increased permitted visitor use at frontcountry interpreted sites and trails in the form of illegal, off-trail use by hikers, bikers, and/or horseback riders, although impacts in backcountry locations will likely increase as well. Continued growth in Tucson is also likely to result in significant development of private lands near the park boundaries, which will probably cause increased unpermitted visitation to backcountry areas within the park, and lead to more off-trail use. This increased human presence/disturbance could have adverse impacts on the park's lesser long-nosed bats.

Conclusion

Although the likelihood of catastrophic fire would be reduced under the No Action Alternative (it would reduce fuel loads with wildland fire use for resource benefit, prescribed fire, and non-fire treatments), this alternative is the only one that would allow wildland fire use for resource benefit and prescribed fire in Sonoran desertscrub and desert grassland, where the lesser long-nosed bats' food base is located. Also, this is also the only alternative that would not incorporate a site-specific fire implementation plan that would specifically address species found in the park such as the Lesser Long-nosed bat. Thus, of the three alternatives, the No-Action Alternative would have the most potential to have adverse, minor to moderate impacts in the short or long term. The No Action Alternative would not produce any impairment of species of special concern whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Alternative D – Prescribed Fire and Non-Fire Treatments

Potential Impacts on Lesser Long-nosed bats from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

The chance of catastrophic fire would be greatest under Alternative D, since without wildland fire use for resource benefit, only a small number of acres could be treated to reduce fuel buildup. Depending on the size, location, and severity of fires adverse impacts on lesser long-nosed bats could be short and/or long term, and probably range from negligible to moderate in severity.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Impacts would be the same as under the No Action Alternative.

Wildland Fire Use for Resource Benefit

Wildland fire use for resource benefit would not be allowed under this alternative.

Prescribed Fire

Alternatives D and E propose using prescribed fire only in forested habitats above 4,000 feet, where it would reduce fuel loads and the risk of catastrophic fire. Thus, unless these burns were to escape and convert to catastrophic wildfire that burns into desert grassland and/or Sonoran desertscrub (see discussion above), Alternative D would not pose a threat to the park's lesser long-nosed bats or their habitat from prescribed burning. Impacts would be beneficial, long-term and minor to moderate.

Cumulative Impacts

Cumulative impacts would be the same as under the No Action Alternative.

Conclusion

Under this alternative there would be considerable risk of catastrophic wildfire due to suppression of all wildland fires and consequent fuel buildup. However, it would incorporate a current site-specific fire implementation plan that would specifically consider species found in Saguaro such as the lesser long-nosed bat. Also, this alternative does not allow fire in the Sonoran desertscrub or desert grassland where the bats main food source exists. Therefore, it would have intermediate (between Alternatives C and E) potential to adversely affect lesser long-nosed bats in the short or long term with minor to moderate impacts. Alternative D would not produce any impairment of species of special concern whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Alternative E – Prescribed Fire, Non-Fire Treatments, and Wildland Fire Use for Resource Benefit (Preferred Alternative)

Potential Impacts on Lesser Long-nosed bats from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Impacts would be the same as under the No Action Alternative, with the potential to be less adverse due to the establishment of a site-specific fire implementation plan that would take lesser long-nosed bats into consideration.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Impacts would be the same as under the No Action Alternative.

Wildland Fire Use for Resource Benefit

Alternative E would allow wildland fire use for resource benefit above 4,000 feet within the constraints of the site-specific fire implementation plan. This strategy should reduce fuel loads (and thus the risk of catastrophic wildfire) while minimizing adverse impacts on sensitive resources. Thus, this alternative would be expected to minimize potential adverse impacts on lesser long-nosed bats and their habitat elements.

Prescribed Fire

Alternatives D and E propose using prescribed fire only in forested habitats above 4,000 feet, where it would reduce fuel loads and the risk of catastrophic fire. Thus, unless these burns were to escape and convert to catastrophic wildfire that burns into desert grassland and/or Sonoran desertscrub (see discussion above), Alternative E would not pose a threat to the park's lesser long-nosed bats or their habitat from prescribed burning. Impacts would be beneficial, long-term and minor to moderate.

Cumulative Impacts

Cumulative impacts would be the same as under the No Action Alternative.

Conclusion

This alternative would provide Saguaro's lesser long-nosed bats and their habitat with the most protection from fire-related adverse impacts by decreasing the likelihood of catastrophic fire and by not using wildland fire use for resource benefit or prescribed fire in non-fire-adapted ecosystems that are home to the bats' food sources. Also, with the use of fire for resource benefit and prescribed fire in the higher elevations above 4000 feet, the chance for catastrophic fire is reduced which would reduce the chance for fires to escape into the above mentioned areas. Overall, impacts would be beneficial, long term, and negligible to minor. Alternative E would not produce any impairment of species of special concern whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

SPECIES: Cactus ferruginous pygmy-owl *(Glaucidium brasilianum cactorum)*

Cactus ferruginous pygmy-owls have been detected but have not been confirmed as resident or breeding in Saguaro National Park. Because they are so rare and their potential habitat is so widespread in the park (Sonoran desertscrub below 4,000 feet), this species is not likely to be affected by fire. However, the greatest potential threat from fire to cactus ferruginous pygmy-owls in the park is from wildfire that

destroys or degrades their habitat/components, particularly riparian or xeroriparian resources and mesquite bosque below 4,000 feet.

Alternative C – No Action Alternative

Potential Impacts on Pygmy-owls from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Although catastrophic fire would be no more likely to occur under the No Action Alternative than under Alternative E (both would reduce fuel loads with wildland fire use for resource benefit, prescribed fire, and non-fire treatments), and would be less likely than under Alternative D, adverse impacts on the cactus ferruginous pygmy-owls from catastrophic fire, if it were to occur, would be more likely under the No Action Alternative than Alternative E. This is due to the lack of a site-specific fire implementation plan that would take the Bat's into consideration. Depending on the size (fires that impact a large area of the species habitat or fires that impact a small area), location (in areas used by the species or not), and severity of fires (severe fires that degrade habitat or fires that enhance habitat), adverse impacts on cactus ferruginous pygmy-owls from wildfires below 4,000 under this alternative would be short and/or long term, and range from negligible to moderate in severity.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Fire management activities that could impact cactus ferruginous pygmy-owls would most likely be limited to those carried out below 4,000 feet. To the extent that such activities were to impact pygmy-owl habitat or habitat components (generally lush Sonoran desertscrub, particularly when associated with riparian or xeroriparian areas or mesquite bosques), they could have short- to long-term adverse impacts ranging from negligible to moderate in severity. Under the No Action Alternative, wildland fire use for resource benefit, prescribed fire, and suppression activities would all be allowed to occur in areas below 4,000 feet. Thus, adverse impacts on cactus ferruginous pygmy-owls from related fire management actions would be more likely to occur under the No Action Alternative than under Alternatives D and E.

Wildland Fire Use for Resource Benefit

The No Action Alternative would allow for the occurrence of some wildland fire for resource benefit in the upper elevations of Sonoran desertscrub (below 4,000 feet). As fire effects on this non-fire-adapted vegetation type are known to be adverse to many of the species found there, this alternative would have the greatest potential to adversely affect cactus ferruginous pygmy-owls habitat or habitat components. Depending on the severity and location of the fire, impacts would be adverse, short or long term, and minor to major.

Prescribed Fire

Prescribed fire would be allowed in the upper elevations of Sonoran desertscrub and in the desert grasslands under the No Action Alternative. Again, since fire effects in Sonoran desertscrub are known to be adverse to saguaros and other cactus species, this alternative would be more likely than the others to adversely affect cactus ferruginous pygmy-owls. Impacts on the pygmy-owls would be adverse, short or long term, and negligible to moderate depending on the severity of fire effects on their habitat or habitat components.

Cumulative Impacts

Other foreseeable projects/management actions that could affect cactus ferruginous pygmy-owls at Saguaro National Park are currently being addressed in the park's GMP update (draft expected in 2005). Specific management issues included in the GMP that would be expected to potentially impact the pygmy-owls are wilderness management and backcountry trails and campsite planning. Impacts from these operations, along with implementation of the fire management plan, are likely to have mixed results depending on their temporal and spatial scale. Since the GMP update is in process, these cumulative impacts will be better covered in the draft EIS for the GMP.

The continuing growth of Tucson and ongoing efforts by the Tucson Chamber of Commerce to promote visitation to the Tucson area will ultimately result in increased impacts on the park's vegetation and other natural and cultural resources. These impacts will primarily result from increased permitted visitor use at frontcountry interpreted sites and trails in the form of illegal, off-trail use by hikers, bikers, and/or horseback riders, although impacts in backcountry locations will likely increase as well. Continued growth in Tucson is also likely to result in significant development of private lands near the park boundaries, which will probably cause increased unpermitted visitation to backcountry areas within the park, and lead to more off-trail use. This increased human presence/disturbance could have adverse, long-term and moderate impacts on cactus ferruginous pygmy-owls.

Conclusion

Because this alternative is the only one that would allow wildland fire use for resource benefit, prescribed fire, and related fire management activities in Sonoran desertscrub and desert grassland (habitat of the cactus ferruginous pygmy-owls), it has the most potential to affect cactus ferruginous pygmy-owls. Overall, impacts could be adverse, short or long term, and negligible to moderate, depending on the severity of fire effects on habitat and habitat components. The No Action Alternative would not produce any impairment of species of special concern whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Alternative D – Prescribed Fire and Non-Fire Treatments

Potential Impacts on Pygmy-owls from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Catastrophic wildfire below 4,000 feet would have adverse impacts on cactus ferruginous pygmy-owls that would be short and/or long term, and range from negligible to moderate in severity depending on the fire's size, location, and severity. Alternative D would lessen the likelihood of such an event because it calls for suppression below 4,000 feet. However, this alternative would not reduce the chance for catastrophic fire above 4,000 feet due to the lack of wildland fire use for resource benefit. This could cause fires to escape firelines and move into areas below 4,000 feet where the owls live and forage. Thus, adverse impact discussed above could be more likely.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Under Alternative D, fire management activities that could impact cactus ferruginous pygmy-owls would probably be limited to suppression activities to contain wildfire below 4,000 feet. To the extent that such

activities were to impact pygmy-owl habitat or habitat parameters (generally lush Sonoran desertscrub, particularly when associated with riparian or xeroriparian areas, or mesquite bosques), they could have short- to long-term adverse impacts ranging from negligible to moderate in severity.

Wildland Fire Use for Resource Benefit

Wildland fire use for resource benefit would not be allowed under Alternative D.

Prescribed Fire

Alternatives D and E would allow prescribed fires only in forested habitats above 4,000 feet. Thus, unless these burns were to escape and convert to wildfire that burns into Sonoran desertscrub, Alternatives D and E would not pose a threat to cactus ferruginous pygmy-owls or their habitat from prescribed burning. Impacts would be beneficial, long-term and negligible to minor.

Cumulative Impacts

Cumulative impacts would be the same as under the No Action Alternative.

Conclusion

Under this alternative there is considerable risk of catastrophic wildfire above 4,000 feet (due to suppression of all wildfires and the lack of wildland fire use for resource benefit). However, this alternative does not allow fire in the habitats of the cactus ferruginous pygmy-owls; and so it has intermediate (i.e., between Alternatives C and E) potential to affect cactus ferruginous pygmy-owls. Impacts could be beneficial or adverse, short or long term, and negligible to moderate. Alternative D would not produce any impairment of species of special concern whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Alternative E – Prescribed Fire, Non-Fire Treatments, and Wildland Fire Use for Resource Benefit (Preferred Alternative)

Potential Impacts on Pygmy-owls from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Impacts would be the same as under the No Action Alternative. However, the chance for adverse effects would be lessened due to the implementation of a site-specific implementation plan that would take into consideration the specific resources such as the pygmy-owl found within Saguaro National Park.

Related Fire Management Actions

Impacts would be the same as under Alternative D.

Wildland Fire Use for Resource Benefit

Alternative E would allow wildland fire use for resource benefit above 4,000 feet within the constraints of the site-specific fire implementation plan. This strategy should reduce fuel loads (and thus the risk of catastrophic wildfire) while minimizing adverse impacts on sensitive resources. Thus, this alternative is expected to minimize potential adverse impacts on cactus ferruginous pygmy-owl habitat and habitat components. Impacts would be beneficial, short or long term, and negligible to minor.

Prescribed Fire

Impacts would be the same as under Alternative D.

Cumulative Impacts

Impacts would be the same as under the No Action Alternative.

Conclusion

Alternative E would provide cactus ferruginous pygmy-owls and their habitat with the most protection from fire-related adverse impacts by decreasing the likelihood of catastrophic fire above 4,000 feet and by not using wildland fire use for resource benefit or prescribed fire in Sonoran desertscrub. Overall, impacts would be beneficial, short or long term, and negligible to minor. Alternative E would not produce any impairment of species of special concern whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

*SPECIES: Peregrine falcon (*Falco peregrinus americanus*)*

There is evidence that peregrine falcons are quite tolerant of human disturbance associated with fire management/suppression activity, both terrestrial and aerial (National Park Service files). Furthermore, these birds nest between April and June, generally before major fire activity begins each year.

Alternative C – No Action Alternative

Potential Impacts on Peregrine Falcons from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Catastrophic fire could have minor to moderate, short- and long-term adverse impacts on peregrine falcons in the Rincon Mountains of Saguaro National Park. These impacts would arise from changes in the abundance and distribution of forest birds, their primary prey base. However, catastrophic fires have been known to increase forest bird abundance due to the increase in insects that attack fire damaged trees. In this were the case, impacts could be beneficial. Smoke from large fires may also affect individual adult or nestling birds, resulting in negligible to moderate, short-term adverse impacts. Although catastrophic fire would be no more likely to occur under the No Action Alternative than under Alternative E (both would reduce fuel loads with wildland fire use for resource benefit, prescribed fire, and non-fire treatments), and would be less likely than under Alternative D, adverse impacts on peregrine falcons from catastrophic fire, if it were to occur, would be more likely under the No Action Alternative than Alternative E. This is due to the lack of a site-specific fire implementation plan that would take the falcons into consideration. Depending on the size (fires that impact a large area of the species habitat or

fires that impact a small area), location (in areas used by the species or not), and severity of fires (severe fires that degrade habitat or fires that enhance habitat), adverse impacts on peregrine falcons from wildfires under this alternative would be short and/or long term, and range from negligible to moderate in severity.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Under the No Action Alternative, fire management activities, including air operations, could cause negligible to minor, short-term adverse impacts on peregrine falcons due to the noise and activity associated with these activities.

Wildland Fire Use for Resource Benefit

The No Action Alternative would allow wildland fire use for resource benefit in the Rincon Mountains. Observations from previous years suggest that even fairly intensive fire management/suppression activities do not have long-term impacts on peregrine falcons. Short-term adverse impacts from wildland fire use for resource benefit would be negligible to moderate. However, adverse impacts on resources important to peregrine falcons are more likely to occur during fires under this alternative, which has no site-specific fire implementation plan, than under Alternative E, which does.

Prescribed Fire

The No Action Alternative would allow prescribed fire in the Rincon Mountains. Peregrine falcons in the Rincons tend to nest early enough (April through June) that they usually are not affected by prescribed fire or related management activities, which occur in late June or after. Thus, prescribed fire operations would probably have negligible to minor, short-term adverse impacts on these birds with beneficial long-term, moderate impacts to the birds habitat.

Cumulative Impacts

Other foreseeable projects/management actions that could affect peregrine falcons at Saguaro National Park are currently being addressed in the park's GMP update (draft expected in 2005). Specific management issues included in the GMP that would be expected to potentially impact the falcons are wilderness management and backcountry trails and campsite planning. Impacts from these operations, along with implementation of the fire management plan, are likely to have mixed results depending on their temporal and spatial scale. Since the GMP update is in process, these cumulative impacts will be better covered in the draft EIS for the GMP.

The continuing growth of Tucson and ongoing efforts by the Tucson Chamber of Commerce to promote visitation to the Tucson area will ultimately result in increased impacts on the park’s vegetation and other natural and cultural resources. These impacts will primarily result from increased permitted visitor use at frontcountry interpreted sites and trails in the form of illegal, off-trail use by hikers, bikers, and/or horseback riders, although impacts in backcountry locations will likely increase as well. Continued growth in Tucson is also likely to result in significant development of private lands near the park boundaries, which will probably cause increased unpermitted visitation to backcountry areas within the park, and lead to more off-trail use. This increased human presence/disturbance could have adverse, short-term minor impacts on peregrine falcons.

Conclusion

Peregrine falcons in the Rincon Mountains of Saguaro National Park appear to tolerate human disturbance caused by all types of fire management activity (e.g., prescribed and wildfire, and tree thinning) fairly well, particularly since they nest early enough in the year to avoid most such activity during their breeding season. Under the No Action Alternative, adverse impacts would be expected to be short term and negligible to moderate in intensity. Catastrophic wildfire would be no more likely to occur under this alternative than under Alternative E, and would be less likely than under Alternative D. However, without a site-specific fire implementation plan, adverse impacts on resources important to peregrine falcons are more likely to occur under this alternative than under Alternative E. Overall, impacts could be adverse, short term, and negligible to moderate. The No Action Alternative would not produce any impairment of species of special concern whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Alternative D – Prescribed Fire and Non-Fire Treatments

Potential Impacts on Peregrine Falcons from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Impacts on peregrine falcons from catastrophic fire would be the same as under the No Action Alternative (negligible to moderate, adverse, and short to long term). However, Alternative D would not decrease the chance of catastrophic fire as well as Alternatives C and E because it would not allow wildland fire use for resource benefit and fuels would continue to accumulate. Therefore, the adverse impacts would have the potential to be greater with this alternative.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Impacts would be the same as under the No Action Alternative.

Wildland Fire Use for Resource Benefit

Wildland fire use for resource benefit would not be allowed under Alternative D.

Prescribed Fire

Impacts would be the same as under the No Action Alternative

Cumulative Impacts

Cumulative impacts would be the same as under the No Action Alternative.

Conclusion

Peregrine falcons in the Rincon Mountains of Saguaro National Park appear to tolerate prescribed fire and associated human disturbance/fire management activity fairly well, particularly since they nest early enough in the year to avoid most such activity during their breeding season. However, catastrophic fire, which is most likely under this alternative, could adversely impact them in the short and long term in a minor to major way. Alternative D would not produce any impairment of species of special concern

whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Alternative E – Prescribed Fire, Non-Fire Treatments, and Wildland Fire Use for Resource Benefit (Preferred Alternative)

Potential Impacts on Peregrine Falcons from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Impacts would be the same as under the No Action Alternative.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Impacts would be the same as under the No Action Alternative.

Wildland Fire Use for Resource Benefit

Alternative E would allow wildland fire use for resource benefit in the Rincon Mountains within the constraints of a site-specific fire implementation plan. Observations from previous years suggest that even fairly intensive fire management/suppression activities do not have long-term impacts on peregrine falcons. Subsequent adverse impacts would be short term and negligible to moderate, and would be less likely to occur than under the No Action Alternative because of the site-specific fire implementation plan.

Prescribed Fire

Impacts would be the same as under the No Action Alternative.

Cumulative Impacts

Cumulative impacts would be the same as under the No Action Alternative.

Conclusion

Peregrine falcons in the Rincon Mountains of Saguaro National Park appear to tolerate human disturbance caused by all types of fire management activity (e.g., prescribed and wild fire, and tree thinning) fairly well, particularly since they nest early enough in the year to avoid most such activity during their breeding season. Under Alternative E, adverse impacts would be expected to be short term and negligible to moderate in intensity. In addition, adverse impacts from catastrophic fire with the potential to harm resources essential to peregrine falcons would be least likely under this alternative due to the development of a site-specific fire implementation plan. Alternative E would not produce any impairment of species of special concern whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

SPECIES: Mexican Spotted Owl (*Strix occidentalis lucida*) – Federally Threatened

The biggest threat to Mexican spotted owls in the Rincon Mountains of Saguaro National Park is catastrophic fire, which could destroy their habitat, perhaps permanently. Owl habitat includes Woodland and forest, ponderosa pine forest, and mixed-conifer forest. Under all alternatives, catastrophic fire would be more likely in the Mexican spotted owls' mixed-conifer and pine-oak habitats, and less likely in their ponderosa pine habitats because the latter have already been treated with prescribed fire to reduce fuel loads.

Alternative C – No Action Alternative

Potential Impact on Mexican Spotted Owls from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

The No Action Alternative is very constrained in burning in Mexican spotted owl protected activity centers. The chance for catastrophic fire is increased in these areas due to the lack of fire. The lack of a current site-specific fire implementation plan that would specifically address issues related to the owls in Saguaro National Park would increase the chance for adverse impacts. Thus, impacts to the Mexican spotted owl from catastrophic fire under the No Action Alternative would be adverse, long term, and major.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Adverse impacts on Mexican spotted owls from fire management would occur under the No Action Alternative. Habitat degradation and noise disturbance can be caused by chain saw use, line preparation, human activity near nest sites, and air drops. Saguaro's current fire management plan/decision-making process does not involve a site-specific fire implementation plan, which means it is less efficient (i.e., it takes longer to identify and assess potential adverse impacts on resources) and could have greater impacts on the ground. Impacts would generally be adverse and short term, and range from negligible to moderate.

Wildland Fire Use for Resource Benefit

Although the No Action Alternative would allow wildland fire use for resource benefit, which could be beneficial in the long term to Mexican spotted owls in forested habitat types, it would also have adverse effects on owls due to the constraints of burning in the owl's protected activity centers and the lack of an implementation plan based on current scientific data. Impacts would therefore be adverse or beneficial, potentially long term, and moderate to major.

Prescribed Fire

Prescribed fire is currently used to restore and maintain Mexican spotted owl habitat in ponderosa pine forests. Fire effects data have confirmed that owl habitat parameters have been maintained and fuel loads have been reduced in these treatment areas (SNPFED 2002). Under the No Action Alternative, these prescribed burns and their effects would continue to help protect Mexican spotted owl habitat from catastrophic fire and place a buffer around nesting sites. Impacts would be beneficial, short term, and negligible to moderate for these areas.

However, under the current fire management plan, the park is very constrained in burning in Mexican spotted owl protected activity centers (the protected activity centers make up an area of 600 acres around an established nesting site). Thus, although the No Action Alternative would provide some short-term protection for the owls and their habitat via some prescribed burning, it would also leave them vulnerable to catastrophic fire in the long term and impacts could be adverse (see catastrophic fire section above).

Cumulative Impacts

Other foreseeable projects/management actions that could affect Mexican spotted owls at Saguaro National Park are currently being addressed in the park's GMP update (draft expected in 2005). Specific management issues included in the GMP that would be expected to potentially impact the owls are wilderness management, the park's packing operation, backcountry trails and campsite planning, and Manning Camp. Impacts from these operations, along with implementation of the fire management plan, are likely to have mixed results depending on their temporal and spatial scale. Since the GMP update is in process, these cumulative impacts will be better covered in the draft EIS for the GMP.

The continuing growth of Tucson and ongoing efforts by the Tucson Chamber of Commerce to promote visitation to the Tucson area will ultimately result in increased impacts on the park's vegetation and other natural and cultural resources. These impacts will primarily result from increased permitted visitor use at frontcountry interpreted sites and trails in the form of illegal, off-trail use by hikers, bikers, and/or horseback riders, although impacts in backcountry locations will likely increase as well. Continued growth in Tucson is also likely to result in significant development of private lands near the park boundaries, which will probably cause increased unpermitted visitation to backcountry areas within the park, and lead to more off-trail use. This increased human presence/disturbance could have adverse, long term, and minor to moderate impacts on Mexican spotted owls.

Conclusion

The current prescribed burn program does offer some short-term moderate benefits to the owls and their habitats. However, under this alternative, there would be the potential for major adverse effects from catastrophic fire in the short and long term. These risks would stem in part from the decision-making process under the current fire management plan, and from park managers' inability to apply prescribed burning and wildland fire use for resource benefit in Mexican spotted owl protected activity centers. The No Action Alternative would not produce any impairment of species of special concern whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Alternative D – Prescribed Fire and Non-Fire Treatments

Potential Impact on Mexican Spotted Owls from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Alternative D does not allow wildland fire use for resource benefit. With the current staffing levels, the prescribed fire and non-fire treatments can not adequately treat all areas that require fuel reduction treatments to reduce the chance for catastrophic fire. Thus, Alternative D has the greatest chance for catastrophic fire with adverse, long-term, moderate to major impacts.

Related Fire Management Actions

(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Under Alternative D, adverse impacts on Mexican spotted owls from fire management actions (e.g., habitat degradation and noise disturbance from chain saw use, line prep, human activity near nest sites, and air drops) are likely to be variable. Suppression activity would be initiated immediately upon a natural ignition, and depending on the location of the ignition in regards to nest site proximity and season of ignition with regards to breeding season, this could cause short- or long-term beneficial or adverse impacts on Mexican spotted owls, ranging from negligible to major. Under this alternative, fuel reduction treatments (e.g., use of hand tools and chainsaws) could be used to thin trees in order to protect sensitive resources (e.g., Mexican spotted owl roosts or nest trees, old growth, etc.). These treatments would occur during the non-breeding season so they would not disturb the owls. Such treatments would help protect Mexican spotted owls and their habitat from potential adverse effects from fire (prescribed, wild, or catastrophic).

Wildland Fire Use for Resource Benefit

Wildland fire use for resource benefit would not be an option under this alternative.

Prescribed Fire

Impacts would be the same as under the No Action Alternative, except that under Alternative D the park would have the potential for burning in the Mexican spotted owl protected activity centers. Thus, this alternative would provide additional long-term protection for the owls from catastrophic fire.

Cumulative Impacts

Cumulative impacts would be the same as under the No Action Alternative.

Conclusion

Under Alternative D, there would be greater potential for major adverse effects from catastrophic fire in the short and long term. This risk would stem from park managers' inability to use natural ignitions to reduce fuel loads throughout the park. However, under this alternative there would be the potential for conducting prescribed burns in Mexican spotted owl protected activity centers to reduce their fuel loads and the vulnerability of roost and nest trees to fire. Therefore, there would be more opportunity to protect Mexican spotted owls and their habitats, offering them some long- as well as short-term benefits. Alternative D would not produce any impairment of species of special concern whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Alternative E – Prescribed Fire, Non-Fire Treatments, and Wildland Fire Use for Resource Benefit (Preferred Alternative)

Potential Impact on Mexican spotted owls from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Under this alternative, when compared with Alternatives C and D, catastrophic fire would be less likely in the Mexican spotted owls' habitats thus, adverse impacts would be lessened. This would be due to the reduced fuel loads as a result of the use of prescribed fire and wildland fire use for resource benefits in all areas of the owls' habitat. Alternative E would have the least chance for catastrophic fire when compared to the No Action Alternative and Alternative D, impacts would be adverse, long term, and moderate to major.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Impacts would be the same as under Alternative D.

Wildland Fire Use for Resource Benefit

This alternative would allow for taking advantage of natural ignitions to reduce fuel loads when conditions (e.g., environmental and Mexican spotted owl breeding status) are favorable. Use of an updated, site-specific fire implementation plan would increase the potential benefits and decrease the potential adverse impacts on the owl, relative to the No Action Alternative. Impacts would generally be negligibly to moderately beneficial in the short and long term.

Prescribed Fire

Impacts would be the same as under Alternative D.

Cumulative Impacts

Cumulative impacts would be the same as under the No Action Alternative.

Conclusion

Under Alternative E, the risk of catastrophic fire would be minimized because opportunities for reducing fuel loads throughout the park would be maximized. Under this alternative, there would be the potential for taking advantage of natural ignitions to reduce fuel loads throughout the park (with the exception of Sonoran desertscrub and grassland) using an updated, site-specific fire implementation plan, and to conduct prescribed burns, including within protected activity centers. This treatment would reduce fuel loads and the vulnerability of Mexican spotted owl roost and nest trees to fire. Therefore, this alternative would offer the most options and best strategy for protecting Mexican spotted owls and their habitats in the park, would provide them with major long- as well as short-term benefits. Alternative E would not produce any impairment of species of special concern whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Species of Special Concern – Plants

Like most plant species in the sky islands of the Sonoran Desert region, species of special concern have adapted to natural fire regimes. In many areas, however, including Saguaro National Park, a history of fire suppression has led to dense, overgrown stands, with high accumulations of forest fuels. This affects special-status species by altering their habitats and placing them and their habitats at risk for high-intensity, stand-replacing fire. Stand-replacing fire can create unsuitable habitat conditions that last for

many years. In addition, fire control activities can adversely affect species of special concern through direct disturbance of plants and habitats. Even management actions designed to benefit habitat, such as prescribed fire, can have inadvertent adverse effects on special-status species (e.g., human activity during a prescribed burn that reduces fuel loads and helps protect habitats from catastrophic fire can also disturb the individual plant species). With these factors in mind, the following parameters were used to analyze the effects on plant species of special concern from the various alternatives proposed in the *Saguaro Fire Management Plan/EIS*.

Type of Impact

Adverse: Would result in detrimental changes to the abundance or distribution of special status species. This could occur through direct disturbance or mortality, or through destruction or alteration of habitat.

Beneficial: Would protect and/or enhance special status species abundance and distribution. This would occur through protection and restoration of habitat structure, succession, and distribution.

Duration of Impact

Short-term: Would cause immediate changes in the abundance and distribution of special status species, but a return to the pre-fire condition would occur within two years, without further impacts.

Long-term: Would cause changes in the abundance and distribution of special status species that would persist for more than two years.

Intensity of Impact

Negligible: Effects on species of special concern would be imperceptible or undetectable.

Minor: Effects would be slightly perceptible and/or limited in extent. Without further actions, adverse impacts would reverse, and the resources would recover.

Moderate: Effects would be readily apparent but limited in extent. Without further actions, adverse impacts would eventually reverse, and the resources would recover.

Major: Effects would be substantial, highly noticeable, and/or affecting a large area. Changes would have the potential to be irreversible or would not reverse without active management.

There are 7 species of special concern. These include Pima Indian Mallow, Trelease Agave, Needle-Spine Pineapple Cactus, Desert Night-Blooming Cereus, Pringle Lipfern, Thornber Pincushion Cactus and Tumamoc Globeberry. Fire Effects of these species are not known. The physical factor that will influence how these plants may be affected by fire is their location on the landscape and more specifically, their elevation. Four of them are found at higher elevations (above 4,000 feet) and three of them are not. Therefor, since the analysis would be the same for these two groupings, we combined them by elevational limits for analysis purposes to avoid unnecessary redundancy.

Species found above 4,000 feet in elevation:

SPECIES: Pima Indian Mallow (*Abutilon parishii*)

Pima Indian mallow is known from the Santa Catalina and Mazatzal Mountains (Kearney and Peebles 1960). This species is rare, occurring on rocky slopes and among boulders in steep canyons from 3,000 to 4,100 feet (Rondeau et al. 1996). About 12 individuals were found clustered on the RMD expansion parcel during a summer 1998 vegetation survey. [USFWS Species of Concern listed 1996

SPECIES: Trelease Agave (*Agave Schottii Var. trelease*)

Trelease agave is known from one location on the southern Catalina Mountains at 6,500 feet (Kearney and Peebles 1960), and is potentially found in both the RMD and TMD. A similar species, Schott's agave (*Agave schottii*, also called shin dagger and amole) is widespread in both districts of the park between 3,000 and 5,600 feet (this species is not listed). [USFWS Species of Concern listed 1996]

SPECIES: Needle-spine pineapple cactus (*Echinomastus erectocentrus var. erectocentrus*)

Needle-spine pineapple cactus is generally found in Pima County up to 4,500 feet (Kearney and Peebles 1960), and is potentially found in the RMD. [USFWS Species of Concern listed 1996]

SPECIES: Pringle lipfern *(Cheilanthes pringelei)*

Pringle lipfern is found in the mountains of Pima County at the base of cliffs from 3,000 to 5,000 feet (Kearney and Peebles 1960) and is common but scattered in the Tucson Mountains on rhyolitic slopes, cliff faces, and under boulders (Rondeau et al. 1996). It also potentially occurs in the Rincon Mountains. [USFWS Species of Concern listed 1996]

Alternative C – No Action Alternative

Potential Impacts on Pima Indian Mallow, Trelease Agave, Needle-spine pineapple cactus, and Pringle lipfern from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Although catastrophic fire would be no more likely to occur under the No Action Alternative than under Alternative E (both would reduce fuel loads with wildland fire use for resource benefit, prescribed fire, and non-fire treatments), and would be less likely than under Alternative D (does not allow for wildland fire use for resource benefit), adverse impacts on these species from catastrophic fire, if it were to occur, would be more likely under the No Action Alternative than Alternative E due to the use of fire in its entire range of habitat. Depending on the size (fires that impact a large area of the species habitat and individual species or fires that impact a small area), location (in areas where the species is found or not), and severity of fires (severe fires that degrade habitat or lower intensity fires that enhance habitat), adverse impacts on these species from wildfires in the park under this alternative would be short and/or long term, and range from negligible to major in severity.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Under the No Action Alternative, fire management activities that could impact these species would primarily be limited to suppression activities (e.g., line cutting, location of spike camps). These actions could have short- to long-term adverse impacts ranging from negligible to moderate in severity. They would have the potential to be greater with the No Action Alternative due to the lack of a site-specific fire implementation plan. This plan would provide managers with current information and guidelines on species of special concern that could be in the park.

Wildland Fire Use for Resource Benefit

The No Action Alternative would allow for the occurrence of some wildland fire use for resource benefit in the upper elevations of Sonoran desertscrub and the desert grassland, which comprise a large portion of

these species habitat. This alternative would lack a site-specific fire implementation plan that would help managers make decisions regarding specific species of special concern potentially found in the park, and thus would have the potential to adversely affect these species. Impacts could be adverse, short or long term, and negligible to major.

Prescribed Fire

Prescribed burns would not be expected to cause adverse effects on the slopes above 4,000 feet where these species may be found. In areas below 4.000 feet, the potential is greater for adverse effects due to the lack of fire prone vegetation types found there and to less fire tolerant species found there. The No Action Alternative would allow prescribed fires below 4,000 feet in the upper elevations of the Sonoran desertscrub and in the desert grassland where these species may be found. Thus, impacts could be adverse or beneficial to these species in the short or long term and minor to major depending on location. However, these effects are easily mitigated by avoidance.

Cumulative Impacts

Other foreseeable projects/management actions that could affect these species at Saguaro National Park are currently being addressed in the park's GMP update (draft expected in 2005). Specific management issues included in the GMP that would be expected to potentially impact these species are wilderness management and backcountry trails and campsite planning. Impacts from these operations, along with implementation of the fire management plan, are likely to have mixed results depending on their temporal and spatial scale. Since the GMP update is in process, these cumulative impacts will be better covered in the draft EIS for the GMP.

The continuing growth of Tucson and ongoing efforts by the Tucson Chamber of Commerce to promote visitation to the Tucson area will ultimately result in increased impacts on the park's vegetation and other natural and cultural resources. These impacts will primarily result from increased permitted visitor use at frontcountry interpreted sites and trails in the form of illegal, off-trail use by hikers, bikers, and/or horseback riders, although impacts in backcountry locations will likely increase as well. Continued growth in Tucson is also likely to result in significant development of private lands near the park boundaries, which will probably cause increased unpermitted visitation to backcountry areas within the park, and lead to more off-trail use. This increased human presence/disturbance could have adverse, long-term and minor to moderate impacts on plants, including these species of special concern.

Conclusion

The No Action Alternative would allow for the occurrence of some wildland fire use for resource benefit and prescribed fire in the upper elevations of Sonoran desertscrub and in the desert grassland, which comprise much of these species and their habitat. This treatment would potentially have adverse effects on desertscrub, which is a non-fire-adapted vegetation type and desert grassland, which needs further study. Since The No Action Alternative would not have a site-specific fire implementation plan that would allow park managers to properly consider these species and mitigate these effects by avoidance, it would have the potential to adversely affect them. Overall, impacts could be adverse, long term, and minor to major. The No Action Alternative would not produce any impairment of these plant species of special concern whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Potential Impacts on Pima Indian Mallow, Trelease Agave, Needle-spine pineapple cactus, and Pringle Lipfern from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

The chance for catastrophic fire is greatest in Alternative D due to the lack of wildland fire use for resource benefit. Although fire is uncommon in much of vegetation types where these species are located (below 4,000 feet and rocky, steep canyon slopes), fires that start in the higher elevations would have a better chance of spreading into these lower elevation types due to high fuel loads. Once fires spread into these types, the fire would be easier to stop due to the natural lack of fuel found there. However, this may not happen before adverse impacts occur to these species. Impacts would be adverse, short to long term and negligible to major depending on the size (how much of the habitat and individual plants are burned), location (in or out of the specific habitat for the species), and severity (how severe the fire burned in these areas).

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Impacts would be the same as the No Action Alternative. However, they would potentially be lessened due to the integration of a current site-specific implementation plan that would provide better guidance to managers regarding specific resource concerns in the park.

Wildland Fire Use for Resource Benefit

There would be no wildland fire use for resource benefit in Alternative D.

Prescribed Fire

Prescribed fire would be limited to elevations greater than 4,000 feet. These species are all potentially found above and below 4,000 feet. Thus prescribed fire operations would not have adverse effects on their potential entire populations. Impacts would be beneficial (by reducing the chance for catastrophic fires in elevations above 4,000 feet thus reducing the chance for fires to spread to below 4,000 feet), long term, and minor. However, potential adverse, long-term and moderate to major impacts could occur to individual species.

Cumulative Impacts

Cumulative impacts would be the same as the No Action Alternative.

Conclusion

Due to the lack of wildland fire use for resource benefit, the chance for catastrophic fire would increase throughout the park due to fuel buildup mostly at elevations above 4,000 feet. Although these species are potentially found at elevations and in vegetation types where fire is uncommon (below 4,000 feet), catastrophic fires could more readily spread to those elevations through the buildup of fuels at higher elevations. Impacts would be adverse, long term, and negligible to major. Alternative D would not produce any impairment of these plant species of special concern whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or

cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Alternative E – Prescribed Fire, Non-Fire Treatments, and Wildland Fire Use for Resource Benefit (Preferred Alternative)

Potential Impacts on Pima Indian Mallow, Trelease Agave, Needle-spine pineapple cactus, and Pringle Lipfern from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Catastrophic fire would be least likely in Alternative E due to the application of wildland fire use for resource benefit, prescribed fire, and non-fire treatments which all reduce fuel loads. Also, protection would be greater than in the No Action Alternative because fire would not be allowed below 4,000 feet where much of the habitat for these species is found**.** Impacts would be adverse, short to long term and negligible to major depending on the size (how much of the habitat and individual plants are burned), location (in or out of the specific habitat for the species), and severity (how severe the fire burned in these areas).

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Adverse impacts would be the same as Alternative D.

Wildland Fire Use for Resource Benefit

Alternative E allows for wildland fire use for resource benefit above 4,000 feet in elevation. This will reduce the chance for catastrophic fire (by reducing fuel loads) which could move into the lower elevations where much of the habitat for these species is found. Thus, impacts could be beneficial, long-term, and minor. However, in the areas above 4,000 feet where these species are potentially found, impacts could be adverse, long-term and moderate to individual species.

Prescribed Fire

Impacts would be the same as Alternative D.

Cumulative Impacts

Impacts would be the same as the No Action Alternative.

Conclusion

Alternative E provides the greatest opportunity, when compared to the No Action Alternative and Alternative D, to reduce the risk of catastrophic fire throughout the park by using wildland fire use for resource benefit, prescribed fire, and non-fire treatments. In addition the site-specific fire implementation plan and the elimination of fire from non-fire adapted vegetation types provides the best protection for the population of these species. Overall, impacts would be beneficial, long-term, and minor to moderate. Alternative E would not produce any impairment of these plant species of special concern whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the

park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Species found below 4,000 feet in elevation:

SPECIES: Desert night-blooming cereus (*Cereus greggii var. greggii*)

Desert night-blooming cereus is found on flats and in washes at TMD around 2,450 and 2,600 feet (Rondeau et al. 1996), and is difficult to locate because it grows into shrubs and resembles one of the stems of the shrub. [USFWS Species of Concern listed 1996]

SPECIES: Thornber pincushion cactus (*Mammillaria thornberi*)

Thornber pincushion cactus is an uncommon small cactus found from 2,200 to 2,350 feet on fine-soiled lower bajadas (Rondeau et al. 1996), and is unusual in that its clumps are actually single non-branching stems. It was found scattered on the west side bajadas of TMD during summer 1998 vegetation surveys. [Arizona Salvage Restricted]

SPECIES: Tumamoc globeberry (*Tumamoca macdougalii*)

Tumamoc globeberry is an uncommon and scattered vine in the Tucson Mountains, 2,150 to 2,600 feet, but it is easily missed because it climbs into trees and shrubs (Rondeau et al. 1996). [Arizona Salvage Restricted]

Alternative C – No Action Alternative

Potential Impacts on Desert night-blooming cereus, Thornber pincushion cactus, and Tumamoc globeberry from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Although catastrophic fire would be no more likely to occur under the No Action Alternative than under Alternative E (both would reduce fuel loads with wildland fire use for resource benefit, prescribed fire, and non-fire treatments), and would be less likely than under Alternative D (does not allow for wildland fire use for resource benefit), adverse impacts on these species from catastrophic fire, if it were to occur, would be more likely under the No Action Alternative than Alternative E due to the use of fire in parts of their habitat. Depending on the size (fires that impact a large area of the species habitat and individual species or fires that impact a small area), location (in areas where the species is found or not), and severity of fires (severe fires that degrade habitat or lower intensity fires that enhance habitat), adverse impacts on these species from wildfires in the park under this alternative would be short and/or long term, and range from negligible to major in severity.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Under the No Action Alternative, fire management activities that could impact these species would primarily be limited to suppression activities (e.g., line cutting, location of spike camps). These actions could have short- to long-term adverse impacts ranging from negligible to moderate in severity. They would have the potential to be greater with the No Action Alternative due to the lack of a site-specific fire

implementation plan. This plan would provide managers with current information and guidelines on species of special concern that could be in the park.

Wildland Fire Use for Resource Benefit

The No Action Alternative would allow for the occurrence of some wildland fire use for resource benefit in the upper elevations of Sonoran desertscrub and the desert grassland, which comprise a large portion of these species habitat. This alternative would lack a site-specific fire implementation plan that would help managers make decisions regarding specific species of special concern potentially found in the park, and thus would have the potential to adversely affect these species. Impacts could be adverse, short or long term, and negligible to major.

Prescribed Fire

The No Action Alternative would allow prescribed fires below 4,000 feet in the upper elevations of the Sonoran desertscrub and in the desert grassland of the Rincon Mountain District where these species may be found. However, these species have only been found in the Tucson Mountain District where prescribed fire is not allowed. Thus, impacts could be adverse (to potential species in the Rincon Mountain District) or beneficial (due to lack of prescribed fire in the Tucson Mountain District) to these species in the short or long term and minor to major depending on location. However, these effects are easily mitigated by avoidance.

Cumulative Impacts

Other foreseeable projects/management actions that could affect these species at Saguaro National Park are currently being addressed in the park's GMP update (draft expected in 2005). Specific management issues included in the GMP that would be expected to potentially impact these species are wilderness management and backcountry trails and campsite planning. Impacts from these operations, along with implementation of the fire management plan, are likely to have mixed results depending on their temporal and spatial scale. Since the GMP update is in process, these cumulative impacts will be better covered in the draft EIS for the GMP.

The continuing growth of Tucson and ongoing efforts by the Tucson Chamber of Commerce to promote visitation to the Tucson area will ultimately result in increased impacts on the park's vegetation and other natural and cultural resources. These impacts will primarily result from increased permitted visitor use at frontcountry interpreted sites and trails in the form of illegal, off-trail use by hikers, bikers, and/or horseback riders, although impacts in backcountry locations will likely increase as well. Continued growth in Tucson is also likely to result in significant development of private lands near the park boundaries, which will probably cause increased unpermitted visitation to backcountry areas within the park, and lead to more off-trail use. This increased human presence/disturbance could have adverse, long-term and minor to moderate impacts on plants, including these species of special concern.

Conclusion

The No Action Alternative would allow for the occurrence of some wildland fire use for resource benefit and prescribed fire (in the Rincon Mountain District) in the upper elevations of Sonoran desertscrub and in the desert grassland. This treatment would potentially have adverse effects on these species that are found in the desertscrub, which is a non-fire-adapted vegetation type and desert grassland, which needs further study. Since the No Action Alternative would not have a site-specific fire implementation plan that would allow park managers to properly consider these species and mitigate these effects by avoidance, it would have the potential to adversely affect them. Overall, impacts could be adverse, long

term, and minor to major. The No Action Alternative would not produce any impairment of these plant species of special concern whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Alternative D – Prescribed Fire and Non-Fire Treatments

Potential Impacts on Desert night-blooming cereus, Thornber pincushion cactus, and Tumamoc globeberry from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

The chance for catastrophic fire is greatest in Alternative D due to the lack of wildland fire use for resource benefit. Although fire is uncommon in the vegetation types where these species are located (below 4,000 feet), fires that start in the higher elevations would have a better chance of spreading into these lower elevation types due to high fuel loads. Once fires spread into these types, the fire would be easier to stop due to the natural lack of fuel found there. However, this may not happen before adverse impacts occur to these species. Impacts would be adverse, short to long term and negligible to major depending on the size (how much of the habitat and individual plants are burned), location (in or out of the specific habitat for the species), and severity (how severe the fire burned in these areas).

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Impacts would be the same as the No Action Alternative. However, they would potentially be lessened due to the integration of a current site-specific implementation plan that would provide better guidance to managers regarding specific resource concerns in the park.

Wildland Fire Use for Resource Benefit

There would be no wildland fire use for resource benefit in Alternative D.

Prescribed Fire

Prescribed fire would be limited to elevations greater than 4,000 feet. These species are all potentially found below 4,000 feet and are known to be located only in the Tucson Mountain District. Thus prescribed fire operations would not have adverse effects on their potential populations or current populations. Impacts would be beneficial (by reducing the chance for catastrophic fires in elevations above 4,000 feet thus reducing the chance for fires to spread to below 4,000 feet), long term, and minor.

Cumulative Impacts

Cumulative impacts would be the same as the No Action Alternative.

Conclusion

Due to the lack of wildland fire use for resource benefit, the chance for catastrophic fire would increase throughout the park due to fuel buildup mostly at elevations above 4,000 feet. Although these species are potentially found at elevations and in vegetation types where fire is uncommon (below 4,000 feet),

catastrophic fires could more readily spread to those elevations through the buildup of fuels at higher elevations. Impacts would be adverse, long term, and negligible to major. Alternative D would not produce any impairment of these plant species of special concern whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Alternative E – Prescribed Fire, Non-Fire Treatments, and Wildland Fire Use for Resource Benefit (Preferred Alternative)

Potential Impacts on Desert night-blooming cereus, Thornber pincushion cactus, and Tumamoc globeberry from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Catastrophic fire would be least likely in Alternative E due to the application of wildland fire use for resource benefit, prescribed fire, and non-fire treatments which all reduce fuel loads. Also, protection would be greater than in the No Action Alternative because fire would not be allowed below 4,000 feet where the habitat for these species is found**.** Impacts would be adverse, short to long term and negligible to major depending on the size (how much of the habitat and individual plants are burned), location (in or out of the specific habitat for the species), and severity (how severe the fire burned in these areas).

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Adverse impacts would be the same as Alternative D.

Wildland Fire Use for Resource Benefit

Alternative E allows for wildland fire use for resource benefit above 4,000 feet in elevation. This will reduce the chance for catastrophic fire (by reducing fuel loads) which could move into the lower elevations where the habitat for these species is found. Thus, impacts would be beneficial, long-term, and minor.

Prescribed Fire

Impacts would be the same as Alternative D.

Cumulative Impacts

Impacts would be the same as the No Action Alternative.

Conclusion

Alternative E provides the greatest opportunity, when compared to the No Action Alternative and Alternative D, to reduce the risk of catastrophic fire throughout the park by using wildland fire use for resource benefit, prescribed fire, and non-fire treatments. In addition the site-specific fire implementation plan and the elimination of fire from non-fire adapted vegetation types where these species are located provides the best protection for these species. Overall, impacts would be beneficial, long-term, and minor to moderate. Alternative E would not produce any impairment of these plant species of special concern

whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Physical Environment – Watersheds, Soils, and Water Quality/Quantity

The unique deciduous riparian woodland and desert riparian communities in Saguaro National Park exist because of ephemeral water located in canyons and washes. Free water may flow in washes for a few hours following summer thunderstorms, and for weeks following heavy winter rains. Some water is retained for longer periods in the deep sands of major washes and in tinajas located in rocky substrate. The water supply for Manning Camp, located at 8,000 feet in the Rincon Mountain District, comes from a small reservoir located behind a concrete dam. Several perennial springs (e.g., Italian Spring, Turkey Creek Spring) exist in the Rincon Mountains and are used by both hikers and wildlife. In the Tucson Mountain District, a perennial seep is located in King Canyon.

Soils of the mountain slopes are shallow, coarse textured, and well drained. Soils of the bajada are alluvial. These range from talus and coarse rock at the base of the mountain slopes to increasingly finer textures at lower elevations. Cryptogamic soils contribute to crustal formation and soil retention and are extremely important sites of nitrogen fixation in arid areas. Disturbance of such crusts may affect both the patterns and rate of nutrient cycling (Wilshire 1983).

The predominant indirect effect of fire on the physical environment results from the removal of above ground vegetation and litter, thereby exposing the soil surface and increasing solar radiation. This can cause increased rates of erosion; increase microbial activity (which increases nutrient cycling rates); change the quality of light striking the soil by increasing the ratio of red to far-red light, which can stimulate seed germination in some species; and increase water yields by decreasing woody species.

Watersheds, soils, and water quality/quantity are interrelated in their reactions to the treatments proposed by the alternatives. Due to these relationships, the analysis was done on them as a group. Impacts upon soils and watersheds were analyzed by considering the likely scale of the effect—whether fire would affect all or part of the watershed slope (ridge, mid-slope, bottom)—and as a result, the likely effect upon water yield, peak flows, sediment yield, nutrient yield, and/or stream system response.

Type of Impact

Adverse:	Moves the system outside of or away from the natural range of variability for watershed conditions (water yield, peak flows, sediment yield, nutrient yield, or stream system response).
Beneficial:	Moves the system inside of or toward the natural range of variability for watershed conditions (water yield, peak flows, sediment yield, nutrient yield, or stream system response).

Duration of Impact

Short-term:	Can be reversed within two fire return intervals.
Long-term:	Requires three or more fire return intervals to reverse effects, or is predicted to stay the same or improve.

Intensity of Impact

Negligible:	Imperceptible or undetectable effects on the physical environment.

Minor: Effects are slightly perceptible and limited in extent. Without further impacts, adverse impacts would reverse and the resources would recover.
Moderate: Effects are readily apparent, but limited in extent. Without further impacts, adverse impacts would eventually reverse and the resource would recover.
Major: Effects are substantial, highly noticeable, and affecting a large area. Changes would not reverse without active management.

Alternative C – No Action Alternative

Potential Impacts on the Physical Environment from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Catastrophic fires in Saguaro National Park are characterized by extensive burned areas that may be continuous from ridgeline to slope bottom and may include riparian areas. Water yield and peak flows increase following high-severity fire because soil infiltration rates decrease and because there is little vegetation to intercept precipitation and little organic litter (duff) to slow water runoff. Extensive and continuous areas of hydrophobic soils are created, further decreasing infiltration and increasing water yields.

With the continued management strategy of prescribed fire, wildland fire use for resource benefit, and suppression treatments, the chances for catastrophic fire would continue to decrease. However, the No Action Alternative would not allow for an updated, site-specific fire implementation plan that would integrate new information about fire effects on watersheds. The lessons learned from past fire events and current scientific knowledge would not be incorporated into the implementation plan, which would increase risk for catastrophic fire. Therefore, impacts could be adverse, long term, and moderate to major.

Related Fire Management Actions

(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Hand line, helispots, spike camps, hand thinning, snagging, and mop up would disturb surface vegetation and soils, potentially causing an increase in erosion. Increased erosion could cause an increase in sedimentation, which could negatively affect water quality and may reduce soil productivity and function. Snagging could provide barriers to erosion on hill slopes. The effects of these activities would be generally local, and would rarely have watershed-scale implications, unless unmitigated. Under the No Action Alternative, all of these activities would be mitigated through avoidance and/or rehabilitation measures such as waterbars. Overall, the impacts of these related fire management actions on the physical environment would be adverse, short term, and minor.

Retardant and suppressant compounds would not typically move into groundwater or into surface water from runoff, as they would be used carefully around surface waters because of potential effects upon aquatic organisms. Most fire retardants contain fertilizer type compounds, including ammonia and nitrogen, which can cause changes in pristine terrestrial and aquatic ecosystems, especially those otherwise low in nitrate/ammonia-type nutrients. Additionally, ammonia itself can be quite toxic in aquatic habitats. Some retardants contain preservatives that release cyanide. The half-lives for these compounds in soil are short. When retardants and suppressants are in use under the No Action Alternative, pilots and engine crews would be directed to avoid dropping retardants within 300 feet of springs, streams, and seeps. Potentially adverse and moderate to major impacts on the physical

environment could be arrested through these wide buffer zones, making the impacts of using retardant and suppressant adverse, short term, and negligible to minor.

Wildland Fire Use for Resource Benefit

Fire in the duff layers would spread across watersheds under variable conditions so that burn severity of wildland fires would range from light to locally severe. Patches of extremely hydrophobic soils would be created by fire in areas of high fuel loading, where soils would be exposed to heating for a longer time and at higher temperatures than in areas with lighter fuels. Water yield and peak flows would increase only slightly and within a small range of variability, so sediment and nutrient yield fluctuations would be short term and generally watershed specific. As a result, there would be negligible channel response, and a short-term recovery of riparian systems. Physical environment impacts within burned areas would be beneficial, short term, and moderate. Effects would not typically be on a watershed scale; however, without an updated, site-specific fire implementation plan to provide guidelines for reducing watershed effects, the risk of adverse, long-term and major impacts would exist.

Prescribed Fire

Due to the controlled nature of prescribed fire in terms of fuel moisture, weather conditions, time of day, spatial pattern of ignition, and other factors, prescribed fire generally would not result in high-severity fire that would alter watershed conditions. However, soils would not be subjected to the natural range of variability present with natural fire. Under the No Action Alternative, prescribed fire would be used as a means to reduce the severity of fire and would limit the potential for catastrophic fire that could burn along the entire vertical gradient in watersheds. Burn blocks would continue to be limited in size, and burns would not be continuous up the vertical gradient of the watershed (i.e., from ridge through mid-slope, and into or through the slope bottom/riparian zone). The effects of prescribed fire on the physical environment would be beneficial, long term, and moderate. Fire in the duff layers would spread under variable conditions, but not with enough severity to cause extensive areas of hydrophobic soil. However, in areas of unnaturally high fuel loads, soils will be exposed to higher temperatures and longer resident times than in the normal range of variability, and some adverse, short term and moderate effects could been seen on a small scale.

Cumulative Impacts

The physical environment within Saguaro National Park has been affected by past fire activities. The effect of 100 years of fire exclusion cannot be overstated. With the exception of Sonoran desertscrub, and potentially the desert grassland, all other vegetation types have moderate to high departures from normal fire return intervals. This indicates that large areas of the park have high potential for catastrophic wildland fires.

Other foreseeable projects/management actions that could affect the physical environment at Saguaro National Park are currently being addressed in the park's GMP update (draft expected in 2005). Specific management issues included in the GMP that would be expected to potentially impact the physical environment are wilderness management, the park's packing operation, and backcountry trails and campsite planning.

The continuing growth of Tucson and ongoing efforts by the Tucson Chamber of Commerce to promote visitation to the Tucson area will ultimately result in increased impacts on the park’s vegetation and other natural and cultural resources. These impacts will primarily result from increased permitted visitor use at frontcountry interpreted sites and trails in the form of illegal, off-trail use by hikers, bikers, and/or horseback riders, although impacts in backcountry locations will likely increase as well. Continued

growth in Tucson is also likely to result in significant development of private lands near the park boundaries, which will probably cause increased unpermitted visitation to backcountry areas within the park, and lead to more off-trail use.

Areas in the park that have missed several fire intervals have the potential to adversely affect aspects of the physical environment in the long run with moderate to major intensity due to increased fuel buildup. These effects, in combination with the impacts of the No Action Alternative, would result in beneficial, long-term, and minor cumulative impacts due to the use of prescribed fire and wildland fire use for resource benefit to reduce the fuel load. However, the chance of adverse impacts exists with the No Action Alternative due to lack of an updated, site-specific fire implementation plan that would help managers make decisions in a timely manner, taking into account past experiences and current scientific data about fire effects on the physical environment. Increased human presence/disturbance could have adverse, short or long term negligible to moderate impacts on the physical environment. However, the no-action alternative will not have an effect either way when combined with those adverse effects.

Conclusion

In aggregate, actions implemented under this alternative would have adverse, long-term, and moderate to major impacts on the physical environment. This conclusion is based on a combination of beneficial, long-term, and moderate impacts with the proper use of wildland fire for resource benefit and prescribed fire, and the potential for adverse, long-term, and major impacts without an updated, site-specific fire implementation plan. The No Action Alternative would not produce any impairment of the physical environment whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Alternative D – Prescribed Fire and Non-Fire Treatments

Potential Impacts on the Physical Environment from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

This alternative would involve the most suppression actions and the fewest fuel reduction treatments. The effects of the treatments would not typically be on a watershed scale. Since park staff would only be able to treat a few acres on an annual basis, the chance of catastrophic fire would not decrease. The effects of catastrophic fire could be on a watershed scale due to high fuel buildups in untreated areas. During severe fire seasons when fuels are dry and fire-fighting resources are scarce, the potential for adverse, long term, and moderate to major impacts on the physical environment would exist and be higher under Alternative D than under Alternatives C and E.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Impacts would be the same as under the No Action Alternative, but could be amplified due to the increase in suppression activities or reduced due to a site-specific fire implementation plan that would specifically address how to best avoid these adverse impacts on the physical environment.

Wildland Fire Use for Resource Benefit

Wildland fire use for resource benefit would not be used under this alternative.

Prescribed Fire

Prescribed fire impacts would be the same as under the No Action Alternative.

Cumulative Impacts

The past, present, and reasonably foreseeable projects affecting the physical environment at Saguaro National Park under Alternative D would be the same as discussed under the No Action Alternative. Overall, the impacts of these projects on the physical environment would be beneficial, long term, and minor to moderate. Alternative D would lead to a higher potential for catastrophic fire over a large area due to the inability of fire staff to treat enough areas in a timely manner to reduce hazardous fuel loads. This would result in negative soil effects and the potential for long-term water quality degradation. When these impacts are combined with the beneficial impacts of the other projects mentioned above, cumulative impacts would have the potential to be adverse, long-term, and moderate to major.

Conclusion

In aggregate, actions implemented under Alternative D would have adverse, long-term, and moderate impacts. This conclusion is based on a combination of beneficial, long-term, moderate to major impacts in the treatment areas, and the potential for areas of adverse, long-term, and major impacts in the suppression units, where large, high-severity fires would likely occur during the life of the plan. Alternative D would not produce any impairment of the physical environment whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Alternative E – Prescribed Fire, Non-Fire Treatments, and Wildland Fire Use for Resource Benefit (Preferred Alternative)

Potential Impacts on the Physical Environment from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Like the No Action Alternative, Alternative E would utilize prescribed fire, wildland fire use for resource benefit, appropriate suppression response, and non-fire treatments. However, this alternative would have the added benefit of an updated, site-specific fire implementation plan that incorporates new policy direction, monitoring data, and best available science. These additions would help fire and resource managers better manage fire as a resource benefit tool.

Because of the actions that would be used in burn units to reduce fuels, there would be the potential for creating strategically located burns to break up the continuity of fuels and vegetation along the vertical gradients within the watersheds. These burned areas would not eliminate the potential for high-severity fires in the watershed, but they would reduce the potential for large fires burning all along the vertical gradient over large areas of the watershed. Areas of hydrophobic soils would likely be created from

unwanted fire or unpredicted fire behavior, but with breaks in the vertical gradient, smaller increases in water yield and peak flows would result. This, coupled with the continued use of wildland fire use for resource benefit, would reduce hazardous fuels over a larger extent of the park, thereby reducing the chance of catastrophic fire events. Impacts on the physical environment would be beneficial, long term, and moderate.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Impacts would be the same as under the No Action Alternative with the possibility of reduced adverse effects due to a site-specific fire implementation plan that would provide guidance on how to best avoid these adverse impacts in the park.

Wildland Fire Use for Resource Benefit

Impacts would be the same as under the No Action Alternative, with the added benefit of an updated, site-specific fire implementation plan. The addition of this plan would help managers at the park make better-informed decisions on application of wildland fire use for resource benefit.

Prescribed Fire

Impacts would be the same as under the No Action Alternative.

Cumulative Impacts

The past, present, and reasonably foreseeable projects affecting the physical environment at Saguaro National Park would be the same as discussed under the No Action Alternative. Overall, the effects of these projects on the physical environment would be beneficial, long term, and minor to moderate. Alternative E would treat the same amount of acres as the No Action Alternative with the added benefit of an updated, site-specific fire implementation plan that would reduce the risk of adverse effects. These actions would have net beneficial impacts on watershed values through reducing the potential for high-severity fire.

Conclusion

Under Alternative E, the potential would continue to exist for high-severity fires with adverse, moderate, and potentially long-term impacts, but the overall impacts on soil and watershed conditions would be beneficial, long term, and minor to moderate. High-severity fires may occur during the life of the plan, but the treatments proposed would reduce their size and effects upon soils and watersheds, and their potential for adverse impacts upon water yield, peak flow, nutrient yield, sediment yield, and stream system response. Alternative E would not produce any impairment of the physical environment whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Air Quality

Smoke from wildfires and prescribed burning is a complex mixture of carbon, tars, liquids, and gases. The major pollutants are particulates, volatile organic compounds (VOCs), and carbon monoxide (CO). Nitrogen oxides (NO_x) are also produced, but in a relatively small quantity when compared to other pollutants. Particulates can remain suspended in the atmosphere for a few days to several months, and can

reduce visibility as well as contribute to respiratory problems. Very small particulates can travel great distances and add to regional haze problems. Regional haze can also result from multiple burn days and/or multiple owners burning within an airshed over too short a period of time to allow for dispersion.

By virtue of its 1976 wilderness designation, Saguaro National Park is officially designated a Class I airshed under the Clean Air Act Amendments of 1977. This most stringent air quality classification is aimed at protecting national parks and wilderness areas from air quality degradation. The goal of preventing deterioration of air quality in this area, however, faces the practical considerations that result from adjoining the Tucson metropolitan area, which significantly impacts air quality throughout the Tucson Basin. Under any of the alternatives, smoke resulting from wildland and prescribed fires will be managed to comply with all local, state, and federal air quality regulations. The park controls smoke emissions and direction during prescribed fires through ignition patterns; wildland fires are suppressed if smoke impacts would be adverse to local human populations. Due to the location of proposed FMU 1, smoke from this unit would generally move away from the Tucson Basin. However, proposed FMU 2's proximity to the city means smoke from some areas could settle in Tucson before firefighters can fully suppress the fire.

There is large variability in the number of acres that may burn annually from suppression fires or wildland fire use actions due to the long fire return intervals and variable weather patterns in the park. Fire occurrence in the Rincon Mountains is cyclic, occurring primarily during the summer thunderstorm season (June through September).

Normally, smoke impacts on the park and surrounding communities are typically minimal. However, wildland fire use for resource benefit and fires that escape initial attack, or that must be placed in confinement or under a containment strategy due to difficult terrain, firefighter safety concerns, or lack of resources, gain size in acreage and consequently increase quantities of air pollution released. Air pollution increases normally last only a few days, or until the fire is contained and mop up begins. Smoke from suppression fires can also reduce visibility in the park. The extent of the impact on visibility depends on the fire size, duration, and location. Most small fires produce some visible smoke in the sub-drainage in which the fire is located, but have minimum impact on air quality or overall visibility. Larger fires can impact views for a larger area, depending on daily windflow patterns (windflow patterns are typically west/southwest during the park's fire season). Inversions, which often form in valleys at night, have the effect of trapping smoke until daytime warming improves air circulation. For this reason, the impact on visibility is usually greatest in the early morning and early evening.

Under all alternatives, the annual number of fire suppression acres (in all vegetation zones combined) is expected to be between 0 and 1,225 acres (10-year average). Under Alternatives C and E, the annual acres of wildland fire use for resource benefit would range from 0 to 2000 acres. During years when wet weather conditions prevail, the number of wildland fire use for resource benefit acres would be negligible. Under all alternatives, 0 to 4,000 acres would be treated with prescribed fire.

Under all alternatives, all prescribed burning and debris disposal would comply with regulations contained in the Arizona State Department of Environmental Quality Smoke Management Plan. A prescribed burn plan would be prepared for each project. These site-specific plans would include all of the required elements listed in *Reference Manual 18 — Wildland Fire Management*.

Table IV-1. Smoke Emissions, Calculated 15-year Average**

	Total Tons Emitted Annually		
	PM10	PM2.5	CO
Wildland Fire Use for Resource Benefit (Alternatives C & E)	362	362	2,220
Prescribed Fire (Alternatives C, D, & E)	164	164	1,004
Fire Suppression (Alternatives C & E)	551	551	3,382
Fire Suppression (Alternative D)	700	700	5,000

** It is important to note that these averages would be considerably lower if two unusually active fire years (1994 and 1999) were taken out of the calculation.

The impacts of the alternatives on air quality in the park were analyzed by considering smoke impacts based on the 15-year average of smoke emissions for the park, while taking into consideration future conditions to the best of the parks ability.

Type of Impact
- Adverse: Increases emissions or raises pollutant concentrations.
- Beneficial: Reduces emissions or lowers pollutant concentrations.

Duration of Impact
- Short-term: Associated with the duration of a specific fire event.
- Long-term: Occurs at the time that the park restores the natural fire regime.

Intensity of Impact
- Negligible: Imperceptible or undetectable effects.
- Minor: Slightly perceptible and limited in extent.
- Moderate: Readily apparent, but limited in extent.
- Major: Substantial, highly noticeable, and affecting a large area.

Alternative C – No Action Alternative

Potential Impacts on Air Quality from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Under the current program of fire suppression, wildland fire use for resource benefit, and prescribed fire, the chance of catastrophic fire would continue to decrease due to decreased fuel loads. These reduced fuel loads mean less smoke emissions in the air during fire events. Since the chance for catastrophic fire would be reduced, impacts on air quality would be beneficial, short and long term, and negligible to moderate.

Related Fire Management Actions

(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Effects on air quality from chainsaws and aircraft (emission producing elements) would be minimal when compared to effects from fire. Effects would be limited to the time of a fire incident. Overall, impacts would be adverse, short term, and negligible.

Wildland Fire Use for Resource Benefit

Wildland fire for resource benefit would have adverse, short term, and minor to moderate impacts on air quality. Anticipated duration would be between one and fourteen days. Some residual smoke may remain for a day or two from heavier fuels that are still smoldering. Through continued use of wildland fire for resource benefit would reduce fuel loads over time and would therefore have beneficial, long term and moderate impacts.

Prescribed Fire

The use of prescribed burning projects would have the same impacts as wildland fire use for resource benefit.

Cumulative Impacts

Pollutant sources from outside the park are additive, including fires on U.S. Forest Service and state lands, metropolitan Tucson vehicle and factory emissions, and construction of new housing developments near park boundaries. Collectively, these developments bring with them population growth and increase vehicle emissions in the area. Activities in the area in combination with the fire management program in the park have both short- and long-term impacts that would remain adverse and moderate.

Conclusion

Emissions under the No Action Alternative would be greater than under Alternative D in the short run (due to more fire), but through continued use of prescribed fire and wildland fire use for resource benefit that would result in decreased fuel loads, the chance of long-duration catastrophic fire events would decrease. Therefore, impacts would be adverse, short term, and negligible to minor. The No Action Alternative would not produce any impairment of air quality whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Alternative D – Prescribed Fire and Non-Fire Treatments

Potential Impacts on Air Quality from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

This alternative would not allow wildland fire for resource benefit. Although this may result in fewer impacts on air quality in the short term, it would increase the chance of catastrophic fires in the long run. Impacts would be adverse, short term, and moderate to major.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Impacts would be essentially the same as under the No Action Alternative. However, they would possibly be amplified slightly due to the increase in fire suppression activities such as chainsaw and aircraft use.

Wildland Fire Use for Resource Benefit

Wildland fire use for resource benefit would not be used under this alternative.

Prescribed Fire

Impacts would be the same as under the No Action Alternative.

Cumulative Impacts

Cumulative impacts would be the same as discussed under the No Action Alternative.

Conclusion

Alternative D would cause the least amount of emissions over the short run, but with continued suppression and increased fuel loads, the chance of long-duration catastrophic fire would increase, which would increase emissions over the long run. Minor to moderate changes in air quality measurements (from current conditions) that could be attributed to the park's fire activity would be expected in the long run. Impacts would be adverse, short term, and minor to moderate. Alternative D would not produce any impairment of air quality whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Alternative E – Prescribed Fire, Non-Fire Treatments, and Wildland Fire Use for Resource Benefit (Preferred Alternative)

Potential Impacts on Air Quality from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Impacts would be the same as under the No Action Alternative.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Impacts would be the same as under the No Action Alternative.

Wildland Fire Use for Resource Benefit

Impacts would be essentially the same as under the No Action Alternative. However, with an updated, site-specific fire implementation plan that takes into account new information on fire behavior and air quality issues, adverse impacts would potentially be lessened.

Prescribed Fire

Impacts would be the same as under the No Action Alternative.

Cumulative Impacts

Cumulative impacts would be the same as discussed under the No Action Alternative.

Conclusion

Under Alternative E, emissions would be the same as under the No Action Alternative—they would be greater than Alternative D in the short run, but through continued use of prescribed fire and wildland fire use for resource benefit that would result in decreased fuel loads, the chance of long-duration catastrophic fire events would decrease. Therefore, overall impacts would be adverse, short term, and negligible to minor. However, with an updated, site-specific fire implementation plan that takes into account new information on fire behavior and air quality issues, adverse impacts would potentially be lessened. Alternative E would not produce any impairment of air quality whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Cultural Resources

Within Saguaro National Park there is archaeological evidence of human habitation that dates back at least 8,000 years. This evidence includes a wide variety of sites reflecting numerous cultures, both prehistoric and historic. The prehistoric sites are primarily Archaic and Hohokam artifact scatters with low surface visibility and expression. The artifact scatters represent villages, campsites, farmsteads, and stone quarries. Other prehistoric sites include rock art (petroglyphs and pictographs), rockshelters, and bedrock milling sites. The historic sites include ranching and mining sites, limekilns, CCC features, and trash scatters. The Freeman Homestead and Kilns are on the State Register of Historic Places.

Land below 4,000 feet in the Rincon Mountain District is on the National Register of Historic Places as the Rincon Mountains Foothills Archaeological District, at the regional level of significance. Thirty percent of the Rincon Mountain District has been surveyed for archaeological remains. Trail corridor and campground surveys above 4,000 feet have indicated that there are few sites at higher elevations. Manning Cabin, built in the early 1900's, is the only Park building listed on the National Register of Historic Places. A series of CCC-era structures (e.g., picnic ramadas, check dams, water catchments) are located at the Tucson Mountain District and are nominated for inclusion on the National Park Service List of Classified Structures. Only 22% of the Tucson Mountain District has been surveyed, principally in use corridors, along boundaries, and in some restricted block surveys.

It is important to note that only 16% of fires in the park's history have occurred below 4,000 feet, which is the area rich in cultural resources. None of the alternatives would allow fire use in these areas, so the only impacts would be from catastrophic wildfire or suppression activities.

Cultural resource impacts in this document are described in terminology consistent with the regulations of the Council on Environmental Quality, and in compliance with the requirements of both NEPA and Section 106 of the National Historic Preservation Act.

Type of Impact

Impacts on cultural resources are considered either adverse or beneficial when analyzed under NEPA. However, impact type is not viewed this way when conducting analysis under Section 106 of the National Historic Preservation Act. For the purpose of assessing effects on historic properties under the National Historic Preservation Act, impacts are either adverse or "not adverse." Under both NEPA and the National Historic Preservation Act, impacts are considered adverse when they diminish the significant characteristics of a historic property.

Duration of Impact

The duration impacts on cultural resources from fire can be short term, long term, or permanent. Analysis of the duration of impacts is required under NEPA, but is not required and is not usually considered in assessing impacts under the National Historic Preservation Act.

Intensity of Impact

Negligible: Impacts would be barely perceptible changes in the significant characteristics of a cultural resource.

Minor: Changes would be perceptible and noticeable, but would remain localized and confined to a single element or significant characteristic of a cultural resource (such as a single archaeological site with low data potential within a larger archaeological district, or a single contributing element of a larger historic district).

Moderate: Impacts would be sufficient to cause a noticeable but not substantial change in the significant characteristics of a cultural resource.

Major: Impacts would result in substantial and highly noticeable changes in significant characteristics of a cultural resource.

Alternative C – No Action Alternative

Potential Impacts on Cultural Resources from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Under the No Action Alternative, wildland fire use for resource benefit and prescribed fire would not be allowed in areas of the park where the bulk of the cultural resources exist; therefore, any impacts would be from catastrophic fire or suppression actions. Most of the park's significant cultural resources are located in the lower elevations of Sonoran desertscrub, and are therefore at low risk from catastrophic fire and emergency fire suppression actions due to the nature of the fuels in this non-fire-adapted vegetation type. However, implementation of any one of the alternatives would have the potential to result in adverse impacts with varying degrees of duration and intensity in these areas. Historic Manning Cabin, located in the ponderosa pine forest, would have the most protection under Alternatives C and E. These alternatives would reduce to the greatest extent the potential for catastrophic fire and its impacts by allowing managed wildland fires in higher elevations. However, the No Action Alternative would not allow for integration of an updated, site-specific fire implementation plan, which would contain a cultural resource component that would help guide managers in the decision-making process for avoiding impacts on cultural resources. Overall, this alternative would result in "not adverse," long-term, minor impacts on cultural resources.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Cultural resources in Saguaro National Park are at highest risk from ground-disturbing activities. Construction of hand lines, removal of snags, and conducting fire mop up cause soil disruption and

compaction and can therefore adversely impact archaeological resources. These activities can also expose archaeological sites. The intensity of these impacts depends upon the nature and significance of the resources as well as the extent of disturbance. Impacts from related fire management actions would potentially be adverse, long term, and minor to moderate. However, these impacts would be avoided or reduced as much as possible through mitigating measures.

Wildland Fire Use for Resource Benefit

Wildland fire use for resource benefit is not used in areas with the highest densities of cultural resources. Where cultural resources exist in wildland fire for resource benefit areas, it is likely that fire could be managed to avoid soil and below-soil temperatures that damage archaeological materials. Cultural resources in the high-density cultural resource areas are mostly known to be above ground. In these areas, managed wildland fire would probably not adversely impact cultural resources. However, post-fire survey and fire-effects research would be necessary to verify this assumption. It is likely that minor to moderate, long-term, beneficial impacts would result from maintaining natural fuel loading around cultural sites. However, the No Action Alternative would not allow for integration of an updated, site-specific fire implementation plan, which would contain a cultural resource component that would help guide managers in the decision-making process for avoiding impacts on cultural resources.

Prescribed Fire

There are very few cultural resources in areas where prescribed fires would be allowed under this alternative. Since prescribed fires are lit under specific conditions to burn in a certain way, the potential for prescribed fire to have adverse impacts on cultural resources would be less than catastrophic fire or even wildland fire use for resource benefit. However, in areas where significant fuels have accumulated, it might not be possible to manage fire so that damage to cultural resources would be avoided. In these areas, prescribed fire would have direct and indirect adverse impacts on cultural resources. The intensity and duration of these impacts would depend upon the nature and significance of the resources as well as the intensity of burning and the post-burn landscape condition. These impacts would be mitigated to the extent feasible by implementing mitigation measures such as avoidance and pre-burn protection measures. Maintaining lighter fuel loads around cultural resource sites would likely result in negligible, long-term, beneficial impacts on cultural resources.

Cumulative Impacts

Cultural resources within Saguaro National Park have been affected by a variety of actions, including past fire suppression activities, trail construction, and vandalism. Overall, the impacts of these activities on cultural resources have been adverse, long term, and major.

Other foreseeable projects/management actions that could affect cultural resources at Saguaro National Park are currently being addressed in the park's GMP update (draft expected in 2005). Specific management issues included in the GMP that would be expected to potentially impact cultural resources are wilderness management, backcountry trails and campsite planning, and Manning Camp. Overall, the impacts of these projects on cultural resources would be beneficial, long term, and minor to moderate. These present and reasonably foreseeable future actions would contribute to reversing the adverse impacts of past actions in the park, and, in combination with the impacts of the No Action Alternative, would result in beneficial, long-term, and minor cumulative impacts.

The continuing growth of Tucson and ongoing efforts by the Tucson Chamber of Commerce to promote visitation to Saguaro National Park will ultimately result in increased impacts on the park’s cultural resources. These impacts will primarily result from increased permitted visitor use at frontcountry

interpreted sites in the form of incidental artifact collection, inadvertent destabilization of walls, and illegal, off-trail use by hikers, bikers, and/or horseback riders, although impacts from vandalism and illegal excavations in backcountry locations would likely increase as well. Continued growth of Tucson is also likely to result in significant development of private lands near the park boundaries, which will probably lead to unpermitted visitation to backcountry archaeological sites within the park, and cause further impacts.

Within the Tucson area generally, construction of new roads, housing subdivisions, and other developments will continue to cause destruction of individual cultural resource sites. As the population of Tucson grows, recreational impacts on U.S. Forest Service lands and resources would continue to increase, resulting in additional degradation of cultural resource sites. As such sites are degraded and destroyed outside the park, the relative rarity and importance of the protected cultural resources within the park will increase.

Conclusion

Implementation of any of the alternatives would potentially have the same impacts on cultural resources in the park, mainly due to the location of the significant cultural resources (below the elevation of most fires). However, the No Action Alternative would not allow for integration of an updated, site-specific fire implementation plan, which would contain a cultural resource component that would help guide managers in the decision-making process for avoiding impacts on cultural resources. Since the majority of significant cultural resources are located primarily in Sonoran desertscrub, and this alternative would allow wildland fire use for resource benefit in the higher elevations of this vegetation type, it could therefore cause more impacts on cultural resources than the other alternatives (although most of the cultural resources are found in the lower elevations of the Sonoran desertscrub). Manning Cabin would have the same protection under Alternatives C and E. Overall, the impacts of the No Action Alternative on cultural resources would be "not adverse," long term, and negligible to minor. The No Action Alternative would not produce any impairment of cultural resources whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Alternative D – Prescribed Fire and Non-Fire Treatments

Potential Impacts on Cultural Resources from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Under Alternative D, wildland fire use for resource benefit and prescribed fire would not be allowed in areas below 4,000 feet, where the bulk of the park's cultural resources exist. Therefore, any impacts would be from catastrophic wildland fire or suppression actions. Most of the park's significant cultural resources are located in the lower elevations of Sonoran desertscrub, and are therefore at low risk from catastrophic fire and emergency fire suppression actions due to the nature of the fuels in this non-fire-adapted vegetation type. However, implementation of any of the alternatives would have the potential to result in adverse impacts in these areas, with varying degrees of duration and intensity. Compared to Alternatives C and E, this alternative would have the greatest potential to have adverse, long-term, major effects on cultural resources at higher elevations. This is due primarily to the exclusion of wildland fire for resource benefit, which would result in higher fuel accumulations, which in turn lead to catastrophic wildfires. Nevertheless, this alternative would have the added benefit of integrating an updated, site-

specific fire implementation plan, which would contain a cultural resource component that would help guide managers in the decision-making process for avoiding impacts on cultural resources.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Impacts would be the same as under the No Action Alternative, although this alternative would have the added benefit of integrating an updated, site-specific fire implementation plan, which would contain a cultural resource component that would help guide managers in the decision-making process for avoiding impacts on cultural resources.

Wildland Fire Use for Resource Benefit

Wildland fire use for resource benefit would not be used under this alternative.

Prescribed Fire

Prescribed fire impacts would be the same as under the No Action Alternative, although this alternative would have the added benefit of integrating an updated, site-specific fire implementation plan, which would contain a cultural resource component that would help guide managers in the decision-making process for avoiding impacts on cultural resources.

Cumulative Impacts

Cumulative impacts would be the same as discussed under the No Action Alternative.

Conclusion

Implementation of any of the alternatives would potentially have the same impacts on cultural resources in the park, mainly due to the location of the significant cultural resources (primarily within the lower elevations of Sonoran desertscrub, below where most fires occur). Alternative D calls for fire exclusion in this non-fire-adapted vegetation type. The exception is Manning Cabin, which is found in the ponderosa pine forest. Manning Cabin would have the least protection under this alternative due to the inability of the park to utilize wildland fire use for resource benefit, and the impacts could be adverse, long term, and major. However, unlike the No Action Alternative, this alternative would have the added benefit of integrating an updated, site-specific fire implementation plan, which would contain a cultural resource component that would help guide managers in the decision-making process for avoiding impacts on cultural resources. Overall, this alternative would be effective at protecting cultural resources in the short run, as treatments would be under management control. It would, however, be the least effective alternative in the long run due to increased suppression and fuel buildup. Alternative D would therefore have short-term beneficial impacts and long-term adverse impacts on cultural resources, ranging in intensity from negligible to moderate. Alternative D would not produce any impairment of cultural resources whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Alternative E – Prescribed Fire, Non-Fire Treatments, and Wildland Fire Use for Resource Benefit (Preferred Alternative)

Potential Impacts on Cultural Resources from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

This alternative would have the same impacts as the No Action Alternative, with the added benefit of integrating an updated, site-specific fire implementation plan, which would contain a cultural resource component that would help guide park managers in the decision-making process for avoiding impacts on cultural resources.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Impacts would be the same as under the No Action Alternative, although this alternative would have the added benefit of integrating an updated, site-specific fire implementation plan, which would contain a cultural resource component that would help guide managers in the decision-making process for avoiding impacts on cultural resources.

Wildland Fire Use for Resource Benefit

This alternative would have the same effects as the No Action Alternative, with the added benefit of integrating an updated, site-specific fire implementation plan, which would contain a cultural resource component that would help guide managers in the decision-making process for avoiding impacts on cultural resources.

Prescribed Fire

Impacts would be the same as under the No Action Alternative, with the added benefit of integrating an updated, site-specific fire implementation plan, which would contain a cultural resource component that would help guide managers in the decision-making process for avoiding impacts on cultural resources.

Cumulative Impacts

Cumulative impacts would be the same as discussed under the No Action Alternative.

Conclusion

Implementation of any of the alternatives would potentially have the same impacts on cultural resources in the park, mainly due to the location of the majority of significant cultural resources (primarily within the lower elevations of Sonoran desertscrub, below where most fires occur). This alternative, like Alternative D, would have the added benefit of integrating an updated, site-specific fire implementation plan, which would contain a cultural resource component that would help guide managers in the decision-making process for avoiding impacts on cultural resources. Manning Cabin would have the same protection under Alternatives C and E. Overall, impacts of Alternative E on cultural resources would be "not adverse," long term, and negligible to minor. Alternative E would not produce any impairment of cultural resources whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Visitor Convenience

Visitor use in the two districts of Saguaro National Park exceeds 3 million visitors per year. 2.2 million of these visitors are commuters using Picture Rocks Road to get to and from Tucson; the rest are recreational visitors. Two-thirds of the recreational visitors arrive during the cooler months of October through April. Use of the park is primarily front-country, including traveling on scenic roads and using picnic areas and trails. Major user groups are from the Tucson Basin and include senior citizens (seasonal residents), athletically inclined recreationists, and family groups. Jogging, bicycling, horseback riding, and hiking are popular activities, particularly among local visitors. Local recreationists, foreign visitors, and vacationing families are typical of the summer visitors to Saguaro.

Two picnic sites are located in the Rincon Mountain District and five in the Tucson Mountain District. These sites are usually filled to capacity during winter and spring weekends. There are approximately 43 miles of trails in the Tucson Mountain District and 125 miles in the Rincon Mountain District. In 2002, 1,424 camper nights were recorded for six backcountry campgrounds in the Rincon Mountains (Douglas Spring, Juniper Basin, Grass Shack, Manning Camp, Happy Valley, and Spud Rock).

The majority of fire activities occur in the backcountry during the months of May through October. As mentioned above, the highest visitor use occurs from October through April, so the only overlapping month would be October. October is primarily a month where first-entry prescribed burns (i.e., the first time an area is burned by management) occurs in the remote backcountry of the Rincon Mountains. Therefore, all of the alternatives would provide for relatively low impacts on visitor convenience and experience based on visitor use timing and primary frontcountry use.

Fire management activities and their potential to cause closures, restrictions, and direct effects on visitor convenience and experience were analyzed for how they would affect visitation.

Type of Impact

- Adverse: Would reduce visitor participation, quality of visitor experience, and/or service level.
- Beneficial: Would enhance visitor participation, quality of visitor experience, and/or service level.

Duration of Impact

- Short-term: Impact would be temporary in nature, during the period when a fire management activity would take place.
- Long-term: Would have permanent effect on visitor participation, quality of visitor experience, and/or service level.

Intensity of Impact

- Negligible: Would have imperceptible or undetectable effects upon visitors.
- Minor: Would have slightly perceptible and localized effects on visitors.
- Moderate: Would have readily apparent localized effects.
- Major: Would have substantial, highly noticeable effects and/or effects that would result in major limits on activities.

Alternative C – No Action Alternative

Potential Impacts on Visitor Convenience from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Compared to Alternative D, Alternatives C and E would have the lowest probability of large catastrophic fire occurrence due to the added ability of fire managers to use both prescribed fire and wildland fire use for resource benefit. This additional treatment option would allow more acres to be treated in more areas throughout the park, as long as prescriptions meet resource management objectives. Therefore, effects on visitor convenience from catastrophic fire would be decreased and impacts would be beneficial, short term, and minor to moderate.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

These activities rarely influence visitor movements or activities since in general they take place in the heat of the summer when visitation is lowest. If these actions were to take place close to trails or picnic/campsites, the areas would be closed off, although visitors would likely avoid the immediate area or stay at some distance due to noise anyway. Under this alternative, most of these activities would have only negligible to minor, short-term, and adverse impacts on visitor convenience.

Wildland Fire Use for Resource Benefit

Under the No Action Alternative, impacts from wildland fire use for resource benefit would potentially be less severe (i.e., of lower intensity) yet more frequent and of longer duration than under Alternative D. Wildland fires take place during summer, the lowest visitor use time of the year. However, some people may be interested in being in the park during these events. Therefore, impacts on visitor convenience from wildland fire use for resource benefit may be adverse or beneficial, short term, and negligible to minor.

Prescribed Fire

Under the No Action Alternative, prescribed fires would continue to be scheduled and managed in ways that would limit their effects on visitors. Effects on visitor activities, including hiking, nature study, and scenic touring, would generally be limited to small-scale closures and restrictions, although visitors would have to recreate outside of the prescribed fire project boundary. Very few people would be unable to partake in their chosen activity, although some would have to go to another part of the park. Smoke would affect a wider area, and thus more visitors, than closures and restrictions. However, because prescribed fires would be ignited only under certain atmospheric conditions, the effects of concentrated smoke would generally be localized. Impacts would be adverse, short term, and minor.

Cumulative Impacts

Past actions that affect visitor convenience include the development of visitor use facilities and trails in and around the park. These facilities and trails have provided support to visitors in beneficial and long-term ways. Other foreseeable projects/management actions that could affect visitor convenience at Saguaro National Park are currently being addressed in the park's GMP update (draft expected in 2005). Specific management issues included in the GMP that would be expected to potentially impact visitor convenience are wilderness management and backcountry trails and campsite planning. These projects have the potential to provide long-term, moderate to major benefits to the visitor. The effects of past, present and reasonably foreseeable actions upon visitor convenience have been/will be beneficial, long term, and major. However, the *Saguaro Fire Management Plan/EIS* does not propose to remove, increase or modify visitor facilities, and its major influence would be that of local effects upon recreational experiences, including hiking, nature study, and scenic touring. The impacts of other projects in the region, in combination with the impacts of this alternative, would result in beneficial, long-term, and major cumulative impacts.

Conclusion

Visitor experience is dependent primarily upon the perception of the individual. The No Action Alternative could have adverse, short-term, minor impacts on visitor recreation opportunities due to closures and restrictions. However, most of the park's visitation is in the frontcountry during months where fire events are rare or short-lived. Also, some visitors may have an enhanced experience from watching a natural process like fire take place in the park while they are visiting. Therefore, impacts could be beneficial, short term, and negligible to minor. This alternative, like Alternative E, would allow for more acres to be treated for fuel reduction than would Alternative D. The potential for long-term catastrophic fire events would therefore decrease, reducing the potential for closures. Although the potential for catastrophic fire would still exist, the intent of this alternative (as well as Alternative E) is to reduce that risk. Overall, impacts would be adverse, short term, and negligible to minor.

Alternative D – Prescribed Fire and Non-Fire Treatments

Potential Impacts on Visitor Convenience from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Alternative D would have the highest probability of large catastrophic fire occurrence over the long run. This is due primarily to the relatively small number of acres that would be treated annually by the fire staff with prescribed burning and non-fire treatments only. Therefore, impacts on visitors would be adverse, long term, and major due to the increased chance of closures and restrictions.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Impacts would be essentially the same as under the No Action Alternative, although Alternative D would have the potential to have greater impacts due to the increase in suppression activities. However, these fire events would be shorter lived than wildland fire for resource benefit or prescribed fire treatments.

Wildland Fire Use for Resource Benefit

Wildland fire use for resource benefit would not be used under this alternative.

Prescribed Fire

Prescribed fires would take place during low visitor use months and in the backcountry where visitor use is lowest. Impacts on visitors from prescribed fire treatments would be adverse or beneficial (depending on visitor perception), short term, and negligible to minor.

Cumulative Impacts

The past, present, and reasonably foreseeable projects affecting visitor convenience at Saguaro National Park would be the same as discussed under the No Action Alternative.

Conclusion

Alternative D would have the largest amount of suppression actions and would treat the least amount of acres for fuel reduction. The risk of widespread catastrophic fire events would therefore increase over

time. This would increase the number of closures and restrictions as well as the potential for long-term, minor to major, adverse impacts on visitor experience.

Alternative E – Prescribed Fire, Non-Fire Treatments, and Wildland Fire Use for Resource Benefit (Preferred Alternative)

Potential Impacts on Visitor Convenience from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Impacts would be the same as under the No Action Alternative.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Impacts would be the same as under the No Action Alternative.

Wildland Fire Use for Resource Benefit

Impacts would be the same as under the No Action Alternative.

Prescribed Fire

Impacts would be the same as under the No Action Alternative.

Cumulative Impacts

The past, present, and reasonably foreseeable projects affecting visitor convenience at Saguaro National Park would be the same as discussed under the No Action Alternative.

Conclusion

Visitor experience is dependent primarily upon the perception of the individual. Alternative E, like the No Action Alternative, could have adverse, short-term, minor effects on visitor recreation opportunities due to closures and restrictions. However, most of the park's visitation is in the frontcountry where fire events are rare or short-lived. Also, some visitors may have an enhanced experience from watching a natural process like fire take place in the park while they are visiting. Therefore, impacts could be beneficial, short term, and negligible to minor. This alternative, like the No Action Alternative, would allow for more acres to be treated for fuel reduction than Alternative D. The potential for long-term catastrophic fire events would therefore decrease, reducing the potential for closures. The potential for catastrophic fire would still exist, but the intent of this alternative, as well as the No Action Alternative, is to reduce that risk. Overall, impacts on visitor convenience from the Preferred Alternative would be adverse, short term, and negligible to minor.

Local Communities

Saguaro National Park is located in Eastern Pima County, Arizona. The park is composed of two distinct districts separated by the Tucson metropolitan area. The Tucson Mountain District encompasses 9,726

hectares extending west into Avra Valley from the Tucson Mountains, whereas the Rincon Mountain District occupies 27,233 hectares on the eastern edge of Tucson, including most of the Rincon Mountains. In addition to Tucson, local communities include Marana, Avra Valley, South Tucson, and Vail in Pima County, and Benson, Pomerene, and Cascabel in Cochise County.

Alternatives were evaluated for their socioeconomic effects on the local communities.

This analysis took into consideration that Tucson itself is a tourist attraction and Saguaro National Park is not necessarily the only reason someone would come to the area. Park closures are most likely not going to affect local communities. The majority of impacts would come from the economic benefits of increased spending due to fire activities.

Type of Impact

Adverse:	Degrades or otherwise negatively alters the characteristics of the existing environment, as it relates to local communities, visitor population, and regional economics.
Beneficial:	Improves the characteristics of the existing environment, as it relates to local communities, visitor population, and regional economics.

Duration of Impact

Short-term:	Temporary and typically transitional effects; associated with implementation of an action.
Long-term:	Permanent effects on the social and economic environments.

Intensity of Impact

Negligible:	Undetectable and expected to have no discernible effect on the social and economic environments.
Minor:	Slightly perceptible and not expected to have an overall effect on the social and economic environments.
Moderate:	Detectable and could have the potential to initiate an increasing influence on the social and economic environments.
Major:	Substantial, highly noticeable influences on the social and economic environments, and could be expected to alter those environments permanently.

Alternative C – No Action Alternative

Potential Impacts on Local Communities from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

The chance of large catastrophic fires that would directly affect local communities is low. Local communities are located adjacent to Sonoran desertscrub, where high-intensity catastrophic fire does not occur due to naturally low fuel loads. Also, the No Action Alternative would continue to reduce the chance for catastrophic fire by applying wildland fire use for resource benefit and prescribed fire by reduces fuel loads. Indirect effects of catastrophic fire would include loss of revenue because of closures or smoke impacts that may keep people away from the park and local businesses. However, Tucson is not a gateway into the park and people visit Tucson for a variety of reasons, only one of which is the park. Also, The No Action Alternative could benefit local communities by increasing purchases to support fire activities and utilizing hotel facilities and restaurants to support fire fighters, as well as by hiring emergency firefighters from the surrounding communities. Impacts would be adverse or beneficial short term, and negligible.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

These actions would not have socioeconomic impacts upon local communities.

Wildland Fire Use for Resource Benefit

Wildland fire use for resource benefit under the No Action Alternative could benefit local communities by increasing purchases to support fire activities and utilizing hotel facilities and restaurants to support fire fighters, as well as by hiring emergency firefighters from the surrounding communities. It is doubtful that revenue loss due to closures would have an effect on local communities. In general, wildland fire use for resource benefit actions are of longer duration than suppression and prescribed fires, and thus may use more resources. Impacts would be beneficial, short term, and negligible to minor.

Prescribed Fire

Prescribed fires are of short duration during months and are initiated in areas where visitor use is lowest. Therefore it is unlikely that prescribed fire activities or area closures will have a negative effect on local communities. In addition, prescribed fire operations use local resources such as hotels and restaurants. Impacts would be beneficial, short term, and negligible.

Cumulative Impacts

Many projects, proposed and on going, in the Tucson metropolitan area would/will affect local communities. These projects include new lodging and visitor service projects, utility and infrastructure projects, and other projects dealing with fire, fuels, and vegetation management.
Whereas these projects will potentially bring about increases in visitation and spending growth, closures during periods of catastrophic fire would bring about short-term decreases in visitation and potentially in spending. However, fire management activities occur during the lowest visitor use months for both the park and the region. Considered in combination with the long-term, minor, and beneficial economic impacts of new development in the communities, the adverse impacts on local communities of infrequent closures under the No Action Alternative would remain short term, and negligible to minor.

Conclusion

The No Action Alternative could have economic benefits for local communities by using local resources during fire activities. Fire activities occur during the lowest visitor use months and in the lowest visitor use areas. Thus, the benefits through spending in the local communities would outweigh the minor impacts that temporary closures could have. Overall, impacts would be beneficial, short term, and negligible.

Alternative D – Prescribed Fire and Non-Fire Treatments

Potential Impacts on Local Communities from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Under Alternative D, as fuels build up without wildland fire use for resource benefit, the chance of long-duration catastrophic fires would increase in the long run. This could bring even more revenue to local communities, since long-duration firefighting requires more support. However, with the increased chance of catastrophic fires would come the chance of more smoke getting to some areas, which could keep people away from local businesses. It is important to note that the general wind pattern does not blow smoke into the Tucson Basin from fire events in the Rincon Mountains, where 99% of fire activity occurs. In general, impacts on local communities would be beneficial or adverse, short term, and negligible to minor.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Alternative D would require total fire suppression of wildland fires, which could benefit local communities by increasing purchases to support fire activities and utilizing hotel facilities and restaurants to support fire fighters, as well as by hiring emergency firefighters from the surrounding communities. Impacts would be beneficial, short term and minor to moderate. With increased suppression activities would come increased ground and air traffic, as well as increased noise. This would most likely have a short-term adverse and moderate effect on community members that live close to the park boundary.

Wildland Fire Use for Resource Benefit

Wildland fire use for resource benefit would not be used under this alternative.

Prescribed Fire

Impacts would be the same as under the No Action Alternative.

Cumulative Impacts

Cumulative impacts would be the same as discussed under the No Action Alternative.

Conclusion

The No Action Alternative would have the potential to have economic benefits for local communities. This would occur through increased suppression activities, which utilize local resources, as well as increased likelihood of catastrophic fire events, which also use local resources. Increased suppression would have a negative effect on community members who live close to the park boundary, due to increased air and ground traffic and noise. Overall, impacts would be beneficial, short term, and negligible to minor.

Alternative E – Prescribed Fire, Non-Fire Treatments, and Wildland Fire Use for Resource Benefit (Preferred Alternative)

Potential Impacts on Local Communities from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Impacts would be the same as under the No Action Alternative.

Related Fire Management Actions

(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Impacts would be the same as under the No Action Alternative.

Wildland Fire Use for Resource Benefit

Impacts would be the same as under the No Action Alternative.

Prescribed Fire

Impacts would be the same as under the No Action Alternative.

Cumulative Impacts

Cumulative impacts would be the same as discussed under the No Action Alternative.

Conclusion

Alternative E could have economic benefits for local communities by using local resources during fire activities. Fire activities occur during the lowest visitor use months and in the lowest visitor use areas. Thus, the benefits through spending in the local communities would outweigh the minor impacts that temporary closures could have. Overall, impacts would be beneficial, short term, and negligible.

Life and Property

Fire is a threat to the public, firefighters, park staff, and developed areas, but fire is also an effective tool for reducing hazardous fuels. Threats to life and property from fire peak in the late spring and early summer pre-monsoon summer months. Impacts are immediate when there is a fire; threats exist during fires and persist through high fire danger seasons. Fires of similar size and intensity in different locations pose very different threats to life and property. Developed areas exist at lower elevations where historically fire has not played a major role. Fires in the lower elevations of Sonoran desertscrub are infrequent and short-lived as sufficient fuels do not exist at this time to carry a fire (this could change due to increased chance of exotic grasses moving in and creating a greater fuel load).

The first and foremost objectives for fire management are the protection of life, property, and resources from the unacceptable effects of wildland or prescribed fire. Life and property encompasses park staff, firefighters, and visitors as well as park developments and personal property of everyone concerned. Life and property on neighboring lands are also of concern.

Alternatives were analyzed for their potential impacts on life and property, both inside and outside park boundaries.

Type of Impact

Adverse:	Degrades or otherwise negatively alters life and property.
Beneficial:	Improves on characteristics of the existing environment, as it relates to life and property.

Duration of Impact

Short-term: Temporary and typically transitional impacts of life and property; associated with implementation of an action.
Long-term: Permanent impacts on life and property.

Intensity of Impact
Negligible: The impact is at the lowest levels of detection—no injuries or property damage.
Minor: The impact is slight but detectable.
Moderate: The impact is readily apparent.
Major: The impact is severely adverse or exceptionally beneficial.

Alternative C – No Action Alternative

Potential Impacts on Life and Property from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

The No Action Alternative would continue to decrease the chance of catastrophic fire by using wildland fire for resource benefit and prescribed fire to reduce fuel loads. Impacts on life and property would be beneficial, short term, and negligible to minor.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Firefighting activities are inherently dangerous. The No Action Alternative would reduce the risk somewhat by reducing the risk of high-intensity catastrophic fire. Firefighting activities occur in the backcountry during low visitor use months, and the park closes any areas where firefighter activities would have a negative effect on life or property. Impacts on life and property from related fire management activities would be beneficial, short term, and negligible.

Wildland Fire Use for Resource Benefit

Under the No Action Alternative, wildland fire use for resource benefit would not be allowed near the boundary of the park where residential areas occur, or where public or firefighter safety would be at risk. In addition, wildland fire use for resource benefit would reduce the risk of high-intensity catastrophic fire. Therefore, impacts on life and property would be beneficial, short term, and negligible.

Prescribed Fire

Under the No Action Alternative, prescribed fire would not be allowed near the boundary of the park where residential areas occur, or where public of firefighter safety would be at risk. In addition, prescribed fire would reduce the risk of high-intensity catastrophic fire. Therefore, impacts on life and property would be beneficial, short term, and negligible.

Cumulative Impacts

The effect of 100 years of fire exclusion in Saguaro National Park cannot be overstated. With the exception of Sonoran desertscrub, and potentially the desert grassland all other vegetation types have moderate to high departures from normal fire return intervals. This indicates that large areas of the park have high potential for catastrophic wildland fires, and the potential for conversion from one vegetation

type to another. The overall impact of past fire suppression activities on life and property has been adverse, short term, and minor to moderate.

Currently, there do not appear to be any other foreseeable projects/management actions that could affect life and property at Saguaro.

Conclusion

With continued use of wildland fire use for resource benefit and prescribed fire, decreasing fuel loads and the risk of high-intensity catastrophic fire would reduce short-term adverse impacts on life and property. Negligible to minor, long-term, beneficial impacts on life and property would accrue as management objectives are met. However, the current plan does not incorporate lessons learned, new data on fire behavior and effects, and new policy guidelines in a site-specific fire implementation plan, which would provide for even more protection of life and property. Overall, impacts would be beneficial, long-term and negligible to minor.

Alternative D – Prescribed Fire and Non-Fire Treatments

Potential Impacts on Life and Property from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Alternative D would not allow wildland fire for resource benefit. This would increase the chance of catastrophic fire, which would put firefighters and the public at a higher risk. Therefore, impacts on life and property from catastrophic fire would be adverse, long term, and minor to major.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Firefighting activities are inherently dangerous. Alternative D would increase the risk somewhat by not reducing the chance of high-intensity catastrophic fire through wildland fire use for resource benefit and by increasing the amount of suppression activities. However, firefighting activities occur in the backcountry during low visitor use months, and the park closes any areas where firefighter activities would have a negative effect on life or property. Impacts on life and property from related fire management activities would be adverse, short term, and negligible to minor.

Wildland Fire Use for Resource Benefit

Alternative D would not allow wildland fire for resource benefit.

Prescribed Fire

Impacts would be the same as under the No Action Alternative.

Cumulative Impacts

The effects of past, present, and reasonably foreseeable projects affecting life and property would be the same under Alternative D as under the No Action Alternative.

Conclusion

Alternative D would place firefighters and the public at risk more often than Alternatives C and E due to the high level of suppression activities and the fact that it would not decrease the chance of catastrophic fire through wildland fire use for resource benefit. In the long term, there would be the potential for moderate to major adverse impacts on firefighter and public safety, as well as property.

Alternative E – Prescribed Fire, Non-Fire Treatments, and Wildland Fire Use for Resource Benefit (Preferred Alternative)

Potential Impacts on Life and Property from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Impacts would be the same as under the No Action Alternative.

Related Fire Management Actions (water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Impacts would be the same as under the No Action Alternative.

Wildland Fire Use for Resource Benefit

Impacts would be the same as under the No Action Alternative.

Prescribed Fire

Impacts would be the same as under the No Action Alternative.

Cumulative Impacts

Cumulative impacts on life and property would be the same as under the No Action Alternative.

Conclusion

With continued use of wildland fire use for resource benefit and prescribed fire under Alternative E, short-term, adverse impacts on public safety and property would be negligible. Minor, long-term, beneficial impacts on life and property would accrue as management objectives are met. As under the No Action Alternative, hazardous fuel loads would be reduced. However, this alternative would have the potential to provide for more protection of life and property because it would integrate lessons learned, new data on fire behavior and effects, and new policy guidelines in a site-specific fire implementation plan.

Wilderness

The impacts of fire management activities and operations on wilderness areas in Saguaro National Park were analyzed by assessing their effect on both the wilderness user and the wilderness setting.

Type of Impact

Adverse: Degrades wilderness values or interferes with the public's use and enjoyment of wilderness.
Beneficial: Improves wilderness values or enhances the public's use and enjoyment of wilderness.

Duration of Impact
Short-term: Occurs only in the period concurrent with the implementation of individual actions, or leaves evidence of human activity that lasts no more than five years after the action.
Long-term: Continues after completion of the individual actions and can be expected to persist for longer than five years.

Intensity of Impact
Negligible: Imperceptible or undetectable.
Minor: Slightly perceptible and limited to a relatively small area.
Moderate: Apparent.
Major: Substantial or highly noticeable.

Most of FMU 1 is designated wilderness, where allowing natural processes of fire to occur is a major goal of Saguaro's fire management program. Some areas of wilderness are in Sonoran desertscrub, however, and would therefore be in the Suppression Unit (FMU 2) because fire did not historically play a role in this vegetation type.

Alternative C – No Action Alternative

Potential Impacts on Wilderness from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Catastrophic fires would potentially burn extensive areas of wilderness, thereby affecting natural resources and possibly moving these areas beyond the lower limits of their natural range of variability for plant composition/diversity, community structure, and fuel loading (as witnessed in areas of the Chiva and Rincon fires). However, along with Alternative E, the No Action Alternative would provide for the greatest amount of annual restoration/maintenance to reduce fuel buildup and restore natural fire regimes, and thus would result in the lowest potential for large, high-severity catastrophic fire. However, without an updated, site-specific fire implementation plan that would help managers make informed. updated decisions with regards to specific resources found in Saguaro, the potential for adverse effects would exist. Overall, impacts would be beneficial or adverse, long term, and minor to major.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Under the No Action Alternative, fire suppression operations used to control unwanted wildland fires would typically include helicopters, chainsaws, and other equipment. Helicopters would be used for reconnaissance, monitoring, water drops and movement of people and supplies. Chainsaws would be used during holding actions and burn unit preparation; this would affect wilderness character in the short term and would be visible to visitors within the immediate area, but would not typically affect views on a landscape scale. It is likely that wilderness users would see the natural effects of fire as beneficial, long term, and major on a landscape scale, and the effects of equipment use on the wilderness experience as adverse, short term, and minor to moderate. Water and retardant drops, helispots, and spike camps can

potentially have short-term effects on wilderness quality. These effects would include evidence of helispots and spike camps, and would be generally local in scale and encountered by few visitors to the backcountry. Impacts would be adverse, short term, and minor.

Wildland Fire Use for Resource Benefit

Wildland fires are predicted to continue to occur in Saguaro's wilderness areas, since the fuels and ignition sources are there. To some wilderness visitors, the effects of wildland fire use for resource benefit on wilderness values may be seen as adverse, but to other visitors the effects would be seen as acceptable and natural. The typical effects of fire in fire-adapted ecosystems include blackened bark, catfaces on some trees (see glossary), opening of the understory, clearing of the forest floor, and the scorching of some trees—resulting in scattered kill and opening of the canopy.

Under the No Action Alternative, wildland fire for resource benefit would be used as a tool to restore/maintain wilderness resources. Where wildland fire use for resource benefit is needed to achieve restoration targets, impacts would be beneficial, long term, and moderate to major. However, without an updated, site-specific fire implementation plan that incorporates current scientific data, the chance of adverse effects would be greater than under Alternative E because park managers would not have this comprehensive decision-making tool to aid in quick decisions that take into account all current sensitive resource values. Thus, the impacts on wilderness could be adverse, long term, and moderate to major.

Prescribed Fire

Prescribed fire would be used as a tool to restore and maintain wilderness resources under the No Action Alternative. Where prescribed fire is needed to achieve restoration targets, the effect would be beneficial, long term, and moderate to major.

Cumulative Impacts

The effects of past and present actions on wilderness are seen in trails and campsites. These features have the potential to diminish the wilderness quality for some visitors, but most visitors depend on many of them and tolerate their presence. Overall, impacts are adverse or beneficial, long term, and minor.

The effect of 100 years of fire exclusion cannot be overstated. With the exception of Sonoran desertscrub, and possibly desert grassland all other vegetation groups have moderate to high departures from normal fire return intervals. This indicates that large areas of the park have high potential for catastrophic wildland fires, and the potential for conversion from one vegetation type to another. The overall impacts of fire exclusion activities on wilderness values have been adverse, long term, and moderate to major.

Other present and reasonably foreseeable actions affecting wilderness include fire management and fuel treatment activities. These actions would result in evidence similar to that left by fire management activities in the past—burned areas, cut stumps, rehabilitated holding lines, burned area rehabilitation work, and other evidence. Impacts on wilderness values would be adverse or beneficial, long term, and minor.

Other foreseeable projects/management actions that could affect wilderness at Saguaro National Park are currently being addressed in the park's GMP update (draft expected in 2005). In addition to wilderness management, specific management issues included in the GMP that would be expected to potentially impact wilderness are the park's packing operation, backcountry trails and campsite planning, and Manning Camp. Overall, the impacts of these projects on wilderness values would be beneficial, long term, and minor to moderate.

When the effects of these actions are combined with the impacts of the No Action Alternative, cumulative impacts on wilderness values would be beneficial, long term, and moderate to major.

Conclusion

Fire management activities under the No Action Alternative would affect wilderness resources in generally beneficial ways, through actions that would maintain plant communities within their natural range of variability, and thus maintain wilderness values. Effects in wilderness areas that are not adapted to fire would be dependent on how quickly fires could be suppressed. In wilderness, helicopter and chainsaw noises would continue to introduce short-term intrusions, with adverse and moderate effects. Overall, these impacts would be beneficial, long term, and minor to moderate. However, the No Action Alternative would not include an updated, site-specific fire implementation plan with current scientific data to help guide managers in making effective, informed decisions with regard to suppression and wildland fire use for resource benefit in wilderness areas. Thus, the chance of adverse impacts would exist. The No Action Alternative would not produce any impairment of wilderness resources whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Alternative D – Prescribed Fire and Non-Fire Treatments

Potential Impacts on Wilderness from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

The least amount of annual restoration/maintenance to reduce fuel buildup and restore natural fire regimes would occur under Alternative D due to the lack of wildland fire use for resource benefit. Thus, this alternative would result in the highest potential for large, high-severity fire. Impacts would be adverse, long term, and moderate to major.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Impacts would be essentially the same as under the No Action Alternative. However, this alternative would call for more suppression activity, which, although generally short term, could lead to greater adverse impacts than the No Action Alternative. These adverse impacts would be mitigated through the use of a site-specific fire implementation plan that will help managers make resource specific decisions on related fire management activities.

Wildland Fire Use for Resource Benefit

Wildland fire use for resource benefit would not be used under Alternative D.

Prescribed Fire

Impacts would be the same as discussed under the No Action Alternative.

Cumulative Impacts

The impacts of past, present, and reasonably foreseeable actions on wilderness would be the same under Alternative D as under the No Action Alternative: adverse, long term, and minor. However, When these impacts are combined with the impacts of Alternative D, which would call for suppression of all naturally ignited fires, thus causing an increase in fuel buildup over time—and a corresponding increase in the risk of catastrophic fire—throughout extensive areas of wilderness, cumulative impacts on wilderness values would be adverse, long term, and moderate to major.

Conclusion

Due to the lack of wildland fire use for resource benefit, the chance of large, high-intensity catastrophic fire would be greatest under Alternative D, potentially affecting large areas of congressionally designated wilderness, which are considered key to the natural integrity of the park and to opportunities for enjoyment of the park. This would result in adverse, long-term, and moderate to major impacts. Alternative D would not produce any impairment of wilderness values whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Alternative E – Prescribed Fire, Non-Fire Treatments, and Wildland Fire Use for Resource Benefit (Preferred Alternative)

Potential Impacts on Wilderness from Catastrophic Fire and All Fire Management Treatments

Catastrophic Fire

Along with the No Action Alternative, Alternative E would provide for the greatest amount of annual restoration/maintenance to reduce fuel buildup and restore natural fire regimes, and thus would result in the lowest potential for large, high-severity catastrophic fires. Impacts would be the same as under the No Action Alternative, with the added benefit of an updated, site-specific fire implementation plan that would incorporate current scientific data to help managers make effective, informed decisions regarding fire and wilderness values, and thereby lower the chance of adverse impacts on wilderness.

Related Fire Management Actions
(water and fire retardant drops, helispots, spike camps, hand line, hand thinning, snagging, and mop up)

Impacts would be the same as under the No Action Alternative.

Wildland Fire Use for Resource Benefit

Impacts would be the same as under the No Action Alternative, with the added benefit of an updated, site-specific fire implementation plan that would incorporate current scientific data to guide managers in making effective, informed decisions regarding fire and wilderness values, and thereby lower the chance of adverse effects from wildland fire use for resource benefit.

Prescribed Fire

Impacts would be the same as under the No Action Alternative.

Cumulative Impacts

The impacts of past, present, and reasonably foreseeable actions on wilderness values in combination with the impacts of Alternative E would be the same as under the No Action Alternative: beneficial, long term, and moderate to major.

Conclusion

As under the No Action Alternative, fire management activities under Alternative E would affect wilderness resources in generally beneficial ways, through actions that would maintain plant communities within their natural range of variability, and thus maintain wilderness values, especially in FMU 1. Effects in FMU 2 would be dependent on how quickly fires could be suppressed. In wilderness, helicopter and chainsaw noises would continue to introduce short-term intrusions, with adverse and moderate effects. Overall, these impacts would be beneficial, long term, and minor to moderate. However, Alternative E would have the added benefit of utilizing an updated, site-specific fire implementation plan that incorporates more current and site-specific knowledge of resources, fire effects, and fire behavior. This implementation plan would help guide managers in making effective, informed decisions with regard to suppression and wildland fire use for resource benefit in wilderness areas and thus reduce the chance of adverse effects. Alternative E would not produce any impairment of wilderness resources whose conservation is to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural identity of the park or opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents.

Environmental Justice

Alternatives were analyzed for their impacts on minority and low-income populations and communities.

Type of Impact

- Adverse: Degrades or otherwise negatively alters the characteristics of the existing social and economic environment, as it relates to local communities of minority and low-income populations.
- Beneficial: Improves on the characteristics of the existing social and economic environment, as it relates to local communities of minority and low-income populations.

Duration of Impact

- Short-term: Temporary and typically transitional effects associated with implementation of an action.
- Long-term: Permanent effects on the social and economic environment.

Intensity of Impact

- Negligible: Not detectable and expected to have no discernible effect on the social and economic environment for minority and low-income populations.
- Minor: Slightly detectable and expected to have no overall effect on the social and economic environment for minority and low-income populations.
- Moderate: Detectable and could potentially initiate an increasing influence on the social and economic environment for minority and low-income populations.
- Major: Substantial, highly noticeable influence on the social and economic environment for minority and low-income populations, and could be expected to alter those environments permanently.

Demographics for the Tucson area are shown below.

Income Statistic	Income
Personal Income, 2001 Projection	$22.639 billion
Per Capita Income	$25,445
Median Family Income, 1999	$41,079
Median Household Income, FY2000	$45,100
Average Annual Pay in Pima County, 1998	$26,773
Annual Earnings per Worker, 2001 Projection	$30,239

Ethnicity	Percent
White, non-Hispanic	62.7%
Hispanic	29.6%
Black	3.1%
Native American	2.5%
Asian or Pacific Islander	2.1%
Other	.01%

Metro Employment by Sector (2001 forecast)	Total #	%
Manufacturing	39,100	10%
Mining	1,900	.5%
Construction	22,600	6%
Transportation, Communications, Public Utilities	14,500	4%
Trade	78,100	21%
F.I.R.E.	15,100	4%
Services	123,700	33%
Government	77,500	21%

Year	Population
1995	758,585
1999	842,289
2000	861,383
2005	952,636
2010	1,047,607

Alternative C – No Action Alternative

Tucson and the surrounding communities have a high proportion of residents who do not work in Saguaro National Park, so fire management activities in the park have no impacts on them. Although the average property values vary among areas closest to park boundaries, fire management activities do not target any of these areas as more important than others. Any differences in activity time and effort are reflective of the complexity of the work required in each area. In addition, prescribed fire, wildland fire use for resource benefit, and thinning activities have historically been conducted in the higher elevations of the Rincon Mountains, far from any residential areas. Under the No Action Alternative, impacts upon minority and low-income populations in local communities would be beneficial, long term, and negligible to minor.

Cumulative Impacts

Cumulative impacts would be the same as described under Local Communities above.

Conclusion

Fire management activities do not target any of the areas around the park as more important than others, and such activities have historically been conducted in portions of the park that are far from any residential areas. Impacts upon minority and low-income populations in local communities would therefore be beneficial, long term, and negligible to minor.

Alternative D – Prescribed Fire and Non-Fire Treatments

All impacts on minority and low-income populations would be the same as under the No Action Alternative.

Alternative E – Prescribed Fire, Non-Fire Treatments, and Wildland Fire Use for Resource Benefit (Preferred Alternative)

All impacts on minority and low-income populations would be the same as under the No Action Alternative.

Energy Consumption

Fuel consumption was estimated for each alternative using the average annual amount of accomplishment for each activity in acres, and an estimate of equipment fuel consumption on a per acre basis. Assessments of impacts were made using the following benchmarks.

Type of Impact

Adverse:	Increases energy consumption.
Beneficial:	Decreases energy consumption.

Duration of Impact

Short-term:	A change in energy consumption that will last less than five years.
Long-term:	Change in energy consumption that will last five years or more.

Intensity of Impact

Negligible:	Increase or decrease is less than 5% annually.
Minor:	Increase or decrease is 5% to 20% annually.
Moderate:	Increase or decrease is 21% to 50% annually.
Major:	Increase or decrease is more than 50% annually.

The energy consumption associated with fire management activities is difficult to calculate because of the great number of variables involved, including the size and complexity of projects. Fire management activities—including monitoring managed wildland fire, prescribed fire, and hand thinning—were considered in the analysis; emergency fire suppression and administrative activities were not.

During a fire, an aircraft (generally a helicopter) is used to monitor the fire on a daily basis, and to provide reconnaissance to anticipate fire movements. During prescribed fire operations, fuel is consumed by drip torches, helicopters, and chainsaws (the latter during site preparation work, which includes thinning around sensitive natural areas). Occasionally, aerial ignition devices are used, which require the

use of a helicopter. During these kinds of projects, ground crews with drip torches and site preparation are still involved.

Estimates of fuel consumption under the three alternatives are shown in Tables IV-2 through 4 (modified from the Yosemite National Park draft fire management plan/EIS). For this analysis, it was estimated that prescribed fire would burn an average of 1,300 acres per year (calculated from the average of the 5-year burn plan). Of that 1,300, it was estimated that 128 acres would be treated with chainsaws for burn preparation activities. Based on the 5-year burn plan, wildland fire use for resource benefit would be 895 acres; based on a 10-year average, suppression fires would be 1,083 acres. It is important to note that these averages are high due to two years of unusually high fire activity in the park (1994 and 1999). Without those two years, the average for wildland fire use for resource benefit would be only 14 acres and the average for suppression only 114 acres (prescribed fire would stay the same).

Alternative C – No Action Alternative

Cumulative Impacts

Energy is used in many park operations. The cumulative impacts of the amount of fuel consumed during fire management activities at Saguaro National Park under the No Action Alternative would be adverse, short term, and negligible.

Conclusion

Energy would be consumed during all fire management activities under the No Action Alternative. Typically, more than 6,000 gallons of various fuels would be consumed during these activities per year (see Table IV-2). The impacts of the program's energy demand would continue to be adverse, short term, and negligible.

Alternative D – Prescribed Fire and Non-Fire Treatments

Cumulative Impacts

Cumulative impacts would be the same as under the No Action Alternative.

Conclusion

Energy would be consumed during all fire activities under Alternative D. Typically, more than 5,000 gallons of various fuels would be consumed per year (see Table IV-3). Although this alternative would use an estimated 1,000 gallons of fuel less than either the No Action Alternative or E, effects would be expected to be the same. The impacts of the program's energy demand would be adverse, short term, and negligible.

Alternative E – Prescribed Fire, Non-Fire Treatments, and Wildland Fire Use for Resource Benefit (Preferred Alternative)

Cumulative Impacts

Cumulative impacts would be the same as under the No Action Alternative.

Conclusion

Energy would be consumed during all fire activities under Alternative E. Typically, more than 6,000 gallons of various fuels would be consumed per year (the same amount as under the No Action Alternative). The impacts of the program's energy demand would be adverse, short term, and negligible.

Table IV-2. Projected Energy Consumption Under the No Action Alternative

Fire Management Treatment	Average Acres Treated/Year	Equipment Used	Treatment Rate or Equipment Use	Fuel Use Rate	Fuel Use
Suppression Fires	1,083 acres/year, 1.2 fires/year (average over 10 years)	Aircraft (helicopter and air tanker)	1 hour/recon flight; 56 helicopter hours/year, and 3 fixed-wing hours/year (average over 4 years)	60 gallons/hour	3,600 gallons of aviation fuel
Wildland Fire Use for Resource Benefit	895 acres/year, 6 fires/year (average over 10 years)	Aircraft (helicopter)			
Prescribed Fire	1,300 acres/year, 1-2 fires/year (average from 5-year burn plan)	Drip torches OR aerial ignition device (ignition balls and helicopter time)	Approx. 1 acre/hour/torch, 8 acres/day in an 8-hour shift OR for aerial ignition, approx. 150 acres/day, 2 hours flight time/day	Approx. 2 gallons/acre burned [OR approx. one box (1,000 balls)/150 acres, plus 60 gallons of fuel/hour of flight time, plus ground crews]	2,600 gallons of drip torch fuel OR 8,667 ignition balls and approx. 1,040 gallons of aviation fuel, plus approx. 200 gallons of drip torch fuel for ground crews
		Chainsaws (used in prep work, on approx. 128 project acres)	5 acres/day	2 gallons/day/saw, 10 gallons/crew/day	256 gallons of saw fuel
Total	**3,278 acres**				**5,096 – 6,456 gallons of various fuels**

Table IV-3. Projected Energy Consumption Under Alternative D

Fire Management Treatment	Average Acres Treated/Year	Equipment Used	Treatment Rate or Equipment Use	Fuel Use Rate	Fuel Use
Suppression Fires	1,300 acres/year, 7.2 fires/year (average over 10 years)	Aircraft (helicopter and air tanker)	1 hour/recon flight; 42 helicopter hours/year, 3 fixed-wing hours/year (average over 3 years)	60 gallons of fuel/hour	2,760 gallons of aviation fuel
Wildland Fire Use for Resource Benefit	Not used	N/A			
Prescribed Fire	1,300 acres/year, 1-2 fires/year (average from 5-year burn plan)	Drip torches OR aerial ignition device (ignition balls and helicopter time)	Approx. 1 acre/hour/torch, 8 acres/day in an 8-hour shift OR for aerial ignition, approx. 150 acres/day, 2 hours flight time/day	Approx. 2 gallons/acre burned [OR approx. one box (1,000 balls)/150 acres, plus 60 gallons of fuel/hour of flight time, plus ground crews]	2,600 gallons of drip torch fuel OR 8,667 ignition balls and approx. 1,040 gallons of aviation fuel; plus approx. 200 gallons of drip torch fuel for ground crews
		Chainsaws (used in prep work, on approx. 128 project acres)	5 acres/day	2 gallons/day/saw, 10 gallons/crew/day	256 gallons of saw fuel
Total	**2,600 acres**				**4,256 – 5,616 gallons of various fuels**

Table IV-4. Projected Energy Consumption Under Alternative E

Fire Management Treatment	Average Acres Treated/Year	Equipment Used	Treatment Rate or Equipment Use	Fuel Use Rate	Fuel Use
Suppression Fires	1,083 acres/year, 1.2 fires/year (average over 10 years)	Aircraft (helicopter/air tanker	1 hour/recon flight; 56 helicopter hours/year, 3 fixed-wing hours/year (average over 3 years)	60 gallons of fuel/hour	3,600 gallons of aviation fuel
Wildland Fire Use for Resource Benefit	895 acres/year, 6 fires/year (average over 10 years)	Aircraft (helicopter)			
Prescribed Fire	1,300 acres/year, 1-2 fires/year (average from 5-year burn plan)	Drip torches OR aerial ignition device (ignition balls and helicopter time)	Approx. 1 acre/hour/torch, 8 acres/day in an 8-hour shift OR in aerial ignition, approx. 150 acres/day, 2 hours flight time/day	Approx. 2 gallons/acre burned [OR approx. one box (1,000 balls)/150 acres, plus 60 gallons of fuel/hour of flight time, plus ground crews]	2,600 gallons of drip torch fuel OR 8,667 ignition balls, with approx. 1,040 gallons of aviation fuel, plus approx. 200 gallons drip torch fuel for ground crews
		Chainsaws (used in preparation work, on approx. 128 project acres)	5 acres/day	2 gallons/day/saw, 10 gallons/crew/day	256 gallons of saw fuel
Total	**3,278 acres**				**5,096 – 6,454 gallons of various fuels**

Sustainability and Long-Term Management

Alternative C

Relationship of Short-Term Uses and the Maintenance and Enhancement of Long-term Productivity

Alternative C would not result in new development thus it would not take lands out of productivity as natural ecosystems. However, fires would continue to have a potential effect upon ecosystem integrity. This alternative would include the greatest amount of prescribed burning and fuel treatment. Therefore, it would have the greatest potential to restore vegetation structure and decrease fuel loads. Although this would greatly reduce the potential for large, high-intensity fires, the no-action alternative would not have a site-specific implementation plan that would aid managers in making well informed decisions based on specific resources, and past experiences with high-intensity wildfire. Also, alternative C would allow for fire in areas of Sonoran Desertscrub which is a non fire adapted vegetation type.

Prescribed burning and other non-fire treatments would not degrade long-term productivity because restoration target conditions would be based upon the natural range of variability for park ecosystems. However, wildland fire use for resource benefit could have the potential to degrade long-term productivity without a site-specific fire implementation plan.

Irreversible or Irretrievable Commitments of Resources

Implementation of Alternative C would decrease the threat of large, catastrophic fires more than alternative D. The amount of prescribed fire and fuel treatment, particularly in the woodland and forested areas, would likely restore target conditions in such a timeframe as to reduce, to the greatest extent, the potential for irreversible or irretrievable loss of resources. However, high intensity fire would still be a possibility due to the lack of a site-specific fire implementation plan but the course of action in Alternative C, compared to Alternative D, would not result in an irreversible or irretrievable commitment of resources.

Historic resources in Saguaro National Park, if burned during catastrophic fire, would be irreversibly and irretrievably lost. Alternative C would allow for some fire in sensitive areas in the Sonoran Desertscrub that could affect historic resources as compared to alternatives D and E which do not allow fire in these areas. However, it provides the same protection to historic Manning Cabin as in Alternative D and E.

With alternative C the effects of managed wildland fire upon wildlife and other park values would generally not be considered irreversible or irretrievable, in that effects would typically be within the natural range of variability for park ecosystems and wildlife habitat, and adverse effects would be short-term. Habitat would typically become suitable to wildlife shortly after a fire. However, alternative C provides less protection than alternative E due to the lack of a site-specific fire implementation plan that would provide added protection to specific wildlife resources in the park.

Under this alternative, no appreciable irreversible or irretrievable commitments of resources would be associated with air quality.

Adverse Impacts that Could Not be Avoided if the Action Were Implemented

The potential for catastrophic fire would exist, but would be less than under Alternative D(due to the use of prescribed fire and wildland fire for resource benefit work proposed under this alternative) , and greater than alternative E (due to the lack of a site-specific fire implementation plan). Treatments would attempt to restore plant community structure and reduce the risk of catastrophic fire. This

would reduce the potential for adverse effects from both unwanted wildland fire and fire exclusion. Thus, the potential for adverse effects is greater than alternative E and less than D.

Prescribed burning and other fuel treatments would not be considered adverse in that target conditions would be based on the natural range of variability for those systems. The adverse effects of treatments would be short-term, while beneficial effects, such as ecosystem restoration, would be long-term. However, as mentioned above and throughout this analysis, adverse effects are intermediate between alternatives D and E due to the lack of a site-specific implementation plan.

Under this alternative, there would be short-term, unavoidable, adverse impacts to air quality due to prescribed burning and wildland fire use for resource benefit in areas where fuel loads are high from decades of fire exclusion. As park vegetation types are restored to their natural state and natural fire regime, fuel loads will be lighter and thus, less smoke will be produced when they burn. The need to burn in the park through prescribed and wildland fire use for resource benefit will never go away, however, adverse impacts on air quality would decrease over the long-term as fuels are reduced.

Alternative D

Relationship of Short-Term Uses and the Maintenance and Enhancement of Long-term Productivity

This alternative would not result in new development, thus it would not take lands out of productivity as natural ecosystems. However, fire suppression would increase in all vegetation types. This would allow some woodland and forest structures to continue to change and fuel load conditions to increase. This would not likely reverse under this alternative, because of the limited amount of prescribed fire project work that would be completed annually. The effects, as described under Vegetation, would include a continued increase in fuel loads as well as other ecosystem effects. Over the long-term, there is great potential for extensive areas to be effected by catastrophic fire, a long-term and adverse effect.

Irreversible or Irretrievable Commitments of Resources

This Alternative would have the highest potential of large, catastrophic fire. The trend has shown that in Saguaro and surrounding areas high-intensity fires are more frequent than they were in the past.

The effects of past high-intensity catastrophic fires were long-term, adverse, and major, and represent, in a relative sense, an irretrievable commitment of resources. Under Alternative D exists the highest potential for having more fires of this intensity, because of the lack wildland fire use for resource benefit fires. Future fires of large size and intensity would likely have irretrievable effects.

The forested areas would continue to be focus of prescribed fire, as they have in the past. This has assisted in protecting them, but they have remained at risk, and, allowing surrounding areas to continue to degrade would increase this risk over time.

If burned during catastrophic fire, Manning Cabin, a historic resource, would be irreversibly and irretrievably lost since one cannot be reconstructed, only replaced by a similar structure which would lack the significance and integrity of the original. Alternative D would continue to protect Manning Cabin at the same rate as alternatives C and E. Alternative D does not allow fire in the lower elevations of Sonoran Desertscrub where the other historic resources exist in the park and would therefore provide greater protection than alternative C.

Effects of prescribed fire and non-fire treatments in FMU 1 upon wildlife and other park values would not generally be considered irreversible or irretrievable, in that their effects would typically be within the natural range of variability for park ecosystems and wildlife habitat, and would be short-

term. Habitat would typically become suitable to wildlife relatively quickly. However, since the chance for catastrophic fire is high with this alternative due to lack of wildland fire use for resource benefit, the chance for adverse effects exists.

Under Alternative D, no irreversible and irretrievable commitments of resources would be associated with air quality.

Adverse Impacts that Could Not be Avoided if the Action Were Implemented

As discussed above, it would be likely that the effects of large, high intensity catastrophic fire could not be avoided, considering the amount of prescribed fire and non-fire treatment work that would occur under this alternative. Treatments would attempt to restore plant community structure and reduce the risk of catastrophic fire. Implementation of this alternative would reduce the potential for adverse effects, but only in areas receiving treatment. The amount of work proposed would not be enough to restore park ecosystems.

Alternative D would not allow for wildland fire use for resource benefit, which would not meet the park's natural resources management objective of returning the park to its natural background conditions for air quality. The continuing risk of wildland fires consuming areas of high fuel loadings would have the attendant effect of minor to moderate, adverse impacts on air quality.

Alternative E

Relationship of Short-Term Uses and the Maintenance and Enhancement of Long-term Productivity

Alternative E would not result in new development thus it would not take lands out of productivity as natural ecosystems. However, fires would continue to have a potential effect upon ecosystem integrity. This alternative would include an intermediate amount of prescribed burning and fuel treatment when compared to the other alternatives. This is due to wildland fire use being allowed in more areas under alternative C and no wildland fire use under alternative D. However, it would have the same potential to restore vegetation structure and decrease fuel loads as alternative C. This is due to the fact that alternative C allows for fire in non-fire adapted ecosystems where vegetative structure would not be restored with fire anyway. Alternative E would greatly reduce the potential for large, high-intensity fires, by reducing fuel loads and by the integration of a site-specific implementation plan that would aid managers in making well informed decisions based on specific resources, and past experiences with high-intensity wildfire

Prescribed burning and other non-fire treatments would not degrade long-term productivity because restoration target conditions would be based upon the natural range of variability for park ecosystems. Wildland fire use for resource benefit would be unlikely to degrade long-term productivity with the integration of a site-specific fire implementation plan.

Irreversible or Irretrievable Commitments of Resources

Implementation of Alternative E would decrease the threat of large, catastrophic fires more than alternatives D and C. The amount of prescribed fire and fuel treatment, particularly in the woodland and forested areas, would likely restore target conditions in such a timeframe as to reduce, to the greatest extent, the potential for irreversible or irretrievable loss of resources. Alternative E would not represent an irreversible or irretrievable commitment of resources.

Historic resources in Saguaro National Park, if burned during catastrophic fire, would be irreversibly and irretrievably lost. Alternative E would not allow fire in sensitive areas in the Sonoran Desertscrub that could affect historic resources as compared to alternative C. Alternative E provides the same protection to historic Manning Cabin as in Alternative C and D.

With alternative E the effects of managed wildland fire upon wildlife and other park values would generally not be considered irreversible or irretrievable, in that effects would typically be within the natural range of variability for park ecosystems and wildlife habitat, and adverse effects would be short-term. Habitat would typically become suitable to wildlife shortly after a fire.

Under this alternative, no appreciable irreversible or irretrievable commitments of resources would be associated with air quality.

Adverse Impacts that Could Not be Avoided if the Action Were Implemented

The potential for catastrophic fire would exist, but would be less than under Alternative C andD. This is because of the use of prescribed fire and wildland fire for resource benefit work proposed under this alternative and due to the integration of a site-specific fire implementation plan. Treatments would attempt to restore plant community structure and reduce the risk of catastrophic fire. This would reduce the potential for adverse effects from both unwanted wildland fire and fire exclusion.

Prescribed burning and other fuel treatments would not be considered adverse in that target conditions would be based on the natural range of variability for those systems. The adverse effects of treatments would be short-term, while beneficial effects, such as ecosystem restoration, would be long-term.

Under this alternative, there would be short-term, unavoidable, adverse impacts to air quality due to prescribed burning and wildland fire use for resource benefit in areas where fuel loads are high from decades of fire exclusion. As park vegetation types are restored to their natural state and natural fire regime, fuel loads will be lighter and thus, less smoke will be produced when they burn. The need to burn in the park through prescribed and wildland fire use for resource benefit will never go away, however, adverse impacts on air quality would decrease over the long-term as fuels are reduced.

Section V: Consultation and Coordination

Introduction

Public scoping is part of the National Environmental Policy Act process (40 CFR 1501.7) for preparing an environmental impact statement (EIS). Scoping helps determine the breadth of issues and opportunities to be used in developing the alternatives and their attributes, and for assessing their environmental impacts. The process used during public scoping, and in additional consultation and coordination for the *Draft Saguaro Fire Management Plan/EIS* is described below.

Public Scoping

In November 1998, the National Park Service issued new directions for wildland fire management in national parks. In January 2001, following the fire season of 2000—during which many homes and structures across the country were destroyed—a Report to the President was prepared and a new Federal Wildland Fire Management Policy was released. The new policy was a revision and update of the December 1995 Final Report of the Federal Wildland Fire Management Policy and Program Review. This document was accepted by the Secretaries of Interior and Agriculture. It endorsed the older policy and strengthened the principles, policies, and recommendations of the 1995 report. A National Fire Plan was also introduced and approved. This national plan directed the National Park Service to expedite the removal of hazardous fuels from wildland/urban interface areas to provide immediate protection of natural and cultural resources, physical property, and facilities, both federal and private.

In late 2002, the fire management office at Saguaro National Park sent a newsletter to individuals, organizations, media, and agency and government offices on the park's planning activity mailing list. This newsletter invited recipients to assist in identifying fire management issues and opportunities, and invited them to an open house in October 2002 to learn about and discuss possible issues and alternatives. Two open houses were held, one at the Rincon Mountain District visitors center and the other at the Tucson Mountain District visitors center. Six people attended the two open houses and two comment letters were received during the scoping period.

As a result of the national direction and the issues raised during the public and internal scoping in 2002, a Notice of Intent to prepare an EIS was prepared and published in the Federal Register on September 23, 2002. The Notice of Intent invited the public to help identify fire management issues and concerns, a suitable range of alternatives and appropriate mitigating measures, and the nature and extent of potential environmental impacts to be addressed in the EIS. During this public scoping period, no letters, faxes, or e-mails were received.

Consultation and Coordination Activities

On December 19, 2001, an interdisciplinary meeting was held with members from the National Park Service, United States Geological Survey, and United States Forest Service. This meeting identified the need for a new fire management plan and created an interdisciplinary team to help create and review the plan and the EIS. The team consisted of National Park Service professionals from several different disciplines (Science and Resource Management, Fire Management, Visitor and Resource Protection, Interpretation, Maintenance, Administration).

On January 24, 2002, an internal scoping meeting was held with members from the National Park Service, United States Geological Service, and United States Forest Service. During this meeting, new fire management goals were created, a cultural matrix describing cultural resources and possible impacts was created, the Intermountain Screening Form was completed, important resources/issue topics were identified, and alternatives were established.

On March 14, 2002, the interdisciplinary team plus additional fire staff held a meeting to determine writing and research assignments.

Throughout the summer of 2002, writing assignments were delayed due to the active fire season. In September of 2002, alternatives were revised and the newsletter was sent out to solicit participation in the upcoming October open houses.

On October 9th and 16th, 2002, Saguaro National Park held open houses so the public could participate in the creation of alternatives, discuss possible impacts or areas of concern, and provide input on appropriate courses of action.

On December 11th, 2002 and January 13th, 2003, participants from the interdisciplinary team as well as representatives from the U.S. Forest Service and U.S. Fish and Wildlife Service held an impact analysis meeting to determine possible impacts on the resources/issue topics created in January 2002.

February 2003 through September 2003 the draft EIS was written.

During October and November of 2003 the draft EIS was sent out for peer review and Intermountain Region review.

Public comment begins on February 10, 2004 and ends on April 9, 2004. The Draft EIS will be released on February 10, 2004 and will be available at the Fire Management Office, 12661 East Broadway, behind the Bureau of Land Management Office, The Rincon Mountain District Visitor Center, and the Park Administrative Headquarters. There will be no public meetings scheduled and comments will be accepted through April 16, 2004.

Written Comments

A total of two written comments were received; one from the US Environmental Protection Agency, and one from an individual.

In accordance with Council on Environmental Quality regulations implementing the National Environmental Policy Act, all letters from federal, state, or local agencies and American Indian tribes, as well as all substantive public comments, must be reprinted in the Final Environmental Impact Statement. Responses must be provided to substantive comments. Comments are substantive if they:

- question, with reasonable basis, the accuracy of information in the environmental impact statement
- question, with reasonable basis, the adequacy of the environmental analysis
- suggest different viable alternatives
- cause changes or revisions in the proposal

In other words, comments are substantive if they raise, debate, or question a point of fact or a point of policy from an alternative. Comments in favor or against the proposed action or alternatives, or comments that only agree or disagree with NPS policy, are not considered substantive.

Letters in response to the Saguaro National Park Draft Fire Management Plan Environmental Impact Statement are reprinted here, along with responses to substantive comments.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

April 2, 2004

Sarah Craighead
Saguaro National Park
3693 South Old Spanish Trail
Tucson, AZ 85730

Subject: Saguaro National Park Fire Management Plan Draft Environmental Impact Statement (DEIS), Arizona [CEQ # 040070]

Dear Ms. Craighead:

The U.S. Environmental Protection Agency (EPA) has reviewed the above referenced document. Our review and comments are provided pursuant to the National Environmental Policy Act (NEPA), the Council on Environmental Quality's NEPA Implementation Regulations at 40 CFR 1500-1508, and Section 309 of the Clean Air Act.

We have rated this DEIS as EC-2 -- Environmental Concerns-Insufficient Information (see the enclosed "Summary of EPA Rating Definitions"). Our concerns primarily regard the need for specific measures in the proposal and alternatives that would be used to minimize and mitigate project impacts to soils, water resources, sensitive species, and habitats. We recommend that the final environmental impact statement (FEIS) describe and discuss these measures vis-a-vis the alternatives so that the proposal and alternatives can be effectively evaluated.

We appreciate the opportunity to review this DEIS and request a copy of the FEIS when it is filed with our Washington, D.C. office. If you have any questions, please call me at (415) 972-3854, or have your staff call Jeanne Geselbracht at (415) 972-3853.

Sincerely,

Lisa B. Hanf, Manager
Federal Activities Office

004037
Enclosures

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SUMMARY OF EPA RATING DEFINITIONS

This rating system was developed as a means to summarize EPA's level of concern with a proposed action. The ratings are a combination of alphabetical categories for evaluation of the environmental impacts of the proposal and numerical categories for evaluation of the adequacy of the EIS.

ENVIRONMENTAL IMPACT OF THE ACTION

"LO" (Lack of Objections)

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

"EC" (Environmental Concerns)

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

"EO" (Environmental Objections)

The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

"EU" (Environmentally Unsatisfactory)

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potentially unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the CEQ.

ADEQUACY OF THE IMPACT STATEMENT

Category 1" (Adequate)

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

"Category 2" (Insufficient Information)

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analysed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

"Category 3" (Inadequate)

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analysed in the draft EIS, which should be analysed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From EPA Manual 1640, "Policy and Procedures for the Review of Federal Actions Impacting the Environment."

Mitigation Measures

1. According to the DEIS (p. 2), fire management plans are fundamental strategic documents that guide the full range of fire management related activities. These activities should include measures to avoid, minimize, and mitigate potential impacts to resources. However, for several resources, the DEIS does not describe or evaluate specific mitigation measures. For example, the DEIS (p. 37) states that impacts to soils would be minimized by using the best available technology and rehabilitation of disturbed soils, as determined by the park fire and resource management staff; however, no details are provided. The DEIS also states that mitigation measures will be implemented to avoid impacts to ephemeral drainages, riparian vegetation, *tinajas*, springs, and wet meadows within the park, but it does not describe or discuss these measures. Page 119 states that adverse impacts to watersheds, soils, and water quality/quantity resources will be reduced using site-specific fire implementation plans (FIPs) that would provide guidance on how to best avoid these adverse impacts in the park.

1

Recommendation: We recognize that individual site-specific FIPs may contain different mitigation measures, based on different approaches to fire management of various sites. However, the FEIS should provide clear descriptions and evaluations of the mitigation measures that would be implemented in these situations and included in the site-specific FIPs. According to the Council on Environmental Quality, the mitigation measures discussed in an EIS must cover the range of impacts of the proposal. (Memorandum for Federal NEPA Liaisons, Federal, State and Local Officials and Other Persons Involved in the NEPA Process, "Forty Questions," 3/16/81). The FEIS should include discussions of how resources such as drainages, riparian vegetation, *tinajas*, springs and wet meadows will be delineated for avoidance in the field during fire management activities; how soil and watershed resources will be protected; and measures that will be taken to avoid adverse impacts to sensitive species.

2. The DEIS (p. 57) indicates that a biological assessment will be included as an appendix in the FEIS. We also understand that you intend to include the biological opinion in the FEIS.

2

Recommendation: The mitigation discussions in the FEIS should incorporate all requirements from the biological opinion and indicate how these will be carried through to the site-specific FIPs.

Specific Comments

1. The DEIS states that wetlands and floodplains were dismissed from analysis in this document because no wetlands or 100-year or 500-year floodplains occur within the park (p. 19).

3

3 Elsewhere, however, the DEIS (p. 114) indicates that ephemeral drainages, riparian vegetation, *tinajas*, springs, and wet meadows are located within the park.

Recommendation: The FEIS should rectify these statements.

4 2. The DEIS is difficult to read because it was printed in all bold, upper case letters.

Recommendation: We suggest that the FEIS be printed using lower case letters for better readability.

Response 1: Additional details on mitigation measures for these topics have been added in Section II: Alternatives, under Actions Common to All Alternatives, pages 38 through 43. This section, including a general section on Mitigation Measures, and additional sections on more specific topics, was revised and reformatted.

Because this is a programmatic document, the mitigation measures are described in a general manner; the on-the-ground implementation details for these mitigation measures will be available in each site-specific implementation plan.

Response 2: The Biological Assessment will be included as an appendix to the Final EIS, and the Biological Opinion will be included as an attachment to the Record of Decision for the Final EIS. All the requirements stated in both of these documents will be referenced as mitigation measures in the Final EIS, and as such, will be carried through to all site-specific implementation plans.

Response 3: Effects to, and protection of, these areas is not discussed as a separate impact topic; instead, key features are analyzed in the context of other impact topics, including the impact topic of Physical Environment – Watersheds, Soils, and Water Quality/Quantity. Language clarifying this has been added to the table on page 18.

Response 4: This has been corrected.

Mark W. Belles
9318 Willard Street
Rowlett, TX 75088

Fire Management Officer
Saguaro National Park
3693 South Old Spanish Trail
Tucson, Arizona 85730-5699

06 March 2004

Dear FMO,

Thank you for the review copy of the draft Environmental Impact Statement for Saguaro National Park's Fire Management Plan.

The no-action alternative (Alternative C) and one of the action alternatives (Alternative D) do not meet the Purpose and Need of the project. Specifically, the Purpose and Need states that,

- The project should, "… allow fire to play its natural role in the ecosystem, both as wildland fire and prescribed fire.", and
- "… reverse the adverse effects from past fire suppression and prevention activities.", and
- "Wildland fire is an essential ecological process and natural change agent."

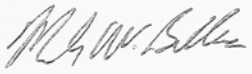
(Reference, Executive Summary)

Alternative C identifies FMUs 4, 5, and 6 and suppression units. Alternative D has no provision for use of wildland fire for resource benefit.

Considering these facts, Alternatives C and D should not be chosen.

Alternative E has merit. My only concern is that I think FM1 could be a bit larger, especially in the NW corner of the Rincon Mountain District and the Northern portion of the Tucson Mountain District.

Thank you for the opportunity to comment,



Response: It is not presently appropriate to increase the size of FMU1 in this way. This is primarily due to concerns about fire potentially crossing Park boundaries and threatening the wildland-urban interface. Additionally, the vegetation in this portion of the FMU is not fire-dependent.

List of Preparers

Table V-1. List of Preparers/Reviewers

Name and Position*	Responsibility	Education	Years of Experience
Sarah Craighead, Superintendent	• Superintendent	• B.A. – Biology	• 23 years National Park Service (NPS)
Chuck Scott Fire, Management Officer	• Alternatives • Goals and objectives • Review • Impact analysis • Scoping meeting(s)	• B.A. – Outdoor Recreation Management	• 25 years NPS
Kathy Schon, Fire Ecologist	• Lead author and project manager • Fire history • Fire effects • RMD description • GIS graphics • Impact analysis • Scoping meeting(s)	• B.A. – Botany • 1 year of graduate study in Vegetation Ecology	• 3 years University of Montana – Plant Sciences • 2 years U.S. Forest Service • 8 years NPS
Danielle Foster, Ecologist	• Invasive species section • Impact analysis • Review	• B.S. – Outdoor Recreation Management • M.S. – Biology	• 8 years NPS • 3 years U.S. Geological Survey, Biological Resources Division
Mark Holden, Biologist	• Tucson Mountain District descriptions • Impact analysis • Review	• B.S. – Forestry • M.S. – Planning (current student)	• 15 years NPS
Natasha Kline, Biologist -Wildlife Program Manager	• Wildlife sections • T&E wildlife • Impact analysis • Review	• B.S. – Zoology • M.S. – Biology	• 14 years NPS • 2 years U.S. Air Force • 2.5 years U.S. Fish and Wildlife Service
Susan Wells, Archaeologist	• Cultural resource sections • Impact analysis	• M.A. – Anthropology (cultural resource management) •	• 20 years NPS
Tom Danton, Chief of	• Review	• B.A. Philosophy • 64 graduate	• 33 years in government service

Interpretation		semester credits	30 of which with NPS
Susan Early, Administrative Officer	• Review	• In progress	• 24 years NPS
Pat Haddad, Fire Program Assistant	• Review	• A.A. Recreation/ Wildlife	• 20 years NPS
Greg Johnson, Chief of Maintenance	• Review	• B.A. – History	• 31 years NPS
Susan Keys, Fire Use Module Clerk	• Review	• A.A. – English	• 2 years NPS
Eva Long, NEPA Advisor	• Review	• BS Applied Biology	• 3 years NPS • 9 years EPA
Bob Love, Chief Ranger	• Review	• B.A. – Parks and Recreation Management	• 22 years NPS
Leslie Uhr, Fuels Management Specialist	• Review	• B.S. – Natural Resource Management	• 15 years NPS
Pete Lahm, Air Resource Program Manager USDA Forest Service	• Review of air quality section	• B.A. Chemistry • M.A. Environmental Management	• 10 years USDA Forest service
Kathy Davis Superintendent NPS	• Peer Review	• M.A. Forestry	• NPS
Larry E. Laing, Natural Resources Program Manager, Southern Arizona Office, National Park Service	• Peer Review	• Certified Professional Soil Scientist, ARCPACS (American Registry of Certified Professionals in Agronomy, Crops and Soils) • B.S. – Agronomy 1970	□ 1 year NPS □ 22 years US Forest Service • 8 years Soil Conservation Service

Thetis A. Gamberg, U.S. Fish & Wildlife Service	• Impact Analysis	• B.A. Communication and Information • B.S. Wildlife	6 year USFWS 13 years US Forest Service
Meg Weesner, Chief of Science and Resource Management	• Review	• M.S. – Wildland Recreation Management • 1986 graduate of NPS Resource Management Trainee Program	• 4 years U.S. Forest Service • 22 years NPS, including 12 years at Saguaro National Park as Chief of Science and Resource Management

*Saguaro National Park staff person unless otherwise noted.

Agencies and Organizations Receiving Copies of Draft Saguaro Fire Management Plan EIS

Federal Agencies and Members of Congress

- Bureau of Land Management, Arizona State Office, 222 N Central Ave, Phoenix, AZ 85004-2203
- Coronado National Forest, Santa Catalina Ranger District, 5700 N Sabino Canyon Rd, Tucson, AZ 85750
- NPS Intermountain Region, P.O. Box 25287, Denver, CO 80225-0287
- NPS-Intermountain Region, Air Resources Div, P.O. Box 25287, Denver, CO 80225-0287
- NPS-Intermountain Region, Denver Service Center, P.O. Box 25287, Denver, CO 80225-0287
- NPS-Intermountain Region, Water Resources Div, P.O. Box 25287, Denver, CO 80225-0287
- Representative Jim Kolbe, US Congress, 1661 N Swan Rd, Tucson, AZ 85712
- Representative Raul Grujalva, US Congress, 810 E 22nd St, Tucson, AZ 85713
- Senator John McCain, US Congress, 450 W Paseo Redondo, Tucson, AZ 85701
- Senator Jon Kyle, US Congress,7315 N Oracle Rd, Tucson, AZ 85704
- United States Attorney's Office, 405 W Congress St, Ste 4800, Tucson, AZ 85701
- David Farrel, CMD-2, Region 9, Environmental Protection Agency, 75 Hawthorne Street, San Francisco, CA 94105
- US Fish & Wildlife Service, Phoenix Regional Office, Field Supervisor, 2632 W Royal Palm Rd, Suite 103, Phoenix, AZ 85021-4951

State and Local Agencies

- AZ Department of Environmental Quality, South Regional Office, 400 W Congress, Tucson, AZ 85701
- AZ State Historic Preservation Office, 1300 W Washington, Phoenix, AZ 85007
- Pima County Board of Supervisors, 130 W Congress, Tucson, AZ 85701
- AZ Dept of Game & Fish, 555 N Greasewood Rd, Tucson, AZ 85745
- AZ Dept of Parks and Recreation, 1300 W Washington, Phoenix, AZ 85007
- AZ State Lands Department, 2901 W Pinnacle Peak Rd, Phoenix, AZ 85027-1002
- Marana Town Council, 13251 N Lon Adams, Marana, AZ 85653
- Pima County Chamber of Commerce, 130 W Congress, Tucson, AZ 85701
- Pima County Department of Environmental Quality, 130 W Congress, Tucson, AZ 85701
- Pima County Sheriff, 1750 E Benson Hwy, Tucson, AZ 85714
- Tucson City Council, P.O. Box 27210, Tucson, AZ 85726-7210

Organizations

- Academy Village, 13701 E Old Spanish Trail, Tucson, AZ 85747
- Center for Biological Diversity, P.O. Box 710, Tucson, AZ 85702
- Friends of Saguaro National Park, 200 W Stone Ave, Tucson, AZ 85702
- Institute for the Study of Planet Earth, The University of Arizona, P.O. Box 210156, Tucson, AZ 85721-0156
- Picture Rocks Fire Department, 6625 N Sandario Rd, Avra Valley, AZ 85743
- Rincon Valley Fire Department, 8850 S Camino Loma Alta, Tucson, AZ 85730
- Sierra Club Rincon Group, 738 N 5th Ave, Tucson, AZ 85705
- Sky Island Alliance, P.O. Box 41165, Tucson, AZ 85717

- Sonoran and Rincon Institute, 7650 E Broadway, Tucson, AZ 85710
- X-9 Homeowners Association, 7700 S X-9 Ranch Rd, Vail, AZ 85641

Tribes

- Tohono O'odham Nation, Planning Department, P.O. Box 400, Sells, AZ 85634
- Zuni Nation, Natural Resource Office, Box 369, Zuni, NM 87327
- San Carlos Apache Tribe, P.O. Box 209, San Carlos AZ
- Ivan Makil, President, Salt River Pima-Maricopa Indian Community 10005 Osborne Rd,Scottsdale, AZ 85256
- Robert Valencia, Chairman, Pascua Yaqui Tribe, 7474 South Camino de Oeste, Tucson, AZ 85746
- Lewis Barnaby, Cultural Resource Management Program, Gila River Indian Community, PO Box 2140, Sacaton, AZ 85427
- Jerry Enos, Chair, Office of the Chairman, Ak Chin Indian Community, 4207 Peters and Nall Road, Maricopa, AZ 85239
- Dr. Clinton M. Pattea, President, Fort McDowell Mohave-Apache Indian Community, PO Box 17779, Fountain Hills, AZ 85269-7779
- Wayne Taylor, Jr., Office of the Chairman, The Hopi Tribe, PO Box 123, Kykotsmovi, AZ 86039

Section VI: References Cited in EIS and Fire Management Plan

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na. A report prepared for the National Park Service, Saguaro National Park, Tucson, AZ.

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