

Mojave National Preserve
San Bernardino County, California

Fire Management Plan

December 20, 2004

Executive Summary

Mojave National Preserve encompasses almost 1.6 million acres of rugged desert terrain including sand dunes, cinder cones, dry lakes, desert washes, and several mountain ranges. Established in 1994 under the California Desert Protection Act, this recently established unit of the National Park System preserves transitional elements of the Mojave Desert for the protection of outstanding natural, cultural, historical, and recreational values. The Preserve includes approximately 700,000 acres of designated wilderness as well as nearly 800,000 acres of critical habitat for the federally threatened desert tortoise. The Preserve lies within the California Desert Interagency Fire Planning Unit.

The Preserve, and the Bureau of Land Management who previously managed these same lands, has historically used a full suppression fire management strategy. That is, all fires were suppressed regardless of origin or location. This is the first Fire Management Plan prepared for the Preserve. Under this plan we propose to alter this fire management strategy and would implement a more complete range of fire response commensurate with the perpetuation of natural processes and values at risk. Under this Fire Management Plan, approximately 343,000 acres (22% of the Preserve) are zoned for wildland fire use where natural ignitions can be allowed to burn under certain conditions for the perpetuation of natural processes and the preservation of wildness and naturalness within wilderness. This Fire Management Plan also provides for hazard fuel reduction immediately adjacent to park owned structures as necessary for protection of park infrastructure.

Consistent with National Park Service policy as well as the 2001 Interagency Wildland Fire Policy, this Fire Management Plan has been prepared to address fire management within the Preserve. This document follows the mandated interagency template for Fire Management Plans. The appendices follow National Park Service or Interagency formats, as required, and include the following documents:

- A. Biological Assessment for Desert Tortoise
- B. Wilderness Minimum Requirements Analysis
- C. Fire Effects Monitoring and Research Plan
- D. Smoke Management Plan
- E. Aviation Plan
- F. Five-Year Work Plan

Consistent with the National Environmental Policy Act, an Environmental Assessment (Environmental Assessment) has been prepared to analyze the impacts of implementation of this Fire Management Plan on the natural and human environments. As required, this plan and its appendices will be available for public review for 30 days. Comments must be received by January 31, 2005 and may be directed via mail or email to the Superintendent, Mojave National Preserve at:

until January 3, 2005, 222 East Main Street, Suite 202, Barstow, California 92311
after January 3, 2005, 2701 Barstow, California 92311
email: MOJA_Superintendent@nps.gov

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- A. Biological Assessment for Desert Tortoise
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I. Introduction

A. Purpose for development of this Fire Management Plan

Mojave National Preserve was established by the California Desert Protection Act in 1994 to preserve outstanding natural, cultural, and scenic resources while providing for scientific, educational, and recreational interests.

Since the establishment in 1994, the wildland fire management strategy for Mojave National Preserve has been to suppress all fires – human-caused and natural ignitions – using minimum impact suppression techniques. The purpose of this Fire Management Plan is to implement a broader range of wildland fire management strategies to better achieve the goals of the Mojave National Preserve General Management Plan. This plan does not specifically address structural firefighting except as related to wildland fuels.

Additionally, this plan fulfills responsibilities under several directives including:

- the *2001 Federal Wildland Fire Management Policy* that directs that "Every area with burnable vegetation must have an approved Fire Management Plan;"
- *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-year Comprehensive Strategy Implementation Plan* to improve fire prevention and suppression, reduce hazardous fuels, restore fire-adapted ecosystems, and promote community;

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- the *Interagency Fire Management Plan Template* that specifies a single interagency template for all federal agency fire management plans;
- and, the *National Park Service Director's Order #18: Wildland Fire Management and the Reference Manual #18* that directs park management to achieve multi-dimensional objectives, with a balance between suppression and fire use to regulate fuels and maintain healthy ecosystems.

B. Relationship to Environmental Compliance

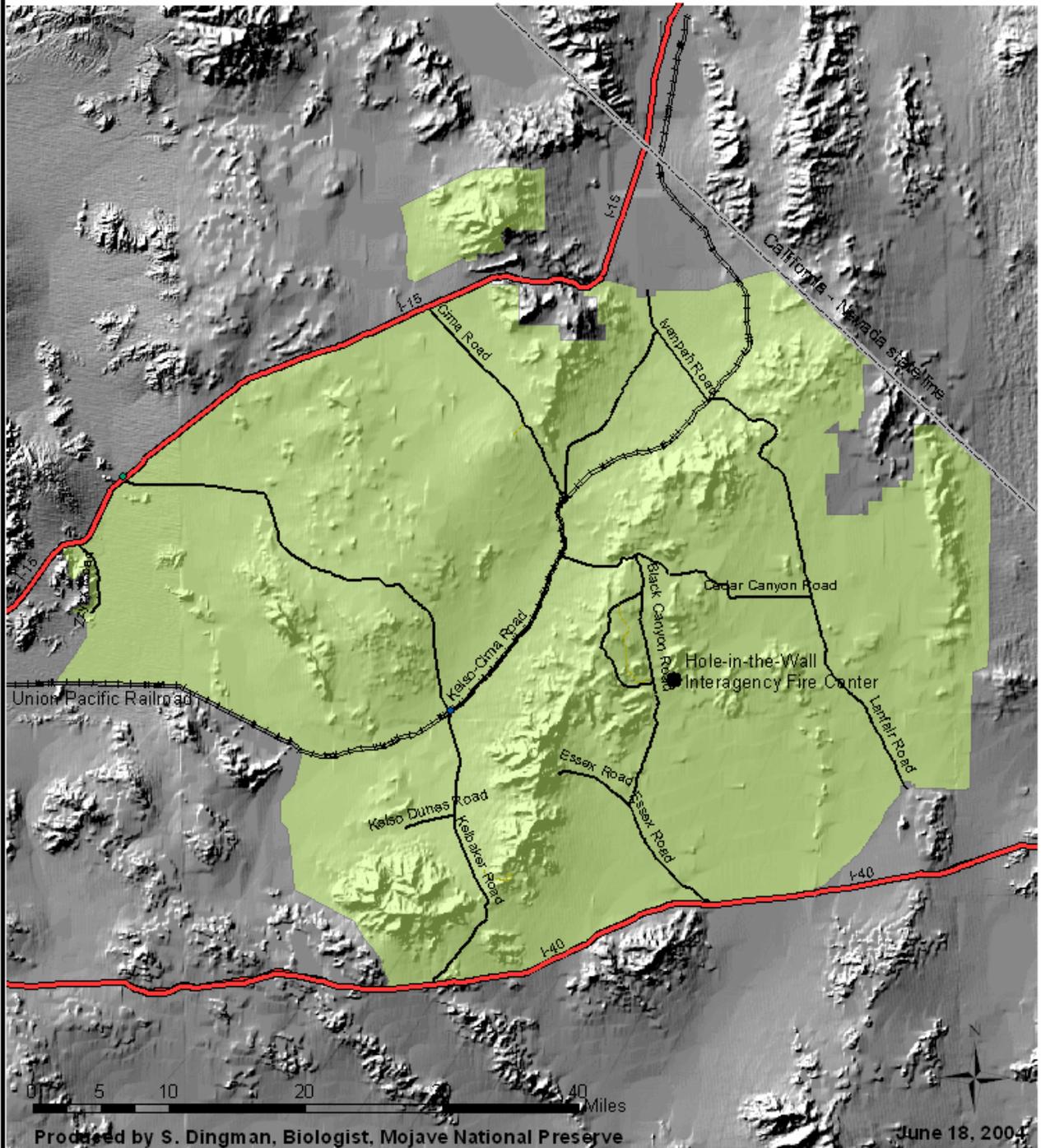
General management of the Mojave National Preserve, including general guidelines for wildland fire management, has been assessed through the formal analysis process required by the National Environmental Policy Act of 1969 (NEPA); 42 U.S.C. 4321-4347. An Environmental Impact Statement (EIS) was written and approved for the GMP and the Record of Decision was signed by the Pacific West Regional Director in September of 2001.

This Fire Management Plan, which is a document tiered from the GMP, articulates specific wildland fire management practices, procedures and policies. Adoptions of programs or plans, such as those that guide or prescribe uses upon which future agency actions may be based, require environmental analyses before a decision is made. That analysis is documented in an Environmental AssessmentEnvironmental Assessment.



Fire Management Plan

Figure 1: Overview



Produced by S. Dingman, Biologist, Mojave National Preserve

June 18, 2004

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Because habitat for the threatened desert tortoise (*Gopherus agasizii*) encompasses almost 800,000 acres of the Preserve, actions carried out for the general management of the Preserve required consultation under Section 7 of the Endangered Species Act (ESA); 7 U.S.C. 136; 16 U.S.C. 460 et seq. (1973). A Biological Opinion was issued by the United States Fish and Wildlife Service for the GMP. The Fire Management Plan (FMP) requires a separate Biological Opinion because the plan details specific policies, procedures and actions and constitutes a federal action not fully assessed in the prior Opinion. The Biological Assessment completed by the park and submitted to the US Fish and Wildlife Service for this FMP is attached (Appendix A).

The Preserve includes numerous cultural resources (described in more detail in Environmental Assessmentthe Environmental Assessment) and the National Park Service Management Policies (NPS 2000) direct:

“... decisions will follow analysis of how proposals might affect the values that make resources significant, and the consideration of alternatives that might avoid or mitigate potential adverse effects. Planning will always seek to avoid harm to cultural resources, and consider the values of traditionally associated groups....The NPS will take action to prevent or minimize the impact of wildland, prescribed, and structural fires on cultural resources, including the impact of suppression and rehabilitation activities.”

Furthermore, Section 106 of the National Historic Preservation Act 16 U.S.C. 470 et seq. (1966) directs agency consultation with the State Historic Preservation Office for federal undertakings that may affect properties listed or eligible for listing on the National Register of Historic Places. This Fire Management Plan and associated documents will be submitted to the California Historic Preservation Office for review and concurrence before a Record of Decision is completed for implementation of this Fire Management Plan.

The Clean Air Act in 42 U.S.C. 7401-7671q (as amended in 1990) provides a legal framework for the National Park Service to preserve and protect parks' air quality related values from pollution sources emanating from within and outside park boundaries. NPS fire management activities which result in the discharge of air pollutants (e.g., smoke, carbon monoxide, and other pollutants from fires) are subject to, and must comply with, all applicable Federal, state, interstate, and local air pollution control requirements, as specified by Section 118 of the Clean Air Act, as amended. These requirements are the same substantive, procedural, and administrative requirements that apply to a private person or other non-governmental entity. Since fires are not point sources but rather tend to be spatially distributed singular events, temporary impacts to visibility and visitor enjoyment must be recognized, expected, and managed. This is accomplished through a Smoke Management Plan, a necessary component of any wildland fire program. The Smoke Management Plan (Appendix D) prescribes the fuel and weather conditions that minimize smoke production and/or maximize smoke dispersion. In addition, the plan describes how the park will advise employees, visitors, neighboring communities, and air pollution control agencies of smoke conditions and outlines the steps park staff will take if there are complaints about smoke generated from fire management programs.

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The Wilderness Act, 16 U.S.C. 1131 et seq. (1988), established the National Wilderness Preservation System, composed of federal lands designated as wilderness areas, including 695,200 acres of Mojave National Preserve. Wilderness areas are to be administered "...for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, so as to provide for the...preservation of their wilderness character...." National Park Service policy (Directors Order 41) directs that in evaluating environmental impacts to wilderness, the National Park Service will take into account wilderness characteristics and values, including the primeval character and influence of the wilderness; the preservation of natural conditions (including the lack of man-made noise); and assurances that there will be outstanding opportunities for solitude, that the public will be provided with a primitive and unconfined type of recreational experience, and that wilderness will be preserved and used in an unimpaired condition. This analysis is provided in the Environmental Assessment (Environmental Assessment). Furthermore, National Park Service policy (Directors Order 410) directs that all management decisions affecting wilderness must be consistent with the minimum requirement concept. This concept is a documented process used to determine if administrative activities effecting wilderness resources or the visitor experience are necessary and how to minimize impacts. The minimum requirements analysis for implementation of this Fire Management Plan can be found in Appendix B. Except where it is used in a direct quote, the use of the term "wilderness" throughout this document and its appendices refers specifically to designated wilderness and should not be confused with "backcountry" which does not carry the obligations of The Wilderness Act.

C. Collaboration

As of 2004, Mojave National Preserve is in the California Desert Fire Planning Unit. This unit includes 14 administrative units managed by four federal agencies and includes approximately 32 million acres. It works collaboratively to implement the fire management and interagency planning actions required under the new Fire Program Analysis program.

The California Desert was designated as an Innovative Management Laboratory in December, 1994 by then-Secretary of the Interior Bruce Babbitt. It was subsequently approved by then-Vice President Al Gore under the auspices of the National Performance Review. The initiative is one of the Department of the Interior's priority efforts to demonstrate how interagency collaboration can be applied on a large scale regional basis. The objectives of this initiative are for the federal and state agencies in the desert to collaboratively: 1) plan and manage under the principles of ecosystem management; 2) provide effective customer service; and, 3) increase agency efficiency through intergovernmental organizational coordination.

The Desert Managers Group was established as the forum for government agencies to address and discuss issues of common concern and is comprised of managers from the Department of the Interior (Bureau of Land Management, National Park Service, U.S. Fish and Wildlife Service, U.S. Geological Survey), Department of Defense (Air Force, Army, Marines and Navy) and the State of California (Departments of Fish and Game, Parks and Recreation, and Transportation), interagency work groups and a small coordination staff.

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The mission of the California Desert Managers Group is to:

- Develop coordinated and complimentary management guidelines, practices, and programs.
- Coordinate and integrate efforts in the California Desert to conserve and restore desert resources, provide high quality recreation, public education and visitor services, and provide for safety of desert users.
- Develop and integrate the databases and scientific studies needed for effective resource management and planning.
- Promote compatibility in the application of each agency's mission

The Fire Management Activity Plan was developed under the auspices of the Desert Managers Group, and the interagency fire management program remains true to the Desert Managers Group mission. Five Zone Fire Management Officers from the Bureau of Land Management and NPS manage the fire programs for all agencies within their zones and strive for "seamless management" across agency boundaries. An annual Operations Plan establishes guidelines, roles and responsibilities of all personnel, and specifies response of interagency resources to all fires within the California Desert.

Interagency agreements to provide mutual aid assistance for wildland fires are in place at the national level for all five federal land management agencies (BIA, BLM, NPS, USFS and USFWS) and at the Regional level for those same federal agencies and the California Department of Forestry and Fire Protection. Additionally, there is a four-party cooperative fire protection agreement between the 1) Bureau of Land Management, California and Nevada, 2) National Park Service, Pacific West Region, 3) U.S. Forest Service, Regions 4,5, and 6, and 4) State of California Department of Forestry and Fire Protection.

Much of the scientific information used in this plan and its appendices - particularly related to plant ecology, invasive plants, fire behavior, and desert tortoise - was provided by the US Geological Survey Las Vegas Field Office. Likewise, this office is an important partner in the fire effects monitoring and research program.

D. Authorities

This Fire Management Plan was prepared under the following authorities:

- 16 U.S.C. 1 through 4.
- Federal Wildland Fire Management Policy (interagency)
- 10-Year Comprehensive Strategy (interagency)
- National Park Service Management Policies
- National Park Service Director's Order #18: Wildland Fire Management

II. Relationship to Resource Management Plan and National Fire Policy

A. NPS Management Policies concerning Wildland Fire Management

NPS Management Policies (NPS 2001) states: "Biological or physical processes altered in the past by human activities may need to be actively managed to restore them to a natural condition or to maintain the closest approximation of the natural conditions in situations in which a truly natural system is no longer attainable....The extent and degree of management actions taken to protect or restore park ecosystems or their components will be based on clearly articulated, well-supported management objectives and the best scientific information available. "

Director's Order #18 (NPS 1998) articulates National Park Service policy on fire management. All NPS units with vegetation capable of burning are required to prepare a Fire Management Plan. This plan guides the fire management program that fully incorporates considerations for the preservation of natural and cultural resources while giving safety of park visitors and employees and the protection of developed facilities the highest priority. Environmental Assessments (Environmental Assessment) are developed in support of the Fire Management Plan and consider the effects of different fire management strategies on air and water quality, health and safety, and natural and cultural resources.

B. Enabling legislation of Mojave National Preserve

With the California Desert Protection Act of 1994, Congress took action to "preserve and protect unrivaled scenic, geologic, and wildlife values" associated with the unique landscapes of the California Desert. This act specifically established Mojave National Preserve from lands formerly managed by the Bureau of Land Management as the East Mojave National Scenic Area. With subsequent land acquisitions, Mojave National Preserve now encompasses approximately 1.6 million acres representing a combination of Great Basin, Sonoran, and Mojave Desert ecosystems. Of the Preserve's 1.6 million acres, almost half are designated wilderness.

The recently completed General Management Plan (NPS 2001) summarizes the purpose of the Mojave National Preserve to:

- Preserve and protect the natural and scenic resources of the Mojave Desert, including transitional elements of the Sonoran and Great Basin Deserts
- Preserve and protect cultural resources representing human use associated with Native American cultures and westward expansion
- Provide opportunities for compatible outdoor recreation and promote understanding and appreciation of the California Desert

C. Park-wide goals and objectives as they pertain to Fire Management

The General Management Plan identifies nine objectives that directly or indirectly relate to fire management in Mojave National Preserve:

- Seek to protect significant natural and cultural resource and values, including geologic features, and to foster an improved understanding of fire and its role as a natural process through monitoring efforts and scientific research.
- Educate visitors regarding the National Park Service mission and the natural and cultural resources of the Preserve, including the ecological role of fire.
- Seek to continually improve the efficiency and effectiveness of fire management operations and administration. Adopt and incorporate sustainable practices into all aspects of the Preserve's fire management operations.
- Perpetuate scenic and cultural landscapes.
- Protect wilderness values and the wilderness experience in areas congressionally designated as wilderness and manage desert resources, including wilderness, for maximum statutory protection provided for under the law, and adopt strategies to minimize impacts of fire management activities in all areas.
- Full protection of unique natural and cultural features.
- Suppress all human caused fires, and implement all fire management actions using methods, equipment and tactics that cause the least impact to natural and cultural resources.
- Use minimum requirements analysis for fires in wilderness. Use of mechanized equipment will continue to remain an exception to be used sparingly.
- Assess research needs and initiate and promote long-term studies.

D. Resource Management Plan objectives as they pertain to fire management

There is currently no Resource Management Plan for Mojave National Preserve.

E. How the Fire Management Plan will help meet objectives of the General Management Plan and Resource Management Plan

The objectives of the General Management Plan are general in nature. The overall vision for the Preserve is the protection and perpetuation of the natural environment and cultural landscape for the enjoyment and use of future generations.

Fire Management Plans articulate specific goals, tasks and protocols in the application of fire management. Consistent with the general guidance provided by the General Management Plan, the Fire Management Plan will:

- Manage all fires to minimize impacts to all natural and cultural resources by limiting suppression tactics to engines on established roads, handcrews, and helicopter water drops and crew transport;

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- Delineate fire management units and identify appropriate fire management strategies, with consideration for protection of human life and property, protection of sensitive resources, and preservation of natural habitats and processes;
- Allow fire to resume its natural role in wilderness where natural fire regimes are unaltered, provided that fire does not pose a threat to structures, historic mine sites, or tortoise habitat;
- Provide basic guidelines for post-burn rehabilitation to minimize and mitigate impacts of fire suppression activities and to reduce risks to critical human, cultural, and natural resources from post-fire watershed effects;
- Identify fire-related research needs and establish a fire effects monitoring program to gain a better understanding of fire effects on soils and biotic communities; and
- Establish guidelines for smoke management to protect air quality and sensitive receptors consistent with the Clean Air Act.

III. Wildland Fire Management Strategies

A. General Management Considerations

In the California Desert, wildland fire on federal land is managed on an interagency basis between the Bureau of Land Management (BLM) and the National Park Service (NPS). Five Zone Fire Management Officers from both Bureau of Land Management and NPS manage the fire programs for the agencies within their zones, and strive for "seamless management" across agency boundaries. The California Desert Interagency Fire Operations Plan is updated annually to establish operational guidelines, roles and responsibilities for the Bureau of Land Management and National Park Service interagency fire management program within the California Desert and to comply with the most current federal wildland fire management policies and directives. This Fire Management Plan is a strategic document that complements the annual Operations Plan, which is essentially a tactical document to guide day to day fire operations in the California Desert.

Consistent with the National Fire Plan, as well as the 2004 California Desert Interagency Fire Operations Plan and the General Management Plan for Mojave National Preserve, this Fire Management Plan delineates fire management units and identifies appropriate fire management strategies within Mojave National Preserve for the protection of life and property as well as preservation of natural and cultural resources.

B. Wildland Fire Management Goals

The Mojave National Preserve's fire management program goals and objectives are aligned with the Preserve General Management Plan goals, Department of the Interior policy, National Park Service policy, and the National Fire Plan. The fire management program goals and sub-goals are listed in descending order of their priority:

1. Protect human life and property.
 - a) Ensure the fire program is in compliance with the Federal Wildland Fire Management Policy, National Wildfire Coordinating Group Guidelines and Incident Qualification Guidelines prior to the established fire season.
 - b) Develop and implement Fire Education and Prevention Outreach programs for local communities and fire agencies.
 - c) Develop and implement hazard fuel treatments to reduce or alter fuel loadings, where necessary to protect park owned structures.
2. Minimize negative impacts of fire and fire management activities on natural and cultural resources.
 - a) Identify management concerns for protecting site-specific resources during wildland and prescribed fires.
 - b) Implement "Minimum Impact Suppression Tactics" whenever possible.

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- c) Develop and implement standard operating procedures for fire management operations in desert tortoise habitat.
 - d) Provide training and experience for National Wildfire Coordinating Group qualified Resource Advisors with expertise in specific park natural and cultural resource needs, including desert tortoise. Ensure a qualified Resource Advisor is assigned to each fire incident that exceeds 10 acres in size or requires extended attack.
3. Provide for the safe and efficient management of all fires.
- a) Define management responsibilities, organizational level and decision-making processes for all fires.
 - b) Maintain a fire management organization during the fire season that will contain 95% of all unwanted fires in the park during initial attack.
 - c) Develop a "Wildland Fire Implementation Plan, Stage 1" for all wildland fires used for resource benefit, within two hours of detection and size-up. Develop "Stage 2" and "Stage 3" plans as required by Federal Fire Policy.
 - d) Make appropriate notifications for all fires to assure that park neighbors and partners are informed of any fire situation that could pose a risk to private property or transportation corridors.
4. Develop a smoke management program.
- a) During all fire incidents, work cooperatively with the Mojave Desert Air Quality Management District to identify and implement smoke management strategies to avoid impact to critical receptors and that will not exceed the state standards for carbon monoxide and particulates in smoke sensitive areas.
 - b) Zone suppression and wildland fire use areas to protect visibility along major transportation corridors.
 - c) Promptly notify California Department of Transportation (Caltrans) and Nevada Department of Transportation (NDOT) for any fires that are likely to affect visibility on interstates and state highways.
5. Develop fire management planning strategies using science-based information and best professional judgment.
- a) Systematically and opportunistically monitor and evaluate the effects of fire on park ecosystems.
 - b) Identify and prioritize fire research needs and seek funding as appropriate.
 - c) Actively acquire and manage the best available scientific information to implement the Fire Management Plan.
6. Recognize fire as a natural process within the Preserve.
- a) Zone for wildland fire use in areas where unplanned natural ignitions do not pose an unreasonable risk to life, property, or resources.
 - b) Develop a "Wildland Fire Implementation Plan, Stage 1" for all wildland fires used for resource benefit, within two hours of detection and size-up. Develop "Stage 2" and "Stage 3" plans as required by Federal Fire Policy.
 - c) Minimize the probability of negative fire effects outside the normal fire regime.

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7. Promote an interagency approach to managing fire.
 - a) Review, update and initiate cooperative agreements as required to assure that interagency approaches to managing wildland fires are implemented in a safe and efficient manner.
 - b) Ensure that local resources from cooperating agencies are used when appropriate to reduce operational costs.

8. Promote public understanding of fire management programs and objectives.
 - a) Develop and implement Fire Education and Prevention Outreach programs for local communities and fire agencies.
 - b) Ensure that a qualified Information Officer is assigned to each fire incident that exceeds 100 acres in size or requires extended attack.

C. Wildland Fire Management Strategies

Wildland fire suppression

Wildland fire suppression is an appropriate management response to wildland fire that results in curtailment of fire spread and eliminates all identified threats from the particular fire. All wildland suppression activities provide for firefighter and public safety as the highest consideration, but minimize loss of resource values, economic expenditures, and/or the use of critical firefighting resources.

The Mojave National Preserve was formerly managed by the Bureau of Land Management as the East Mojave National Scenic Area. An assessment of fire reports from 1985 indicate the majority of man-caused ignitions were less than 0.1 acre in size and started near the main roads in or adjacent to the unit, primarily I-15 and I-40. Natural ignitions clustered in the higher elevation areas within the Granite – Providence – Kingston Mountain range belt, and varied in size from 0.1 to 0.5 acre in size. A few natural starts, which developed into fires larger than 200 acres, occurred in Lanfair Valley and the Piute range. In general, smaller fires occurring along roadways were wildland exposures resulting from car fires in areas of light or previously burned fuels, so spread was minimal. Natural ignitions burned in rocky, high elevation areas where fire spread was contained by sparse fuels or natural barriers. Large fires were driven by frontal winds and easily controlled only after winds subsided and/or rain ensued.

Prior to 1994, Bureau of Land Management operational strategies for suppression in this area entailed minimal line construction and use of air support when available. Aerial reconnaissance of old burns indicates minimal resource damage occurred as direct consequence of past suppression actions.

Under this Fire Management Plan, 1,246,401 acres (approximately 78% of the Preserve) are zoned for suppression to protect desert tortoise habitat, structures, historic resources, private lands, rare plant species, and lands where the flammability of the vegetation has been altered by

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invasive grasses. Additionally, all human caused ignitions will be suppressed regardless of their location. Approved suppression tactics consist of fire engines operating on pre-existing roads, hand crews, and helicopters for crew transport and water drops. Management of helicopters and fixed wing aircraft is further described in the Aviation Plan (Appendix E). Hand crews use hand and power tools to cut, scrape or wet down vegetation to create a barrier to fire spread. Handline construction will be minimal and minimum impact suppression techniques will be employed to the fullest extent possible. Engines are used to apply water or soap-based surfactants (Class A foam) to vegetation. The following fire fighting tactics are not approved for use in Mojave National Preserve: heavy equipment (dozers, backhoes, loaders, graders), chemical fire retardant (except for Class A foam), and off-road operation of vehicles including engines.

Minimum Requirements Analysis will be performed when fire operations take place within designated wilderness areas to determine the types of techniques and tools appropriate for the situation at hand.

As personnel trained to identify and mitigate suppression impacts and recommend post-fire rehabilitation measures, resource advisors will assess burn areas that exceed 100 acres or fires of any size that occur in sensitive habitats. Sensitive habitats include habitat for state or federally listed species as well as locally rare plant communities such as desert riparian and spring areas, interior chaparral, white fir stands, and dolomitic plant assemblages.

Prescribed fire

A prescribed fire is any fire ignited by management action to meet specific objectives. A written, approved prescribed fire plan must exist and environmental compliance requirements must be met prior to ignition. Appropriate objectives include burns conducted for research or scientific purposes, reduction of hazard fuels, restoration of a natural process to fire-dependent plant communities, or removal of exotic plant species.

Prescribed fire is not planned for implementation in Mojave National Preserve under this Fire Management Plan due to the lack of available information regarding the natural fire regime and the extent to which that fire regime has been altered by human activities.

Wildland fire use

Wildland fire use is the management of naturally ignited wildland fires to accomplish specific pre-stated resource management objectives in pre-defined geographic areas outlined in Fire Management Plans. Operational management is described in the Wildland Fire Implementation Plan, an expandable document that is prepared for each fire use incident.

Prior to the establishment of Mojave National Preserve, high elevation natural ignitions were sometimes monitored by the Bureau of Land Management but not directly suppressed. These fires burned within areas contained by natural breaks in fuels or

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physical barriers such as rock outcrops and self-extinguished in a relatively brief time. Aside from this scenario, records do not indicate any use of wildland fire to meet pre-established land management objectives. The overall management emphasized suppression as the strategy in the East Mojave Scenic Area and in the California desert region generally.

While there is much that we do not know about the role of fire in the Mojave Desert, we do know that there were natural ignitions and burnable vegetation prior to European settlement. Thus fire must play some role in the ecology of the desert and particularly in shaping vegetation communities. While the recent invasion of non-native plants has increased the flammability of the landscape in general, the effects of this invasion are not consistent across the landscape. Many of the higher elevation plant communities have a native perennial grass component that naturally occupies the spaces between shrubs, so the flammability of these communities is less influenced by the invasion of non-native grasses. In other areas, the non-native plants have difficulty establishing a continuous fuel bed on the shifting substrates that characterize much of the western third of the park, so the flammability of these areas are less influenced by their presence. Furthermore, effective fire suppression in some areas is extremely difficult because of the inaccessibility of the terrain. This is especially true of areas that are designated wilderness as their suitability for inclusion in wilderness was due to their remoteness, inaccessibility, and lack of human alterations (such as roads). Ideologically, the preservation of both wildness and naturalness in wilderness is best served by allowing fires started by lightning to burn naturally provided that the fires do not pose a risk to human life, property, biological resources, or cultural resources.

Under this Fire Management Plan, 342,927 acres of designated wilderness are zoned for wildland fire use. This is approximately 22% of total lands within Mojave National Preserve and 44% of Preserve lands that are designated wilderness. These wildland fire use areas are located in the higher elevation lands found in portions of Clark Mountain, Piute Range, Woods Mountains, Hackberry Mountains, Providence Mountains, and Granite Mountains as well as the sparsely vegetated lands along the Park's western boundary at Kelso Dunes, Kelso Mountains, Devil's Playground, Cowhole Mountains, Old Dad Mountains, and Soda Dry Lake.

Non-fire treatments

Non-fire treatments for fuels include mechanical, chemical, biological and manual methods. These treatments may be used individually, with or without fire, and/or in combination to achieve resource benefits and managements goals such as hazard fuels reduction, ecosystem restoration, and maintaining ecosystem health.

Mechanical fuel reduction is the only non-fire fuel treatment identified for implementation in this Fire Management Plan. Mechanical fuel management uses hand and/or power tools to cut or remove live or dead vegetation to decrease either the volume or flammability of the fuels. Fuels treatments are planned activities that are conducted before a fire occurs in order to reduce fire risk. The only fuel treatments proposed in Mojave National Preserve are hazard fuel reduction

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immediately adjacent to park owned structures and hazard fuel reduction in the campsites in the Mid Hills Campground.

The Park will also incorporate hazard fuel reduction and fire preparedness requirements into various permits and agreements that involve structures inside of Mojave National Preserve. Examples include utility rights-of-way substations and communication sites, as well as the research and education facilities operated by universities. Private or public inholdings located within the Preserve that are not legally subject to permits or agreements cannot be required to adhere to hazard fuel reduction. To encourage such owners/operators to voluntarily implement fire prevention measures, the Preserve will implement a fire prevention and education campaign and work with property owners and residents to reduce fuel hazards.

The Preserve has no plans to employ biological means to reduce fuels. This includes the use of cattle or other introduced grazing animals. Former grazing allotments within the Preserve were purchased by a third party conservation group and subsequently donated to the Preserve. By agreement with these parties, these allotments are permanently retired and grazing will not be reintroduced.

D. Description of Wildland Fire Management Strategies by Fire Management Unit

Fire Management Units (FMUs) identify areas of the Preserve that are assigned different fire management objectives and strategies based on management constraints, fire regime, and the human, natural, and cultural resource values to be protected. By designating Fire Management Units, decision making processes regarding the use of fire and fire suppression are simplified for the Incident Commander and/or Fire Program Manager.

There are five Fire Management Units within Mojave National Preserve. Appropriate fire management objectives and strategies within each Unit are based on vegetation type, known fire history, behavior and effects, resource concerns, accessibility, and proximity to developed areas, private property and homes.

One key variable in the delineation of fire management units is vegetation type. Vegetation types as described in this plan are based on the Central Mojave Vegetation Mapping Project (Thomas et al 2004). This geospatial data displays vegetation and other land cover types in the eastern Mojave Desert of California. Map labels represent alliances and groups of alliances as described by the National Vegetation Classification system (FGDC 1997). The nominal minimum mapping unit is 5 hectares. Each map unit is labeled by a primary land cover type. Data were developed using field visits, 1:32,000 aerial photography, SPOT satellite imagery, and predictive modeling. These vegetation map units are further grouped into ecological zones (based on the descriptions of Brooks and Minnich, in press) that approximate fire regimes.

When possible, boundaries of Fire Management Units coincide with roads or landmark features that are easily distinguishable on the ground by fire personnel. The designation of Fire Management Units is intended as a general guideline for fire management protocol and priorities established to address safety and resource concerns specific to that unit.

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Fire Management Plan

Common to all units, all human-caused ignitions are suppressed. Firefighter and public safety, protection of property, and responsible stewardship of all resources are primary concerns in the consideration of tactical or operational fire management efforts in all Fire Management Units.



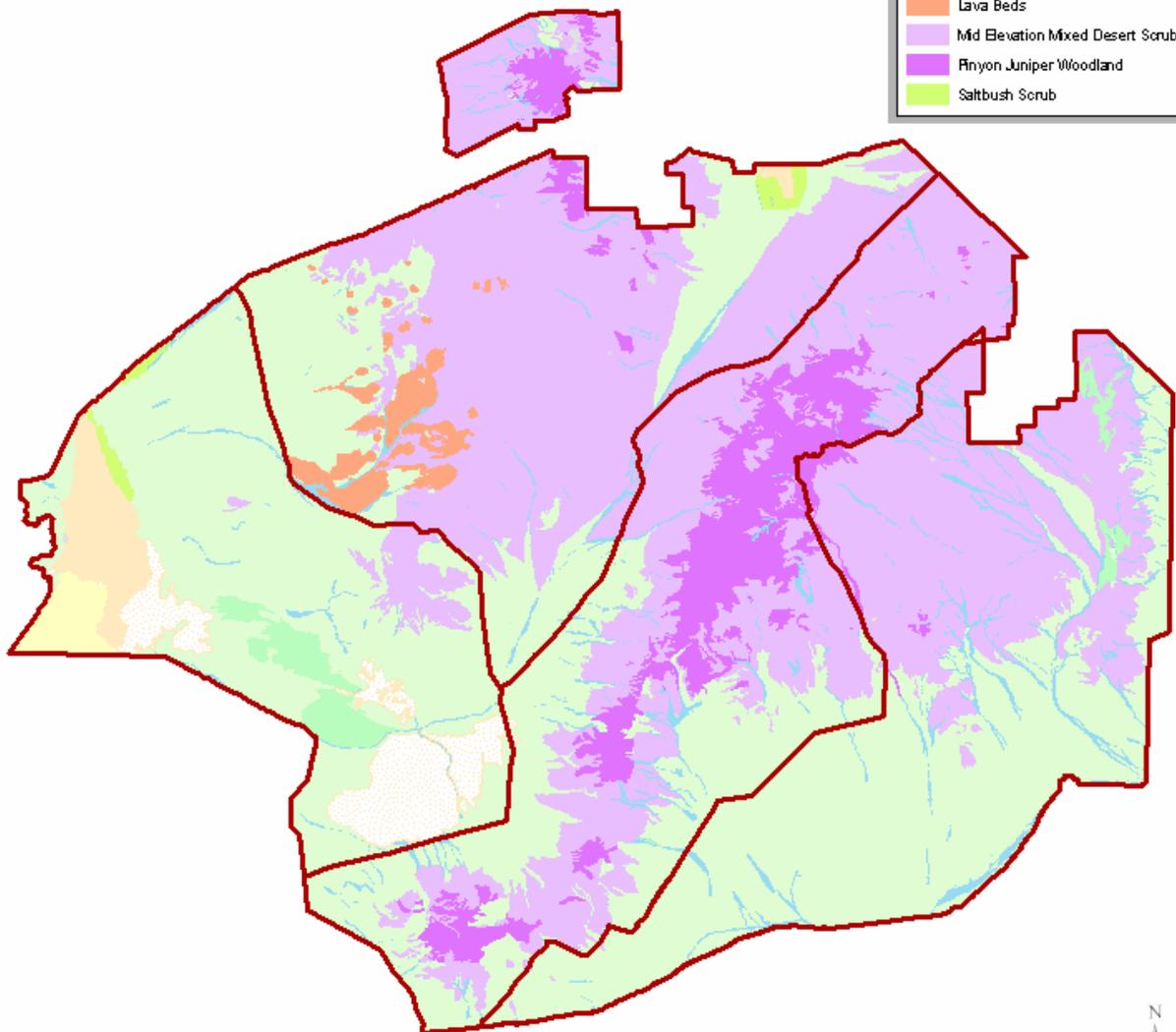
Fire Management Plan

Figure 3: Vegetation

The vegetation data is from the Central Mojave Vegetation Mapping Project of the U.S. Geological Survey (Thomas 2004). The vegetation classification is based on photointerpreted 1:32000 aerial photography with a 5 ha minimum mapping unit. The vegetation is classified according to the National Vegetation Classification System (FGDC 1997) and is presented here at the system level.

Legend

- fire management units
- Vegetation type**
 - Barren
 - Creosote Bush Mixed Scrub
 - Desert Grassland and Shrub Steppe
 - Desert Sink
 - Desert Wash System
 - Interior Dunes
 - Land Use
 - Lava Beds
 - Mid Elevation Mixed Desert Scrub
 - Pinon Juniper Woodland
 - Saltbush Scrub



0 5 10 20 30 40 Miles



Produced by S. Dingman, Biologist, Mojave National Preserve

June 18, 2004

FILE: Untitled.mxd



Fire Management Plan

Figure 4: Fire Regime

This map is an interpretation of the vegetation map (Thomas 2002) whereby mapped vegetation classes were assigned to one of five fire regimes based on ecological zones and fire ecology described by Brooks and Minnich (in press). More complete descriptions of these ecological zones and fire regimes can be found in Appendix D.

Legend

 fire management zone

fire regime

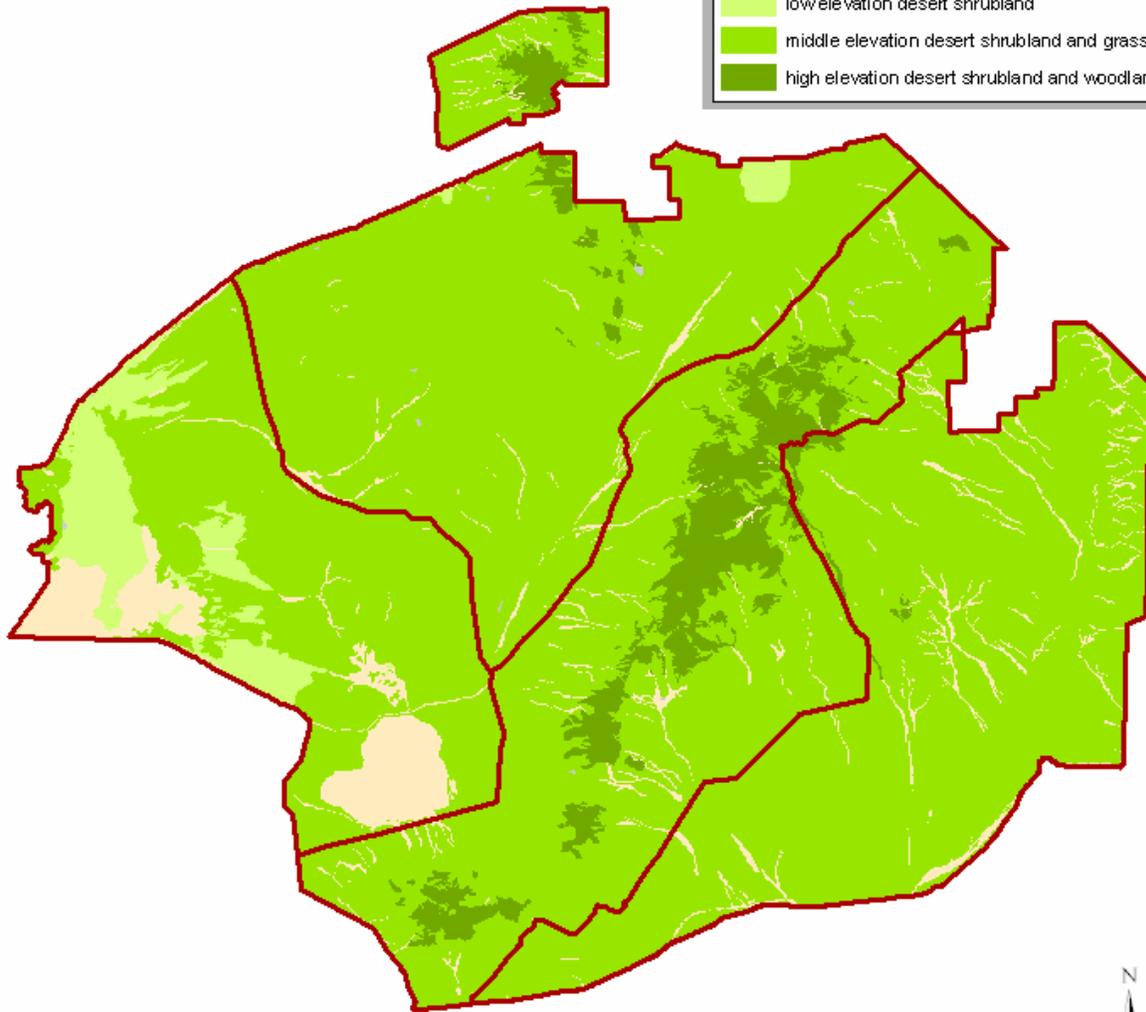
 non-fuel: human development or land use

 non-fuel: barren or sparsely vegetated

 low elevation desert shrubland

 middle elevation desert shrubland and grassland

 high elevation desert shrubland and woodland



0 5 10 20 30 40 Miles



Produced by S. Dingman, Biologist, Mojave National Preserve

June 18, 2004

FILE: C:\GIS\FMP\figures\fire regime.mxd

1. Kelso Fire Management Unit

Area	315,736 acres total
Precipitation	3.4 inches per year average
Winds	Summer, SW; Autumn, SW with common E, events; winter, gusty NW
Average Temperatures (Fahrenheit)	Winter 37-64; Spring 56-89; Summer 75-105+
Elevational Range	900-2,800 feet
Vegetation Communities (based on system classification of Thomas 2004)	62% creosote bush mixed scrub, 14% interior dunes, 8% desert sink, 5% mid elevation mixed desert scrub, 5% desert grassland and shrub steppe, all other vegetation classes occupy less than 5%

a) Physical characteristics of Kelso Fire Management Unit

The western and northern boundaries of this unit coincide with the Preserve’s administrative boundary. The northern boundary begins west of Zzyzx road, extends parallel to the southern side of Interstate 15 and terminates about three miles west of Halloran Springs. The Pipeline road just north of the Granite Mountains serves as a southern boundary. The Unit’s Eastern boundary begins at the intersection of the Pipeline road and Kelbaker road until about 10 miles southeast of Baker when the road bends in a northwesterly direction toward that community. A dirt road at that junction, which extends north to just west of Halloran Springs, serves as the remainder of the eastern boundary. The western boundary is the administrative boundary between the Preserve and lands managed by the Bureau of Land Management.

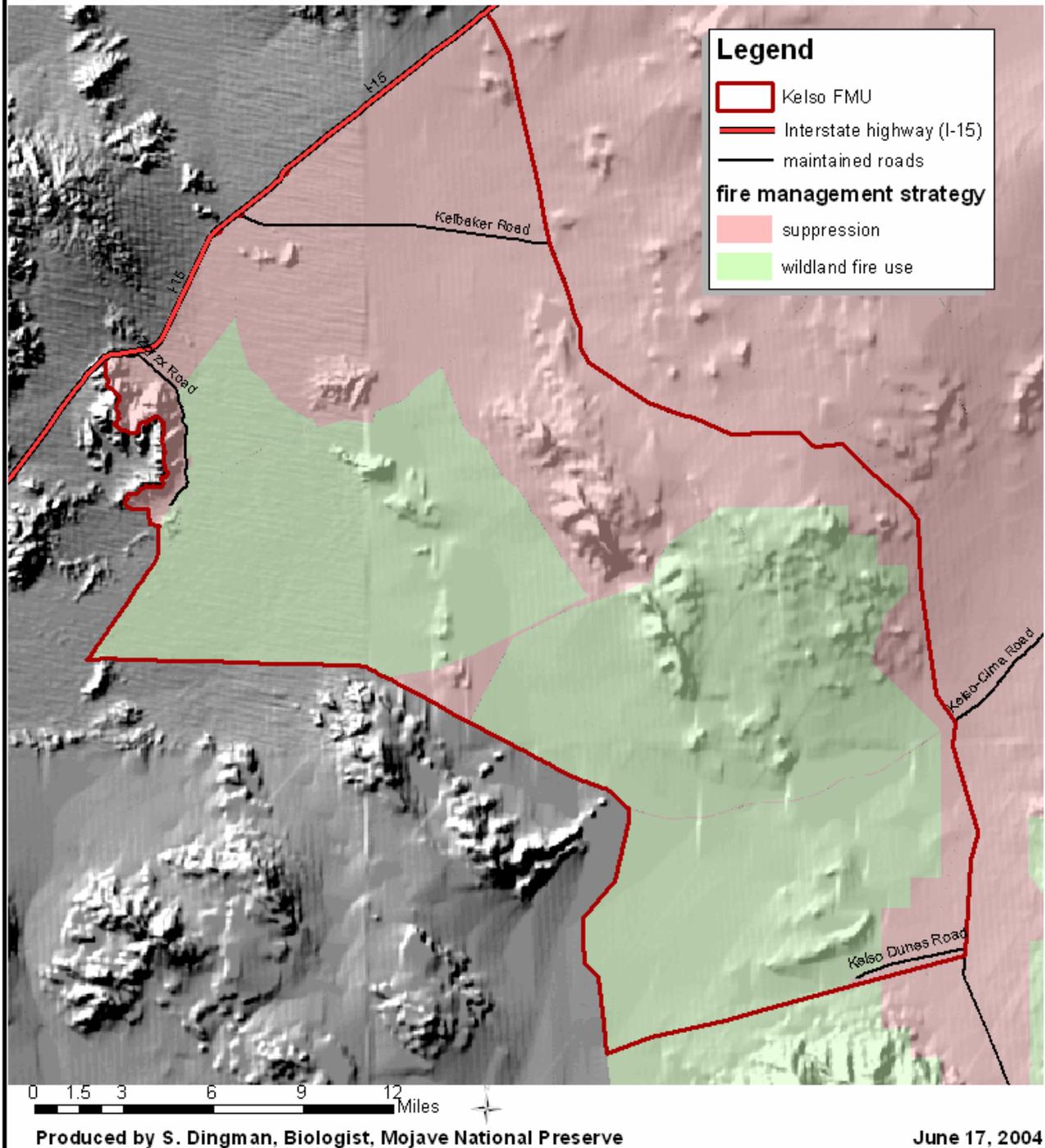
The vegetation within much of the Kelso unit is characteristic creosote bush mixed scrub dominated by creosote, white bursage, and saltbush (Thomas 2004). Nonetheless, the peripheral areas differ in their vegetative composition. Around Soda Dry Lake in the northwestern portion of the unit the vegetation is sparse with occurrences of brittlebush, greasewood, and desert sink vegetation such as iodine bush. Psammophytic plants inhabit the dunes of the western and southern boundaries of the unit. The east-central portion of the unit includes scattered Mojave yucca, Joshua tree, and blackbrush in the mountains.

The Cowhole, Old Dad and Kelso ranges are relatively isolated mountains that run northwest to southeast. The relief of these ranges is rocky and steep, providing suitable habitat for a substantial herd of Nelson’s bighorn sheep. Vegetation is sparse and the fuels are discontinuous.



Fire Management Plan

Figure 5: Kelso FMU



b) Historic role of fire in Kelso Fire Management Unit

The dominant vegetation type in this unit, creosote bush scrub, is generally widely spaced, with a sparse herbaceous understory in most places. Creosote (*Larrea tridentata*) dominates this community. Common associates are burro bush (*Ambrosia dumosa*) cheesebush (*Hymenoclea salsola*) saltbush (*Atriplex spinifera*) and allscale (*Atriplex polycarpa*). Invasive, non-native species include red stem filaree (*Erodium cicutarium*), Saharan mustard (*Brassica tournefortii*), Arabian grass (*Schismus arabica*) and red brome (*Bromus madritensis* ssp. *rubens*). These invasive species appear to be most abundant adjacent to roads and in other disturbed areas. The presence of these non-native species may have altered the natural fuel regime by occupying the intershrub spaces thus creating a more continuous fuel bed resulting in larger fires. The lower slopes of the Kelso Dunes host a variety of plants in a patchy distribution including several species not commonly seen in rest of the Preserve. Most notable in terms of fuel are the large, dense clumps of big galleta grass (*Hilaria rigida*) interspersed along the slopes and swells of the lower dunes.

Like the rest of the Preserve, fire occurrence records only back to 1984 and the shrub species and substrates do not lend themselves to fire occurrence analysis. From 1984 to 2003, 63 fires were recorded in this unit or immediately adjacent to it along Interstate 15. Those 63 fires burned a total of 109.25 acres, ranging in size from 0.01 acre to 100 acres. Of those 63 fires, only four were caused by lightning, including the largest fire on record in this unit, a 100-acre fire that burned in creosote scrub in July 1995. In fact, all four lightning-caused fires burned in the month of July. The remaining 59 fires were human caused and were mostly associated with road corridors. This pattern is consistent with the assumed fire regime of creosote scrub, where this community experiences infrequent natural fire, due to the nature and arrangement of fuels typical of this community. Fire occurrence in this community is thought to be associated with periods of above average precipitation resulting in a more abundant fine fuel load and the occurrence of lightning associated with monsoons in late summer.

The Kelso Dunes, Devils Playground, and Soda Lake areas are at minimal risk for wildfire. Vegetation is sparse and discontinuous, there is a high proportion of bare ground, sand or rock, and the potential for man-caused ignitions is generally low. The Bureau of Land Management's Razor Road Off-Highway Vehicle (OHV) area is adjacent to the northern portion of the western unit border. This is a high use area in which use occurs predominantly in the winter months. OHV users trespass into NPS wilderness increasing the potential for human-caused ignitions in this area, but the sparseness of fuels renders the potential for large fires or extensive spread insignificant

Plant communities in the Kelso Fire Management Unit display few obvious morphological or reproductive adaptations to fire. Brown and Minnich (1986) postulate that many creosote bush scrub taxa (and desert perennials in general) are poorly adapted to recurrent burning. Historically, it is believed fire was very infrequent in the Sonoran and Mojave deserts due to limited biomass, wide spacing between shrubs, Also, rare fires may have long-term impact on this community as post-disturbance recolonization by long-lived species is quite slow and may require centuries. As a group, they appear to be unable to persist after burns by surviving fires, sprouting, fruit serotiny, long-term seed viability or immediate germination by scarification of

seed. Generally speaking, fire historically played a minimal role in this ecotype and consequently such adaptations were not physiologically necessary. Still, many individual species can eventually re-establish on a burned site, over highly variable and sometimes very extended time, by a number of means.

Although vegetation is characteristically patchy, fire can be carried by standing biomass, litter, and dead or decadent shrub parts if winds are sufficient. Annual grasses can also contribute to fire spread in some years, but the extent and degree varies from year to year based on fuel moisture and drought conditions. Drought years contribute to increased dead fuels, while wet years contribute to increased live fuels which cure later in the hot season.

Native grasses may colonize burns if non-native annual species such as red brome and cheatgrass have not previously dominated the understory. Some hydrophobicity (water-repellency) has been noted in the soils of creosote bushes, and this characteristic may inhibit the establishment of some annuals.

c) Wildland fire management situation in Kelso Fire Management Unit

1) Historical weather analysis: Limited data exists on historical weather patterns. Generally, precipitation is less than about four inches annually. Winds are generally southwesterly in the summer and fall, with some Foehn (dry easterly) wind events occurring mostly in mid to late fall. Winter and spring winds are north-northwest. Local differences in terrain causes variability in wind direction and velocity. Monsoon-generated and convection thunderstorms generate erratic winds and strong downdrafts and occur most often in late July through early September, although the occurrence and severity of monsoons is variable from year to year. Relative humidity is mostly in the low teens, with sometimes single digit readings, and periodically higher with the occurrence of precipitation.

2) Fire Season: The fire season is somewhat variable with a later start if weather remains cool into the spring. Vegetation can support fire by May 1 but in some years it may support fire as early as April if cool season grasses cure during an early warm spell following a wet winter. Lightning ignitions generally occur between late June and mid-September. Lightning is often accompanied by heavy rain but on some occasions multiple dry strikes occur. High winds contribute to fire spread but generally blazes are limited to 0.10 acre or less and generally require minimal suppression actions, if any. In most situations the absence of wind precludes extensive fire spread.

3) Fuel characteristics in relation to fire behavior: Desert plants are opportunists and quickly store and utilize water when it becomes available. Winter precipitation is particularly important as it generally occurs as slow, steady rain generated by winter storms from the north. Live fuel moistures are consequently at their highest point in the spring and during flowering. By mid-summer, several desert shrubs enter a dormant phase and may partially or fully lose foliage. They may accumulate dead leaves and other plant matter within their bases or on the ground beneath. Leaves become very dry and plants appear to be dead or dying. The presence of continuous

dry annual grasses in intershrub spaces can contribute to fire spread. The extent of winter annuals is highly dependent on winter precipitation. Summer rains are of shorter duration and higher volume, but plants do take advantage of moisture that is available. Both live and dead fuel moistures can vary significantly, even within a few miles, as these rains can be highly localized.

4) Fire regime alteration: Some compositional change has occurred in the vegetation types within this unit due to the proliferation of non-native annual grasses. Nonetheless, the degree of this change is variable depending on the amount of winter precipitation in a given year. The presence of these non-native species may have altered the natural fuel regime by occupying the intershrub spaces thus creating a more continuous fuel bed resulting in larger fires. These invasive species and thus the alteration of the fire regime is most common in chronically disturbed areas such as those found along roadsides and corrals or waterholes frequented wild burros and formerly livestock.

5) Control Problems and dominant topographic features: Fire ignitions and spread are not a significant concern in the Soda Lake, Devil's Playground, Kelso, Kelso Dunes, Old Dad or Cowhole Mountains as fuels are generally sparse and discontinuous although it should be noted that the clumps of big galleta grass in the lower slopes of Kelso Dunes can burn with intensity. Playa areas with creosote-bursage and light mixed shrubs will not generally host fires of significant size, but some spread may occur with a flashy herbaceous layer combined with high winds. Minor to moderate control problems could occur in the mid-level elevations of this unit during wind events where Mojave yucca series occurs. Higher elevations with mixed shrub, yucca and scattered Joshua tree have higher fuel loadings and in some places have a more continuous horizontal fuel complex and generally higher site productivity. Production of fine fuels is high in some years and could present some control problems in these areas.

In the past, tactical operations have been generally limited to use of engines, if fire is adjacent to a paved or dirt road, and use of hand tools for limited line construction. Fires not adjacent to roads have traditionally been suppressed by small crews who access the area on foot, using bladder bags and hand tools.

6) Values to be protected, managed, or at risk: There are no inholdings at risk from wildfire in the Kelso Unit. Structural fire protection is managed by San Bernardino County. NPS units will provide wildland exposure protection and assist with water delivery as requested.

The Zzyzx facility, at the edge of Soda Dry Lake, is not considered at risk of damage by wildfire due to their fire-resistant construction and the lack of vegetation. Kelso Depot and associated structures are not at risk of damage by wildfire, but structural fire protection may pose problems due to long suppression response times by San Bernardino County and insufficient water and water pressure. Resulting risk of exposure to wildlands resulting from structural fires is probably not significant, as fuels to carry fire are

Mojave National Preserve
Fire Management Plan

generally sparse plus structures are surrounded by cleared areas, roads, and other barriers to fire. Adjacent private residences are also generally at low risk from wildland exposure.

Mines, shafts and adits are numerous throughout the Old Dad range but fire occurrence there is very low due to sparse fuels. Those that potentially have historic value and contain flammable materials (i.e. remains of wooden structures) were deliberately zoned for suppression.

Along its eastern boundary, the Kelso Fire Management Unit overlaps with the western edge of the Ivanpah Desert Wildlife Management Area, an area of critical habitat for the threatened desert tortoise. Approximately 47,617 acres of critical habitat are included in this Fire Management Unit and are zoned for suppression for the protection of the tortoise and its habitat.

The endangered Mohave tui chub fish (*Siphateles bicolor mohavensis*) occurs in small ponds in the Zzyzx compound. The sparse fuel conditions around the ponds make a post-fire watershed effects on the ponds unlikely, but these ponds must be avoided during any water drafting activities for structural or wildland fire suppression in the area. Furthermore, Class A foam will not be used near the ponds.

d) Fire management objectives for Kelso Fire Management Unit

- In the suppression zone, limit all ignitions to less than two acres in size.
- In the fire use zone, manage fires started by natural ignitions according to the Wildland Fire Implementation Plan.
- Record and document fire behavior, fire effects and severity, and post-fire succession when possible.

e) Management considerations to operational implementation in Kelso Fire Management Unit

- Minimize impact to habitat of the threatened desert tortoise and ensure operations activities are conducted in accordance with applicable terms and conditions established in the Biological Opinion issued by the U.S. Fish and Wildlife Service.
- Diligently avoid impacts to the endangered Mohave tui chub and its habitat at Lake Tuendae pond and MC Spring located at Zzyzx. Avoid use of Class A foam, drafting water from ponds, and removal of vegetation immediately overhanging the ponds.
- Protect all identified cultural and historical resources.
- Employ minimum impact suppression techniques.

f) Fire Management strategies in Kelso Fire Management Unit.

Suppression: 128,434 acres are zoned for full suppression. These areas are along roads (including I-15), around historic resources, and in critical habitat for desert tortoise.

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Fire Use: 187,302 acres are zoned for fire use. These areas are in remote locations where suppression action is not practical and there are no structures or resources at risk from fire.

Hazard Fuel Treatments: Structures at Kelso Depot, Zzyzx picnic area, and Kelso Dunes day use area will be treated as needed to remove hazard fuels immediately adjacent to buildings. Specifics are outlined in the Five-Year Work Plan (Appendix F).

Restoration and Rehabilitation: Planting of grasses or herbaceous species in the creosote bush scrub and desert sink communities should be avoided as this area naturally has barren intershrub spaces that have already been altered by the invasion of non-native grasses. In consultation with the U.S. Fish and Wildlife Service, post-fire treatments should focus on tortoise habitat restoration, including possible plantings of native shrubs if needed, as well as removal of invasive plant species.

2. Cima Fire Management Unit

Area	393,237 acres total
Precipitation	8.5 inches annually including snowfall in the higher elevations during winter months
Winds	Summer and Autumn SW w/ with some Foehn (dry easterly) winds in mid to late fall; Winter and spring N-NW
Average Temperatures (Fahrenheit)	Winter 29-54; Spring 35-76; Summer 59-93; Autumn 36-84
Elevational Range	2,600-5,400 feet
Vegetation Communities (based on system classification of Thomas 2004)	60% mid elevation mixed desert scrub, 29% creosote bush mixed scrub, 6% lava beds, all other vegetation classes occupy less than 5%

a) Physical characteristics of Cima Fire Management Unit

This unit occupies the northeastern portion of the Preserve. The northern boundary extends parallel to the southern side of Interstate 15 from about three miles west of Halloran Springs extending east along Nipton Road. Kelso-Cima Road serves as the southwestern boundary which then extends along an unnamed 4x4 road to the Nevada-California state line that runs along the bajada on the north side of the Castle Peaks. The Unit’s western boundary runs parallel to Kelbaker road until about 10 miles southeast of Baker when the road bends in a northwesterly direction toward that community. A dirt road at that junction, which extends north to just west of Halloran Springs, serves as the remainder of the western boundary.

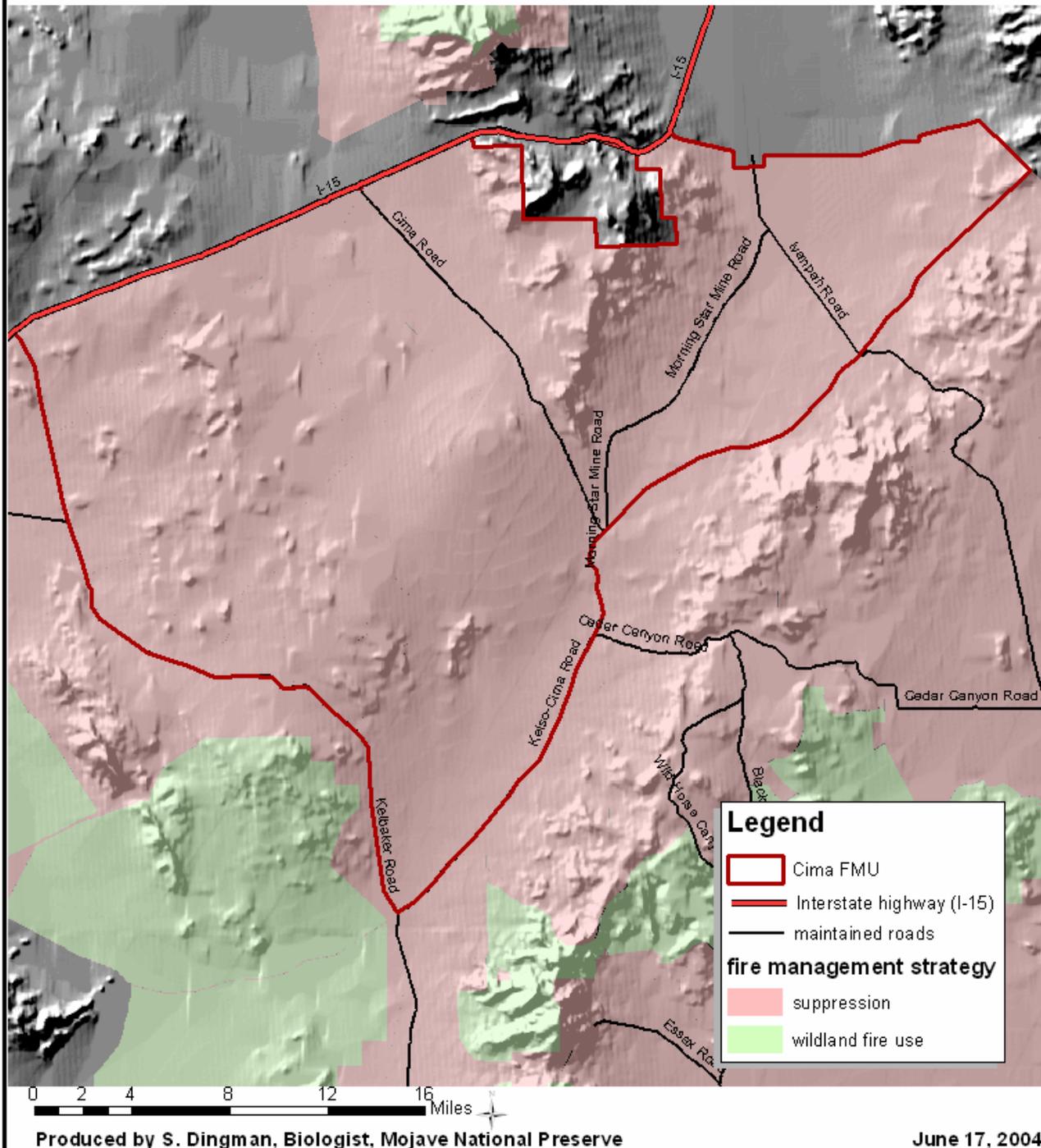
The Cima Unit is a diverse landscape in terms of vegetation and topography. Approximately 25% of the unit, the northwestern quarter, consists of cinder fields or “cones”. The cones rise about 300 feet above the surrounding terrain. Between the cones are large sandy washes and extensive black lava flows of rough extrusive rock. Considered a “barren” habitat type, the lava supports less than 20% vegetation cover and is generally insufficient to support the spread of fire.

The westernmost area of the unit, and the low elevation areas in the northeastern area is dominated by creosote. Natural fires in this area generally are less than 0.1 acre. Given an abundance of annual grasses, fires can be carried further, particularly in the presence of high winds. Short-term fire histories show that fire spread is dependent on the degree of fine inter-shrub herbaceous component, fuel moistures and wind velocity. Summer thunderstorms often bring wetting rains and flash floods are common.



Fire Management Plan

Figure 6: Cima FMU



Mojave National Preserve Fire Management Plan

East of the cinder fields is the Cima Dome. The Cima Dome area covers approximately 75 square miles. This mass of once-molten monzonite was uplifted by volcanic action and over thousands of years has become extensively eroded. It is considered to be the most symmetrical natural dome feature in the United States. Elevational ranges on the dome are from 4,000 to 5,500 feet. The dome supports an extensive Joshua tree forest featuring Joshua trees (*Yucca brevifolia*), Mojave yucca (*Yucca shidigera*), and Spanish Bayonet (*Yucca baccata*) in the overstory, and understory shrub associates including big sagebrush (*Artemisia tridentata*), blackbrush (*Coleogyne ramosissima*), bladderpod (*Isomeris arborea*), bush buckwheat (*Eriogonum fasciculatum*), cheesebush (*Hymenoclea salsola*), ephedra (*Ephedra nevadensis*), bitterbrush (*Purshia tridentata*), winterfat (*Krascheninnikovia lanata*), and rabbitbrush (*Chrysothamnus nauseosus*). Annual grasses, quite abundant in years of high precipitation, include desert needlegrass (*Achnatherum speciosum*), black and blue grama (*Bouteloua* spp), Indian ricegrass (*Achnatherum hymenoides*) and bush muhly (*Muhlenbergia porteri*).

To the northeast of Cima Dome, the Mescal range and Ivanpah Mountains result in topography more varied than that in the surrounding areas. The mountains are relatively steep but can be traversed by numerous dirt roads that once provided access to the mines of the Standard Mining District. These rugged mountains support discontinuous stands of Joshua tree as well as juniper (*Juniperus* spp.) and big sagebrush.

The southwestern area of the Unit is relatively flat with transitions into bajadas and low rolling hills that eventually give way to the impressive spine of mountains that are in the Providence Fire Management Unit. This area supports a mix of creosote, Mojave yucca, and Joshua trees, providing high quality habitat for the desert tortoise.

Ivanpah (dry) Lake in the extreme northeastern area of the Fire Management Unit and east of the Ivanpah Mountains has generally uniform, flat terrain. Two gently-sloping bajadas, one from the east and one from the west, lead into it. The bajadas are laced with small, shallow washes that drain toward the lake. The lake is flat and completely covered with sand. Saltbush (*Atriplex* sp) scrub is found on the margins of the lake. The Creosote and bursage community with a compliment of cholla, barrel cactus, galleta, needlegrass and squirreltail are found on the western slopes. Joshua tree and yucca becomes more abundant at higher elevations.

b) Historic role of fire in Cima Fire Management Unit

Like the rest of the Preserve, fire occurrence records only back to 1984 and the shrub species and substrates do not lend themselves to fire occurrence analysis. From 1984 to 2003, 250 fires were recorded in this unit or immediately adjacent to it along I-15. Those 250 fires burned a total of 369.45 acres, ranging in size from 0.01 acre to 102 acres. Of those 250 fires, 47 were caused by lightning including the largest fire on record in this unit, a 102-acre fire that burned creosote scrub in early August of 1993. In fact, 30 of the 47 lightning-caused fires burned in the months of July and August. This pattern is consistent with the assumed fire regime of creosote scrub described in the Kelso Fire Management Unit. Additionally, Joshua tree woodland may naturally sustain more fire spread than creosote due to the presence of native herbaceous and understory species in the intershrub spaces. In assessing postfire recovery in Joshua tree woodland, Minnich (1995) examined fire regimes in this type. Large fires occur in Joshua tree woodland as a result

of special conditions of unusually wet weather and fuel build-up. Site fire intervals, he concluded, are long because very wet weather is rare and not all sites burn during wet periods.

c) Wildland fire management situation in Cima Fire Management Unit

1) Historical weather analysis Limited data exists on historical weather patterns. Generally, precipitation averages 8.5 inches, with precipitation falling in two distinct periods: relatively gentle winter rains/snows and monsoon-generated thunderstorms in late summer or early autumn. From December through February, snowfall may be frequent on the higher elevations of Cima Dome, the Mescal Range, and the Ivanpah Mountains while it is generally light with short residence time, heavy lingering snow has been recorded. Winds are generally southwesterly in the summer and fall, with some Foehn (dry easterly) wind events occurring mostly in mid- to late fall. Winter and spring winds are north-northwest. Local differences in terrain cause variability in wind direction and velocity. Monsoon-generated and convection thunderstorms generate erratic winds and strong downdrafts, most often occurring in late summer although the severity of monsoons varies from year to year. Relative humidity is mostly in the high teens to mid 20's and periodically higher with the occurrence of precipitation.

2) Fire Season: In general, vegetation in this unit can support significant fire from late May to late September with a shorter fire season in the higher elevations. Abundant precipitation and subsequent growth of both cool season annuals and native warm season grasses can increase the flashy fuel component in this unit. Autumn Foehn winds may occur, extending the fire season.

3) Fuel characteristics in relation to fire behavior: Desert plants are opportunists and quickly store and utilize water when it becomes available. Winter precipitation is particularly important as it generally occurs as slow, steady rain generated by winter storms from the north. Live fuel moistures are consequently at their highest point in the spring and during flowering. By mid-summer several desert shrubs enter a dormant phase and may partially or fully lose foliage. They may accumulate dead leaves and other plant matter within their bases or on the ground beneath. Leaves become very dry and plants appear to be dead or dying. The presence of continuous dry winter annual grasses in intershrub spaces can contribute to fire spread. The extent of winter annuals is highly dependent on winter precipitation. Native bunchgrasses often contain dead and decadent material within their centers, contributing to flammability. Summer rains are of shorter duration and higher volume, but plants do take advantage of moisture that is available. Both live and dead fuel moistures can vary significantly, even within a few miles, as these rains can be highly localized.

4) Fire regime alteration: Over a century of continuous cattle grazing may have altered the vegetation community structure, favoring the establishment of shrubs. In turn, an increased number of shrubs provide more "nurse plants" required for Joshua tree seedling establishment. This may explain the unusually high density of Joshua trees on the Cima

Dome. While the structure and composition of the vegetation types within this unit is believed to have been modified, there is no mutual agreement that the fire regime has changed as well.

5) Control Problems: The lava flow and cinder cone portions of the unit are probably not at significant risk for fire. The high elevations of this unit such as the dome area are characterized by higher annual precipitation and thus are more productive than lower bajadas and valleys. Native grasses and non-native annual grasses alike are abundant as are non-native annual grasses. Understory shrubs and grasses form a continuous fuel complex in many areas. There is a significant component of blackbrush in the understory. Under dry conditions and moderate winds some control problems could occur. As in the Kelso unit, the creosote scrub community does not generally support extensive spread of fire, but wind-driven fires can occur when flashy fine fuels are abundant. The mountains within the Cima Fire Management Unit can support fire in the yucca/Joshua tree and mixed shrub communities.

6) Values to be protected, managed or at risk:

The entire Ivanpah Valley area is within critical desert tortoise habitat, including 366,433 acres in the Cima Fire Management Unit. The entire Fire Management Unit, including desert tortoise habitat is zoned for suppression. Additionally, there are long-term tortoise research plots located within this unit. Fires that occur in or near the research plots should be reported to the Park's research coordinator.

The Standard Mining District, located in the Mescal Range and Ivanpah Mountains, includes numerous historic mining sites that have flammable structures. While roads throughout the District reduce the opportunity for fire spread, fire is still a threat to these resources. Fire suppression within the District should be designed to minimize ground disturbance around the mine sites and structural protection measures should be employed as necessary to reduce the risk of fire.

Approximately 20 miles of this Unit are immediately adjacent to I-15. A primary concern for this unit is the potential for smoke to affect visibility on this busy highway and the possibility that the spectacle of wildland fire and/or fire suppression operations could contribute traffic congestion.

The Cima Fire Management Unit includes 155,803 acres of designated wilderness, all of which is zoned for suppression for the protection of other values at risk.

There are several occupied home sites within this unit, including the tiny community of Cima and two isolated ranches that are used for park housing. Additionally, the Town of Nipton is located immediately adjacent to the eastern boundary of the unit. Hazard fuel reduction will be used to remove fuel immediately adjacent to park owned structures. To reduce the risk of fire to the privately owned residences, mostly in Cima and Nipton, the Preserve will implement a fire prevention and education campaign.

d) Fire management objectives for Cima Fire Management Unit

- Record and document fire behavior, fire effects and severity, and post-fire succession when possible.
- Aggressively suppress fires that have the potential to create a hazard to traffic traveling on I-15, including reduced visibility from smoke.
- Aggressively suppress all fires that occur within tortoise habitat.

e) Management considerations to operational implementation in Cima Fire Management Unit

- Minimize impact to habitat of the threatened desert tortoise and ensure operations activities are conducted in accordance with applicable terms and conditions of the biological opinion issued by the U.S. Fish and Wildlife Service.
- Protect all identified cultural and historical resources.
- Commensurate with values at risk, employ minimum impact suppression tactics throughout this unit.
- As needed, maintain communications with the Cima Post Office for any fires that could affect the Cima community.
- As needed, maintain communications with the Nipton Store for any fires that could affect the Town of Nipton.
- Within the wilderness, minimum tool analysis will be used to minimize the impact of fire suppression activities.
- To reduce these hazards, all fires potentially affecting I-15 will be reported to California Highway Patrol.

f) Fire Management strategies in Cima Fire Management Unit

Suppression: The entire Cima Fire Management Unit, 393,237 acres, are zoned for full suppression.

Fire Use: There are no acres are zoned for fire use in the Cima Fire Management Unit.

Mechanical Fuel Reduction: Approximately 15 acres are identified for mechanical fuel reduction immediately adjacent to park owned structures, mostly at Kessler Springs Ranch and Valley View Ranch. Specifics are outlined in the Five-year Work Plan (Appendix F).

Restoration and Rehabilitation: Planting of grasses or herbaceous species in the creosote bush scrub should be avoided as this area naturally has barren intershrub spaces that have already been altered by the invasion of non-native grasses. In consultation with the US Fish and Wildlife Service, post-fire treatments should focus on tortoise habitat restoration including possible plantings of native shrubs if needed, as well as removal of invasive plant species.

3. **Clark Fire Management Unit**

Area	37,708 acres total
Precipitation	8.5 inches annually including snowfall in the higher elevations during winter months
Winds	Summer and Autumn SW w/ with some Foehn (dry easterly) winds in mid- to late fall; Winter and Spring N-NW
Average Temperatures (Fahrenheit)	Winter 29-54; Spring 35-76; Summer 59-93; Autumn 36-84
Elevational Range	3,200 - 7,929 feet, the highest point in the Preserve
Vegetation Communities (based on system classification of Thomas 2004)	68% mid elevation mixed desert scrub, 22% pinyon juniper woodland, all other vegetation classes occupy less than 5% each

a) Physical characteristics of Clark Fire Management Unit

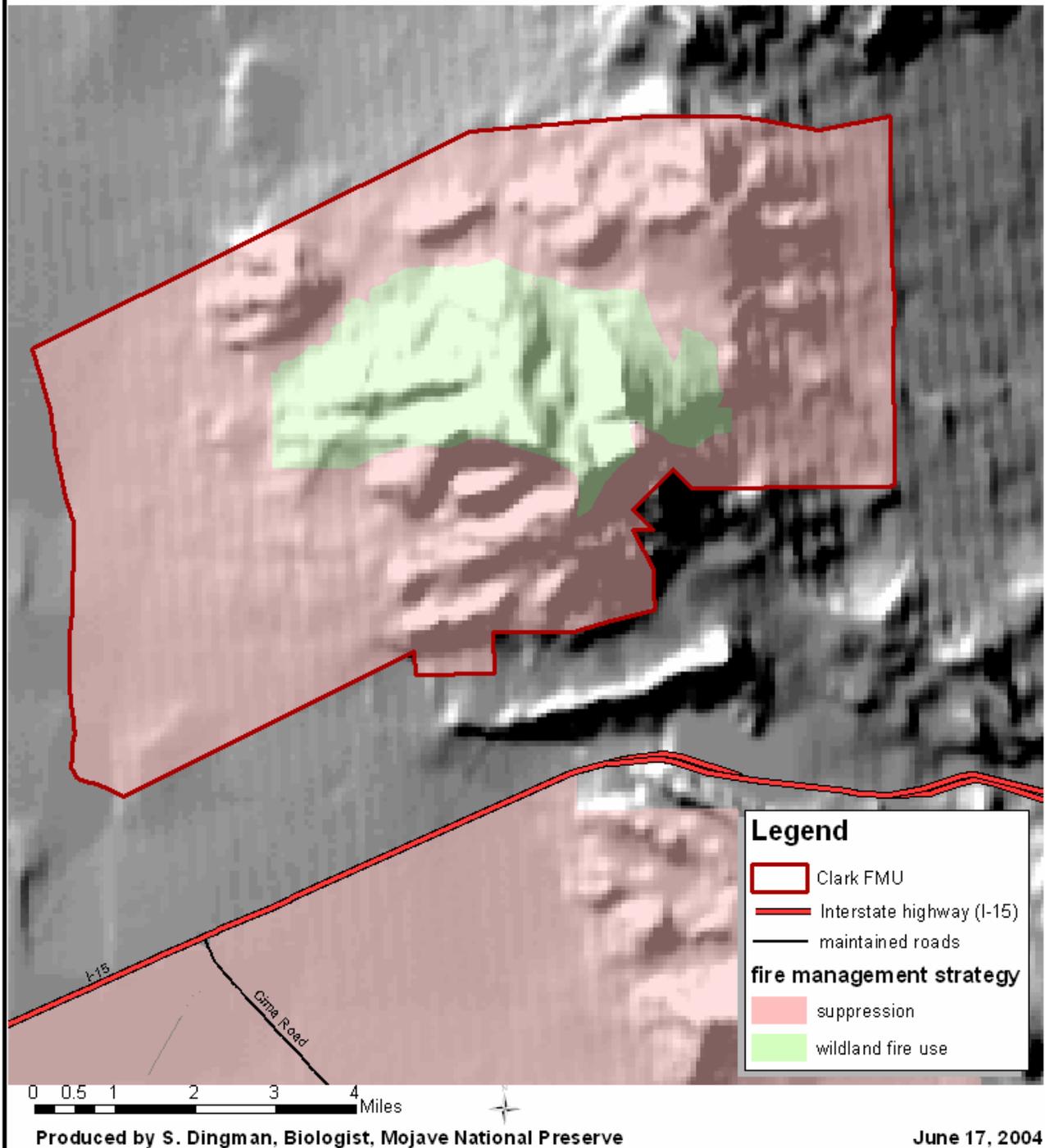
This unit is the geographically disjunct area of the Preserve known as Clark Mountain. This unit is 38,708 acres and is the only portion of the Preserve that lies north of I-15. It is separated from the rest of the Preserve by I-15, as well as private lands. These private lands include the small community of Mountain Pass and the active industrial complex of Molycorp Mine located between the Clark unit and the north side of I-15. Between the Cima Unit and south side of I-15, these private lands include scattered houses along Bailey Road and the intermittently active Kokoweaf Mine. The northern, western, and eastern boundaries of this unit are shared with lands managed by the Bureau of Land Management.

At 7,929 feet elevation, Clark Mountain is the highest point in Mojave National Preserve and dominates the south central portion of this unit. This elevation results in a much different climate and vegetation community than the rest of the Preserve. Clark Mountain experiences sustained freezing temperatures and the upper elevations hold snow for much of the winter months, particularly on the north-facing slopes. In summer months the weather on Clark Mountain can be hot, but is generally milder than the surrounding desert and night-time temps may be cold even during summer months. This elevation has served as a refugia for White Fir (*Abies concolor*). The genotype of this White Fir is that of the Rocky Mountains, not the Sierra Nevada. During the Pleistocene, cold global temperatures allowed Rocky Mountain forests, including white fir, to spread across the Great Basin and into the Mojave Desert. As the climate warmed, the forest retreated until only pockets of this forest remained in the highest elevations of the Great Basin and Mojave. The stands of white fir on top of Clark Mountain are such relicts and are of great interest to science. The White Fir occurs in numerous, isolated pockets, often on steep



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Figure 7: Clark FMU



north-facing slopes. The pockets of white fir are separated from each other and the pinyon-juniper woodland below by steep, almost vertical rocky cliffs and ridges.

Below the White Fir, the pinyon-juniper woodland grows. This woodland is characterized by scattered shrubs and cacti, punctuated by individual trees and occasionally clumps of trees. In places this woodland has a significant grass component, including both native perennial grasses and the non-native annual red brome. The pinyon-juniper woodland grades gently into the Joshua Tree Woodland where the pinyon and juniper are replaced by Joshua trees and Mojave yucca are interspersed with desert shrubs.

There are numerous mining sites located in this unit including the Colosseum Mine, an inactive industrial mining site. There are also older mine sites, some that may be historically important and include remains of structures that would be susceptible to fire.

All roads in this unit are unpaved and many require four-wheel-drive. There are no roads that traverse the unit from north to south and there are only a few routes that traverse the unit from east to west, all located on the north side of Clark Mountain. The highest reaches of Clark Mountain are accessible only by hiking several miles at a steep grade and there are some areas that are inaccessible even on foot due to the steepness of the terrain.

b) Historic role of fire in Clark Fire Management Unit.

In the white fir montane forest, low productivity results in very low fuel loads and continuity. Except on steep, north-facing canyons, heavy fuels are widely spaced and fine fuels are low and relatively inflammable making it difficult to carry fire in this landscape. Thus, the historic fire regime is characterized by truncated small, patchy, variable intensity, passive crown fires, and a truncated long fire return interval (Brooks and Minnich in press).

Like the rest of the Preserve fire occurrence records only back to 1984 and the shrub tree species have not been analyzed for reconstruction of fire history. From 1984 – 2003, four fires were recorded in this unit or immediately adjacent to it along the east, north, or west boundary (the fires along I-15 were included in the Cima Fire Management Unit discussion). Those four fires burned a total of less than one acre. Of those four fires, one was caused by lightning and it burned 0.1 acre of Joshua tree woodland in June 1987. Other small fire scars have been observed within this unit, indicating that there have been fires that ignited, burned, and naturally went out without be detected and recorded.

c) Wildland fire management situation in Clark Fire Management Unit.

1) Historical weather analysis Limited data exists on historical weather patterns. Generally, precipitation averages 8.5 inches, with precipitation falling in two distinct periods: relatively gentle winter rains/snows and monsoon-generated thunderstorms in late summer or early autumn. During December – February, snowfall may be frequent on the higher elevations of Clark Mountain and snowpack may persist for several weeks on north facing slopes. Winds are generally southwesterly in the

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summer and fall, with some Foehn (dry easterly) wind events occurring mostly in mid to late fall. Winter and spring winds are north-northwest. Local differences in terrain cause variability in wind direction and velocity. Monsoon-generated and convection thunderstorms generate erratic winds and strong downdrafts. Relative humidity is mostly in the high teens, to mid 20's and periodically higher with the occurrence of precipitation.

2) Fire Season: Generally, vegetation in this unit can support significant fire from June to September. Abundant precipitation and subsequent growth of both cool season annuals and native warm season grasses can increase the flashy fuel component in this unit. Autumn Foehn winds may occur extending the fire season.

3) Fuel characteristics in relation to fire behavior: In the Joshua Tree Woodland and Pinyon-Juniper Woodland, fire behavior is typical of desert shrublands where live fuel moistures are consequently at their highest point in the spring and during flowering. By mid-summer several desert shrubs enter a dormant phase and may partially or fully lose foliage. The presence of continuous dry winter annual grasses in intershrub spaces can contribute to fire spread and native bunchgrasses often contain dead and decadent material within their centers, contributing to flammability. Summer rains are short duration and high volume but plants do take advantage of moisture that is available. Both live and dead fuel moistures can vary significantly, even within a few miles, as these rains can be highly localized. The white fir montane forest occurs in numerous pockets on very steep, primarily north-facing, slopes. These forests have little live understory but may have pockets of large accumulations of needle cast and woody debris forming a thick bed of fine fuels that may carry fire for short distances before encountering barren rock. The steep slopes of this habitat may contribute to crowning of fire where tall vertical trees intercept surface fuels in the stand above.

4) Fire regime alteration: Over a century of continuous cattle grazing may have altered the vegetation community structure in the Joshua tree woodland and pinyon-juniper woodland, favoring the establishment of shrubs. While the structure and composition of the vegetation types within this unit is believed to have been modified, there is no mutual agreement that the fire regime has changed as well. The fire regime in the White Fir montane forest is thought to be unaltered as its steep and remote location kept it free from cattle grazing and the influence of most invasive plants.

5) Control Problems: Crown fire burning in white fir has the most potential for control problems in this unit. As most of the white fir pockets are separated from each other and other fuels by steep rocky ridges, the potential for spread is generally small but may be significant based on location, wind direction, and the potential for long-range spotting as the woody embers of fir trees have the mass to sustain combustion for a relatively long time. Many pockets of white fir are simply not accessible by foot, and those that are will require hikes of several miles uphill. Suppression of ignitions in white fir will likely require aerial tactics and such tactics are warranted for fires burning on the south side of

the peak where they could threaten Mountain Pass community, Molycorp Mine, and the I-15 travel corridor.

6) Values to be protected, managed or at risk:

The western edge of this unit overlaps with the Ivanpah Desert Wildlife Management Area, an area of critical habitat for the threatened desert tortoise. There are 12,281 acres of tortoise habitat within the Clark Fire Management Unit, all zoned for suppression.

Mines, shafts and adits are numerous throughout the Clark Mountain area, and there may be sufficient woody fuels in some areas to sustain and carry fire around some of the structures. Those that potentially have historic value and contain flammable materials (i.e. remains of wooden structures) were deliberately zoned for suppression.

Approximately 11 miles of this Unit is within two miles of I-15 as the interstate crosses over the mountains at Mountain Pass. A primary concern for this unit is the potential for smoke to affect visibility on this busy highway, particularly since the topography of Mountain Pass may restrict the rapid dissipation of the smoke and would hold smoke in the event of an inversion. Another more remote concern is the possibility that the spectacle of wildland fire and/or fire suppression operations could contribute traffic congestion. Also at risk of fire or smoke are the Molycorp Mountain Pass Mining Facility and the residents of Mountain Pass. To reduce these hazards, the south side of Clark Mountain has been zoned for suppression. Additionally, all fires potentially affecting I-15 will be reported to California Highway Patrol.

The Clark Fire Management Unit includes 13,119 acres of designated wilderness, centered on the summit of Clark Mountain. Except where the wilderness overlaps tortoise habitat or is located along I-15, the wilderness is zoned for fire use.

d) Fire management objectives for Clark Fire Management Unit.

- Contain unwanted wildfires to less than 10 acres in size.
- Monitor lightning-caused ignitions on the north-side of the peak where there is no threat of spread or unacceptable resource damage.
- Record and document fire behavior, fire effects and severity, and post-fire succession when possible.
- Aggressively suppress fires on the south side of the peak that have the potential to threaten the infrastructure of the Mountain Pass community and Molycorp Mine.
- Aggressively suppress fires that have the potential to create a hazard to traffic traveling on I-15, including reduced visibility from smoke.
- Suppress all fires that occur within the tortoise habitat on the western side of the unit.

e) Management considerations to operational implementation in Clark Fire Management Unit.

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- Minimize impact to habitat of the threatened desert tortoise and ensure operations activities are conducted in accordance with applicable terms and conditions of the biological opinion issued by the U.S. Fish and Wildlife Service.
- Protect all identified cultural and historical resources.
- Commensurate with values at risk, employ minimum impact suppression tactics throughout this unit.
- As needed, maintain communications with the California Highway Patrol office located at Mountain Pass.
- Where wilderness is zoned for suppression, minimum tool analysis will be used to minimize the impact of fire suppression activities.
- Fires that burn in white fir should be reported to the Park's Science Advisor so that research can be initiated if warranted.
- Emphasize mine safety with all field personnel working in and around this unit. In particular the Incident Commander will need to manage for firefighter safety when reduced visibility (smoke or nighttime) makes it difficult to see the numerous mine shafts and adits.

f) Fire Management strategies in Clark Fire Management Unit.

Suppression: 30,744 acres are zoned for full suppression.

Fire Use: 6,964 acres are zoned for wildland fire use. These areas are in remote locations in wilderness where suppression action is not practical and there are no structures or resources at risk from fire.

No mechanical fuel reduction is identified for this unit.

Restoration and Rehabilitation: Post-fire treatments should focus on tortoise habitat restoration, including possible plantings of native shrubs if needed, as well as removal of invasive plant species. Post-fire watershed effects are unlikely, but in the event of a large fire, analyses should focus on potential watershed effects on the active Molycorp Mine and inactive Colosseum Mine, with special attention given to the potential for transport of contaminated water or soil from these industrial sites into other areas.

4. Providence Fire Management Unit

Area	429,069 acres total (the largest FMU in the Preserve)
Precipitation	5.4 inches annually with winter snowfall in high elevations
Winds	Summer and Autumn SW w/ with some Foehn (dry easterly) winds in mid to late fall; Winter and Spring W-NW
Average Temperatures (Fahrenheit)	Winter 28-60; Spring 35-69; Summer 59-92; Autumn 43-74
Elevational Range	3,000-6,500 feet
Vegetation Communities (based on system classification of Thomas 2004)	48% mid-elevation mixed desert scrub, 30% creosote bush mixed scrub, 19% pinyon juniper woodland, all other vegetation classes occupy less than 5%

a) Physical characteristics of Providence Fire Management Unit

This unit runs as a long, thin diagonal through the middle of the Preserve. The Preserve boundary serves as the narrow western boundary of this unit, immediately adjacent to lands managed by the Bureau of Land Management. This unit is bounded on the north by Kelso-Cima Road, extending along an unnamed 4x4 road to the Nevada-California state line that runs along the bajada on the north side of the Castle Peaks. The Preserve boundary, coincident with the Nevada-California State line, serves as the narrow eastern boundary. The southern boundary of the unit is not defined by roads, instead following the topographic break along the southern edge of the chain of mountains.

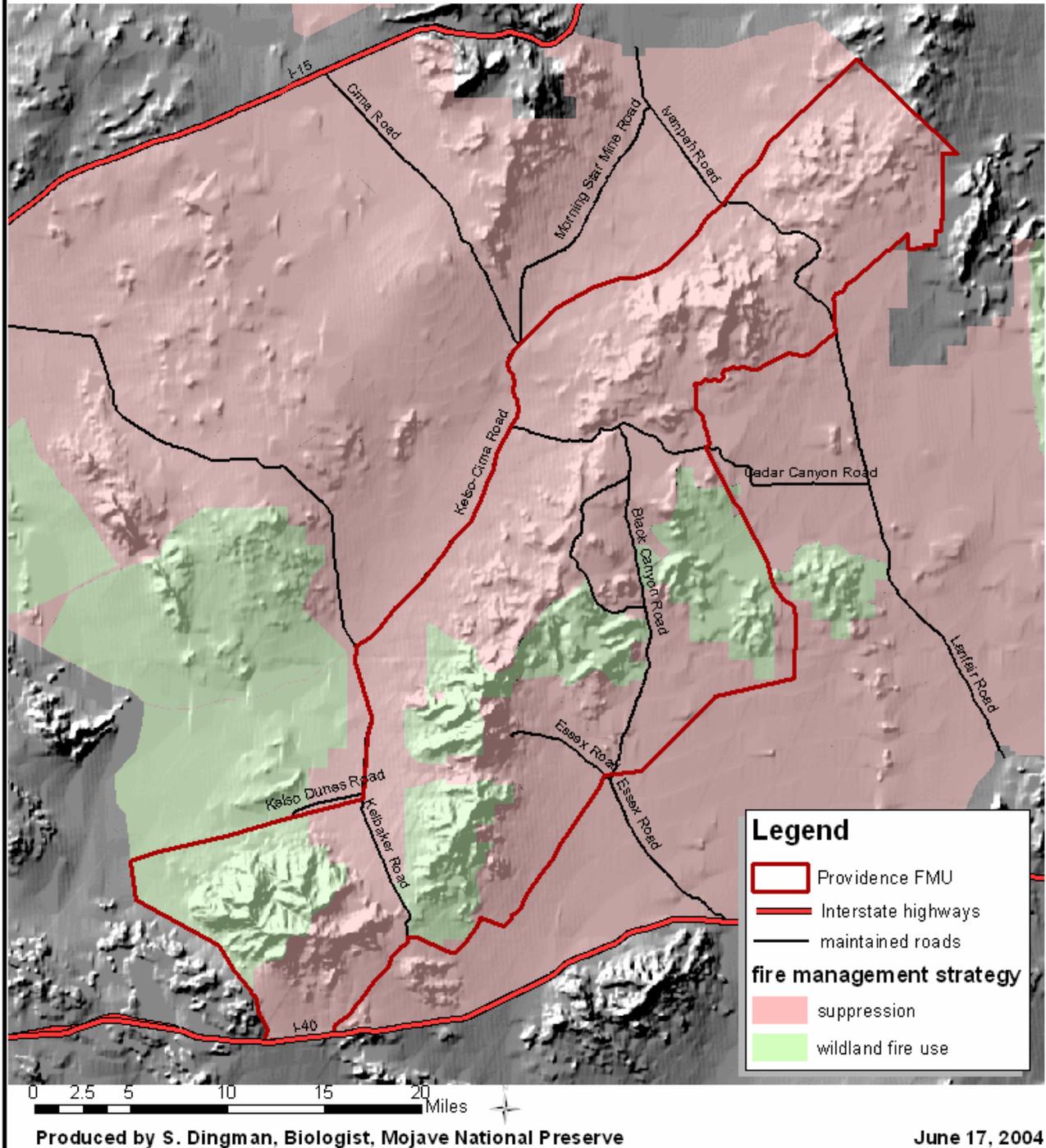
The Providence Fire Management Unit includes the Granite Mountains to the south, north to the Providence range, the Wildhorse Canyon and Mesa area, Hole-in-the-Wall, Mid Hills, and the New York and Castle Peaks to the north. The Providence FMU is the most diverse unit in the Preserve in terms of topography and vegetation types. This unit features areas of significant fire potential, such as Mid Hills, Round Valley, Gold Valley, Pinto Valley, Wildhorse and upper Macedonia Canyon.

This unit showcases the blending of Great Basin, Mojave and Sonoran desert vegetation types, and a number of unique vegetation communities are found within the Unit. These include calcicolous scrub (associated with limestone or dolomitic outcrops) in the Providence, New York and Clark Mountains one small stand of Rocky Mountain white fir in the New York Mountains; coastal chaparral in Caruthers, Keystone, and Live Oak Canyons and giant Mojave yucca on the slopes of the Providence Mountains. Giant yucca can also be found on the slopes of the Woods Mountains as well as extensive stands of succulent shrubs including cholla, barrel cactus, prickly pear, hedgehog, and pin cushion cactus. The Granite Mountains range in elevation from approximately 2,300 feet to 6,500 feet. This range is characterized by extremely steep, rocky draws and canyons. The lower foothills feature a creosote scrub/ white bursage assemblage to the north, south and west facing, slopes, while the eastern-facing areas, near



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Figure 8: Providence FMU



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Granite Pass, feature a mix of creosote scrub, yucca, Joshua tree, cholla, and some catclaw acacia, with the usual compliment of associates. Washes, draws and springs host catclaw acacia, and screwbean mesquite.

Fuels in the Granite Pass area are continuous and could carry fire. Fuels along the western, southern and northern lower slopes are generally widely spaced and would probably carry fire only if a sufficient layer of fine herbaceous fuels were present. Spread rates would probably not be significant without strong winds. Higher elevations feature pockets and fairly continuous stands of pinyon-juniper and mixed shrubs. Under dry and windy conditions fire spread here could be somewhat extensive but in many places would be limited by physical barriers.

The Providence Mountains run in a northeast to southeast declination separating the Devil's Playground, Kelso Mountains and Kelso Wash to the northwest and the Lanfair Valley to the southeast. This range ranges in elevations of about 3,000 feet to 5,400 feet. Like the Granite Mountains, relief is steep. Foothills to the north and south feature creosote and mixed shrubs, while basin areas such as Quail Springs host Joshua tree/yucca with a mix of cholla, desert shrub, and catclaw. In higher elevations, scattered pockets of pinyon-juniper are seen.

The vegetation types in the north Colton Hills, Mid Hills and Hole-in-the-Wall area are interesting, mixed, and varied. Elevations in this area range from about 3,500 to 6,200 feet. Topography is diverse as well with steep canyons, sweeping valleys and basins, mesas and plateaus, rolling hills, and extensive wash and drainage areas.

In the higher elevations, pinyon-juniper dominates, with blackbrush, bitterbrush and its common associates as a significant component of the vegetation community. Areas such as Wildhorse, Barber and Beecher canyons and upper Mid Hills have extensive, moderately dense stands of mature juniper. Lower elevations feature a mix of yucca, Joshua tree, cholla, mixed shrubs, and areas of mesquite and catclaw. Dense stands of sagebrush characterize Round Valley. North and east, rolling foothills feature an unusual mix of yucca, Joshua tree, juniper and scattered pinyon, cholla, and mixed shrubs. Mesquite and catclaw can be found in wash areas. The Woods and Hackberry Mountains host similar plant communities, with the Woods Mountains noted for extensive cactus gardens in many of its valleys.

Large fires with significant rates of spread can occur in the Providence unit. The higher elevation, increased annual precipitation and moderate temperatures favor high productivity and therefore an abundance of continuous fuels. Extensive stands of mature sagebrush, juniper, mixed shrub and blackbrush are susceptible to ignition, both by lightning and human-caused starts, in this high-use area.

The New York Mountains/ Castle Peaks ranges, which reach between 4,600-7,200 feet, feature Joshua tree/yucca associations on both north and south foothills. In addition to a fairly continuous brush understory, production of both winter annual and native warm season bunch grasses can be quite high. Rugged canyons such as Fourth of July and Caruthers feature unusual plant communities best described as remnant coastal chaparral and live oak associations. A small grove of Rocky Mountain white fir (*Abies concolor concolor*) is found just west of Caruthers Canyon.

b) Historic role of fire in Providence Fire Management Unit.

Like the rest of the Preserve, fire occurrence records are available back to 1984 and trees have not been subjected to fire occurrence analysis. From 1984 to 2003, 157 fires were recorded in this unit or within three miles of its eastern or western boundary. Those 157 fires burned a total of 1488 acres ranging in size from 0.01 acre to 650 acres. Of those 157 fires, 121 were caused by lightning including the largest fire on record in this unit, a 650-acre fire that burned in July of 2002. In fact, 89 of the 121 lightning caused fires burned in the months of July and August. This pattern is consistent with the fire patterns of the desert southwest where high fire occurrence is correlated with the monsoon season.

Prior to the period of record, there are a few anecdotal accounts of large fires in this area, indicating an ongoing potential for large fires, most notably within mature pinyon-juniper, sage and blackbrush. In 1946 a 640-acre fire burned in Globe Canyon within the pinyon-juniper type, and in 1960 a 1,280-acre fire, also in pinyon-juniper, burned in the Foshay pass area. In 1946 a large fire (several hundred acres) burned in the Castle peaks area in the Joshua tree community.

Most of the research on fire effects and fire ecology of the pinyon-juniper and sagebrush communities, such as those found in Mid Hills, has been conducted in the Great Basin north of Mojave National Preserve. Findings indicate that fire may have a role in these communities, but fire behavior is such that controlled fire use would be difficult in an area such as Mid Hills. Fire in these vegetation types usually occurs during hot, dry, windy conditions with fast spread, long flame lengths, and hot burns. Wind-driven crown fires and extreme fire behavior are often seen in the pinyon-juniper type. Both fuel types require moderate winds (25-30 mph) for successful spread. The presence of private inholdings and residences, high visitor use and campground facilities, and poor water availability in the Mid Hills area make fire use or prescribed fire difficult to execute without unwanted outcomes.

c) Wildland fire management situation in Providence Fire Management Unit

1) Historical weather analysis: Limited data exists on historical weather patterns. As measured at the Mid Hills Remote Automated Weather Station, precipitation ranges from 2.1 to 7.8 inches and averages 5.4 inches, with precipitation falling in two distinct periods: relatively gentle winter rains/snows and monsoon-generated thunderstorms in late summer or early autumn. Variation in both topography and elevation within this unit result in highly localized weather effects and variable precipitation amounts from canyon to canyon or peak to peak. Snow falls during most winters in the higher elevations of the unit. Heavy, lingering snow, as much as several feet, has been recorded on north facing slopes but generally areas such as Mid Hills and Hole-in-the-Wall snow is measured in inches and has a short residence time. Winds are generally southwesterly in the summer and fall, with some Foehn (dry easterly) wind events occurring mostly in mid to late fall. Winter and spring winds are north-northwest. Local differences in terrain cause extreme variability in wind direction and velocity, with pronounced diurnal changes in winds in canyons and on slopes. Monsoon-generated and convection thunderstorms generate erratic winds and strong downdrafts. Relative humidity is mostly in the high teens, to high 20's and

periodically higher with the occurrence of precipitation. Summer temperatures are somewhat mild in comparison to lower elevations of the Preserve, with mid-summer high temperatures in the low 90's and low temperatures in the high 60's.

2) Fire Season: The fire season in this unit begins in mid-May and can extend through September.

3) Fuel characteristics in relation to fire behavior: Desert plants are opportunists and quickly store and utilize water when it becomes available. Winter precipitation is particularly important as it generally occurs as slow, steady rain generated by winter storms from the north. Live fuel moistures are consequently at their highest point in the spring and during flowering. By mid-summer, several desert shrubs enter a dormant phase and may partially or fully lose foliage. They may accumulate dead leaves and other plant matter within their bases or on the ground beneath. Leaves become very dry and plants appear to be dead or dying. The presence of continuous dry winter annual grasses in intershrub spaces can contribute to fire spread. The extent of winter annuals is highly dependent on winter precipitation. Native bunchgrasses often contain dead and decadent material within their centers, contributing to flammability. Summer rains are of shorter duration and higher volume, but plants do take advantage of moisture that is available. Both live and dead fuel moistures can vary significantly, even within a few miles, as these rains can be highly localized. Relative humidity and fuel moistures can vary considerably with slope aspect. Canyons such as Carruthers and Fourth of July Canyons can be considerably cooler and more mesic.

4) Fire regime alteration: Over a century of continuous cattle grazing may have altered the vegetation community structure in the lower elevations of this unit, favoring the establishment of shrubs. In turn, an increased number of shrubs provide more "nurse plants" required for Joshua tree seedling establishment. Research is underway to assess the current vegetation communities within the Preserve and to measure changes over time that may result from the removal of livestock grazing. While the structure and composition of the vegetation types within this unit is believed to have been modified, there is no mutual agreement that the fire regime has changed as well. Higher elevations of the unit, which were likely less affected by livestock grazing, probably have not changed in regards to fire regime, which is characterized as aperiodic in nature.

5) Control Problems: Recent fire documentation shows the majority of lightning strikes hit along this belt of mountainous areas. Documented fires from the last 20 years have been small in size and have generally been less than 20 acres. Anecdotal accounts of fires ranging from hundreds of acres to over a thousand acres indicate the potential for large burns in a number of areas within this unit, most notably within mature pinyon-juniper, sage and blackbrush. Blackbrush is a significant component of the Joshua tree community understory and could significantly add to fire intensity. Terrain in much of this unit is rugged and inaccessible by foot. Wind-driven fires in foothill and basin areas could have fairly significant spread with the presence of adequate fine fuels. Lightning

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strikes could hit pinyon-juniper pockets, but spread would often be limited by topography.

6) Values to be protected, managed, or at risk:

The northern margin of this unit overlaps with the recommended Ivanpah Desert Wildlife Management Area while the southwestern edge overlaps with the recommended Piute-Eldorado Desert Wildlife Management Area, both of which are critical habitat for the threatened desert tortoise. There are 115,656 acres of tortoise habitat within the Providence Fire Management Unit, all zoned for suppression.

The Providence Fire Management Unit includes 294,820 acres of designated wilderness, centered along the spine of mountains. Much of the southern reach of wilderness is zoned for wildland fire use, while all of the north reach of wilderness is zoned for suppression for the protection of cultural resources, structures, rare plants, and private lands.

Unusual plant community assemblages are found in the New York Mountains and Granite Pass areas in particular. Additionally, there are dozens of state listed rare plant species that occur within these mountain ranges, many with highly restricted distributions.

This unit has the highest number of occupied residences in the Preserve and significant blocks of private land, particularly in the New York Mountains and Hole-in-the-Wall area, indicate the necessity of preparedness planning in conjunction with residents and property owners.

Hole-in-the-Wall and Mid Hills are high use areas with two campgrounds, a visitor center, and the interagency fire center. There is also a park residence located five miles north of the Hole-in-the-Wall complex.

The University of California's Sweeney Granite Mountains Natural Reserve is located in the southwestern corner of this unit, in the Granite Mountains. This site has many structures grouped together as well as numerous research plots spread out over a relatively large area.

The Providence Mountains State Recreation Area and the Mitchell Caverns State Natural Preserve are located along the southeastern boundary of this unit along the Providence Mountains. These state-operated sites include visitor use facilities as well as administrative and residential buildings.

Mines, shafts and adits are numerous throughout the mountain ranges. Those with potentially historic value and containing flammable materials (i.e., remains of wooden structures) were deliberately zoned for suppression.

d) Fire management objectives for Providence Fire Management Unit.

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- Contain unwanted wildland fires at less than 10 acres in size.
- Monitor lightning-caused ignitions in fire use zones where there is no threat of spread or unacceptable resource damage.
- Record and document fire behavior, fire effects and severity, and post-fire succession when possible.
- As needed, conduct hazard fuel reduction at park owned structures.
- Implement a fire education and prevention campaign to provide information to owners/operators of non-NPS structures.
- Implement a public fire education and prevention campaign to provide timely information at the Hole-in-the-Wall Visitor Center and the two campgrounds.

e) Management considerations to operational implementation in Providence Fire Management Unit.

- Minimize impact to habitat of the threatened desert tortoise and ensure operations activities are conducted in accordance with applicable terms and conditions of the biological opinion issued by the U.S. Fish and Wildlife Service.
- To the extent feasible, avoid suppression impacts to unique plant communities and rare plant species.
- Protect facilities in the Mid Hills Campground and Hole-in-the-Wall area.
- Where wilderness is zoned for suppression, minimum requirements analysis will be used to minimize the impact of fire suppression activities.
- Protect identified cultural and historical resources.
- Coordinate response to fires in or near Granite Mountains Natural Reserve with the onsite manager.
- Coordinate response to fires in or near Mitchell Caverns with the staff on duty.
- Communicate with Park Rangers regarding fires that could potentially threaten Fourth of July Canyon, Round Valley, and Mid Hills Campground so that they can coordinate timely evacuations from these sites with limited escape routes.

f) Fire Management strategies in Providence Fire Management Unit.

Suppression: 315,983 acres are zoned for full suppression.

Fire Use: 113,086 acres are zoned for fire use. These areas are in remote locations where suppression action is not practical and there are no structures or resources at risk from fire.

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Mechanical Fuel Reduction: Twenty acres are identified for mechanical fuel reduction, primarily at Mid Hills Campground, Rocking L employee residence, and the Hole-in-the-Wall visitor complex. Specifics are outlined in the Five-Year Work Plan (Appendix F).

Restoration and Rehabilitation: In consultation with the US Fish and Wildlife Service, post-fire treatments should focus on tortoise habitat restoration including possible plantings of native shrubs if needed, and removal of invasive plant species. Post-fire watershed effects are unlikely but in the event of a large fire in the steep terrain above Fourth of July Canyon, analyses should focus on potential watershed effects on the numerous residential structures located in the canyon floor.

5. Lanfair Fire Management Unit

Area	413,590 acres total
Precipitation	7-8 inches annually, average. 4 inches in south/southeast portions
Winds	Summer and Autumn SW w/ with some Foehn (dry easterly) winds in mid to late fall; Winter and Spring W-NW
Average Temperatures (Fahrenheit)	
Elevational Range	1,850 – 6,585 feet
Vegetation Communities (based on system classification of Thomas 2004)	54% creosote bush mixed scrub, 38% mid elevation mixed desert scrub, 5% desert wash system, all other vegetation classes occupy less than 5%

a) Physical characteristics of Lanfair Fire Management Unit

The Lanfair unit consists of the southeastern quarter of the Preserve southeast of the spine of mountains that traverses the Preserve. The eastern boundary of the Lanfair Fire Management Unit is the Preserve’s eastern boundary, which is coincident with the Nevada-California State line for six miles. The southern boundary of the unit is also the Preserve’s southern boundary and runs adjacent to the north side of I-40. The northern and narrow western boundary are contiguous with the Providence Fire Management Unit, defined by the topographic break of the mountains.

The southern portion of the unit, along the margin of the Granite, Providence, and the southern end of the Piute mountains, is characterized as a southeastern-sloping bajada. North and westerly portions feature a mixed vegetation community of creosote, bursage, cholla, and yucca. South and eastern portions feature creosote, white bursage, ephedra, rattany, and other common grass and forb associates in this type. Southern washes and drainages feature catclaw and mesquite, particularly in the Fenner Valley and towards Goffs..

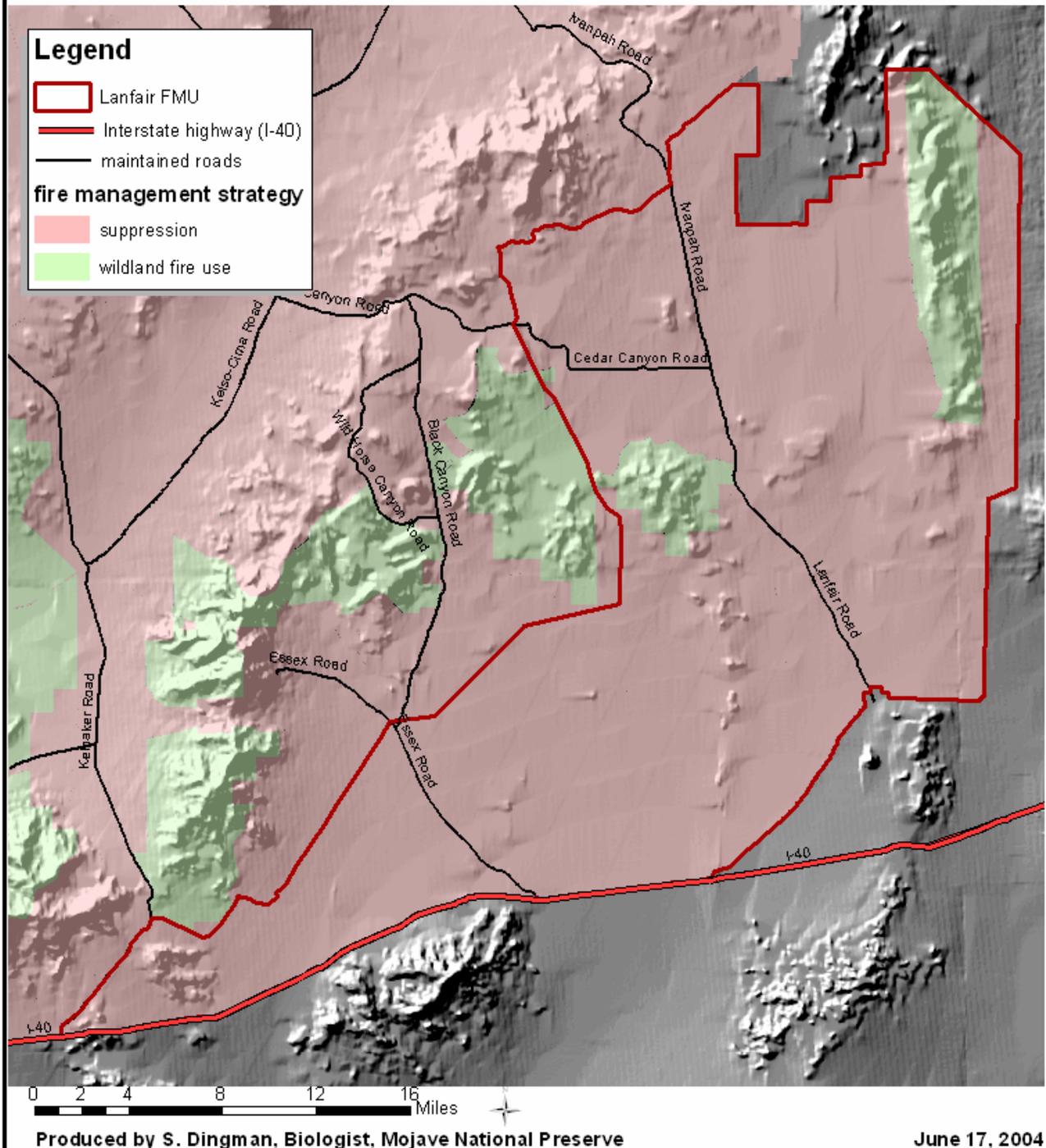
The upper portions of the mid-western boundary, between the northern Hackberry mountains and extending toward the New York Mountains, feature a sagebrush and Utah juniper component. Sloping moderately south and east, this area eventually transitions into Joshua tree, yucca, and cholla association. Further east, the type is characterized by a higher percentage of creosote, and creosote/bursage with some Joshua tree and yucca.

The north and western portion of the unit, bordered by the New York Mountains on the west and the Preserve boundary to the east features a creosote/ cholla/Joshua tree/yucca association featuring giant yuccas. Topography here is characterized by rolling foothills with moderate to steep slopes. Drainages run from northwest to southeast. Extensive Joshua tree woodland is found here as well.



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Figure 9: Lanfair FMU



The Piute Mountains, inside the eastern boundary of the unit, are characterized by creosote associations with areas of cholla and barrel cactus. At least one major fire occurred here within the last twenty years. Although cover is sparse in many areas and the topography is broken up by rocky terrain, flashy fuels such as red brome can form a continuous fuel across sizeable areas. The Piute Range also includes Piute Creek, a spring-fed perennial stream flowing through an incised channel with abundant riparian vegetation. Piute Creek burned with intensity in a human-caused fire in September 2004 and fire scars on willows indicate that this riparian corridor has sustained several other fires in the last several decades.

b) Historic role of fire in Lanfair Fire Management Unit

Like the rest of the Preserve, fire occurrence records are available back to 1984. From 1984 to 2003, 108 fires were recorded in this unit or within three miles of its southern or eastern boundary along major highways. Those 108 fires burned a total of 12,249 acres ranging in size from 0.01 acre to 9,497 acres. Of those 108 fires, 50 were caused by lightning, including the largest fire on record in this unit, a 9,497 acre fire that burned in June, 1994. Unlike the other fire management units, fire occurrence data indicates that the primary fire season extends from June through August, possibly as a result of the more abundant fine fuels that result from the proliferation of non-native grasses.

A long history of livestock grazing and other disturbance has encouraged the profuse establishment of a number of exotics plant species. These species include red brome and mustards (*Brassica spp.*). Private inholdings, many with structures, are numerous in this unit, and are concentrated within this central portion of the unit. Within the last 10 years, some structures have been threatened by fast-moving wildland fires.

c) Wildland fire management situation in Lanfair Fire Management Unit

1) Historical weather analysis: There is limited weather data for this unit. Limited data exists on historical weather patterns. Generally, precipitation is about seven to eight inches annually in the north and northwest portions of the unit, and about four inches in south/ southeast portions. Winds are generally southwesterly in the summer and fall with some Foehn (dry easterly) wind events occurring mostly in mid- to late fall. Winter and Spring winds are north-northwest. Local differences in terrain cause variability in wind direction and velocity. Monsoon-generated and convection thunderstorms produce erratic winds and strong downdrafts. Relative humidity is mostly in the mid- to high teens and periodically higher with the occurrence of precipitation.

2) Fire Season: The fire season normally is mid-late April through September depending primarily on the volume and density of grass grown through the winter and early spring. In a high growth season, the fuels may remain comparatively dense even after curing and breaking down through the summer and fall, and large fires may be possible year-round. Lightning ignitions generally occur between late June and mid-September. Lightning is often accompanied by heavy rain, particularly in the higher elevation areas but dry lightning may occur and may be accompanied by high winds from

the thunderstorms. Fires are generally limited to 0.10 acre or less, but the largest fires recorded in the area have occurred in the dense grassy fuels of this unit.

3) Fuel characteristics in relation to fire behavior: The fuels in this unit are comparatively dense and consist of both native and non-native grasses and shrubs with significant stands of cholla, which have been negatively impacted by large fires in the past. Non-native grasses introduced have been spread further by these large fires and they continue to contribute to high fuel loadings throughout this unit. Due to the higher elevation and precipitation from more consistent summer monsoons, fuel moistures tend to be higher in this unit throughout the year than in other areas of the Preserve.

4) Fire regime alteration: This unit has been extensively, and sometimes intensively, grazed by livestock for well over a century. The plant communities in this unit have probably changed over time with a higher density of shrubs in some areas and a proliferation of non-native cool season annual grasses in all areas. Intershrub spaces that were once bare now support carpets of flashy fuels that add to fuel continuity and flammability, but the degree of grass abundance and distribution can vary from year to year, depending on precipitation levels. The degree to which the native fire regime has been altered is undetermined.

5) Control Problems: Large fires on this unit occurred in flashy fuels during high winds. Aside from areas such as the Piute Mountains and Hackberry Mountains, terrain is relatively flat and uniform, and the unit is traversed by an extensive network of roads. Under very windy conditions, fire in this unit could be difficult to control.

6) Values to be protected, managed or at risk:

This unit overlaps with the Piute-Eldorado Desert Wildlife Management Area, an area of critical habitat for the threatened desert tortoise. In recent years the tortoise population within this unit has seen dramatic declines (Berry 2000). There are 230,427 acres of tortoise habitat within the Lanfair Fire Management Unit, all zoned for suppression. There are also tortoise research plots within the Lanfair Fire Management Unit. The eastern boundary of this unit coincides with the boundary between the Preserve and adjacent land managed by the Bureau of Land Management as an Area of Critical Ecological Concern due to its value as tortoise habitat.

The Lanfair Fire Management Unit includes 85,962 acres of designated wilderness in the Hackberry Mountains and the Piute Mountains. Most of these wilderness acres are zoned for wildland fire use. Some wilderness acres were zoned for suppression for the protection of desert tortoise habitat, structures, and cultural resources.

The OX ranch headquarters is owned by the National Park Service and is used as housing, storage, and office space. This site includes many structures, including some with historic value. Additionally, there are cultural landscape elements on site.

Mojave National Preserve
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This unit includes a high density of private inholdings including many developed residences on large acreages. Some residences are on private roads with locked gates, which could interfere with the Park's ability to suppress fires.

The Piute Mountains include the Park's Park's only perennial stream and riparian area. This area hosts riparian plant species that are fire intolerant.

There are scattered historic mining sites in the unit, some of which include structures that are at risk from fire. This unit also includes the remains of historic Fort Piute.

Approximately 29 miles of this Unit is immediately adjacent to I-40. A primary concern for this unit is the potential for smoke to affect visibility on this highway and the possibility that the spectacle of wildland fire and/or fire suppression operations could contribute traffic congestion.

The small community of Goffs is located immediately adjacent to the southern boundary of the Unit.

d) Fire management objectives for Lanfair Fire Management Unit.

- In the suppression zone, contain all fires to less than two acres.
- In fire use zones, monitor lightning-caused ignitions in high-elevation areas where there is no threat of spread or unacceptable resource damage.
- Record and document fire behavior, fire effects and severity, and post-fire succession when possible.
- As needed, conduct hazard fuel reduction at park-owned structures at the OX Ranch.
- Implement a fire education and prevention campaign to provide information to owners/operators of non-NPS structures.
- Aggressively suppress fires that have the potential to create a hazard to traffic traveling on I-40, including reduced visibility from smoke.
- Suppress all fires that occur within the tortoise habitat on the western side of the unit.

e) Management considerations to operational implementation in Lanfair Fire Management Unit.

- Minimize impact to habitat of the threatened desert tortoise and ensure operations activities are conducted in accordance with applicable terms and conditions of the biological opinion issued by the U.S. Fish and Wildlife Service.
- Protect tortoise study plots from human-caused fire and suppression impacts. Notify the Park's Science Advisor if any fires or suppression activities occur in or adjacent to research plots.
- Where wilderness is zoned for suppression, minimum tool analysis will be used to minimize the impact of fire suppression activities.

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- Commensurate with values at risk, employ minimum impact suppression tactics throughout this unit.
- Where fire affects I-40, maintain communications with the California Highway Patrol office located at Needles.
- Protect identified cultural and historical resources with special attention to Fort Piute.
- As needed, maintain communications with the Goffs General Store for any fires that could affect the Town of Goffs.

f) Fire Management strategies in Lanfair Fire Management Unit.

Suppression: 378,017 acres are zoned for full suppression.

Fire Use: 35,573 acres are zoned for fire use. These areas are in remote locations where suppression action is not practical and there are no structures or resources at risk from fire.

Mechanical Fuel Reduction: Twelve acres are identified for mechanical fuel reduction to protect park owned structures at the OX Ranch. Specifics are outlined in the Five-Year Work Plan (Appendix F).

Restoration and Rehabilitation: In consultation with the US Fish and Wildlife Service, post-fire treatments should focus on tortoise habitat restoration, including possible plantings of native shrubs if needed, as well as removal of invasive plant species. Post-fire watershed effects are unlikely, but in the event of a fire in the Piute Creek riparian area, analyses should focus on potential watershed effects and the potential for natural recovery.

IV. FIRE MANAGEMENT PROGRAM COMPONENTS

A. Wildland Fire Suppression

Fire Suppression Program and History

Over 90% of fires within Mojave National Preserve have been less than one-tenth acre in size and were suppressed within four hours. Most involve only a single tree or yucca with virtually no spread due to lack of ground fuels. The remaining 10% of fires have been large, ranging from 10 acres to over 2,000 acres in size. Several of the large fires have occurred at higher elevations, most notably in the Cedar Canyon/Lanfair Valley area. This higher elevation area hosts more dense and varied vegetation with cooler average temperatures and higher yearly precipitation. The fuels in this area are contiguous; some are decadent and feature a large component of fine, flashy fuels. In consequence, it can be very receptive to ignition and capable of high rates of spread, particularly with moderate to high winds.

The structure of fuels within the desert is also changing. Native desert shrubs grow sparsely, with virtually no understory, and large patches of bare ground between individual shrubs. Non-native invasive species such as red brome were introduced by grazing and other activities. They have created an understory of light, flashy fuels that are more receptive to ignition and can spread quickly under windy conditions.

Of all the fuel models in the Preserve, the pinyon-juniper complex has the highest potential for extreme behavior and risk to humans, due to the location of residences and campgrounds. The majority of ignitions in the pinyon-juniper have been from lightning and over 90% are usually contained to a single tree. They are frequently "sleeper" fires that cannot be detected until they begin smoking noticeably and may holdover three to nine days. They are usually detected and reported by local residents and are extremely difficult to spot via road or air due to light, infrequent smoke. However, under windy conditions, fire can spread rapidly through these fuels due to their density and can result in extreme fire behavior with flame lengths of 50-100 ft. and rates of spread exceeding two miles per hour.

One recent example of this type of behavior was observed on the Wild Horse #2 fire located just northwest of the Hole-in-the-Wall Fire Center between Black Canyon Road and Wildhorse Canyon Road. The Wild Horse #2 fire was ignited by lightning in July, 2002 and was burning in pinyon-juniper and sage fuels at approx. 4,400 ft. elevation. when it was hit by downdrafts from a passing thunderstorm. Prior to being hit by the storm, fire behavior was erratic with occasional torching and short fuel-dependent runs over a 20-acre area. The fire was dying out in areas of sparse fuels and was nearly contained by three engines and a 10-person hand crew when the downdrafts occurred. Within seconds, the fire spotted across the control lines and burned an additional 620 acres in 30 minutes. Observed rates of spread exceeded 180 chains per hour (ch/hr, where one chain equals 66 linear feet) for short (five- to ten- minute) intervals, with sustained spread of approximately 80-120 ch/hr and driven by sustained winds of 10-15 mph with gusts of estimated 20-25 mph. Flame heights ranged from 20 to 100 ft. Once the storm

Mojave National Preserve
Fire Management Plan

passed, fire spread ceased almost immediately and the fire was contained by five engines and two handcrews the next day. (K.MacMillan, personal communication)



Fire Management Plan

Figure 10: Fire History

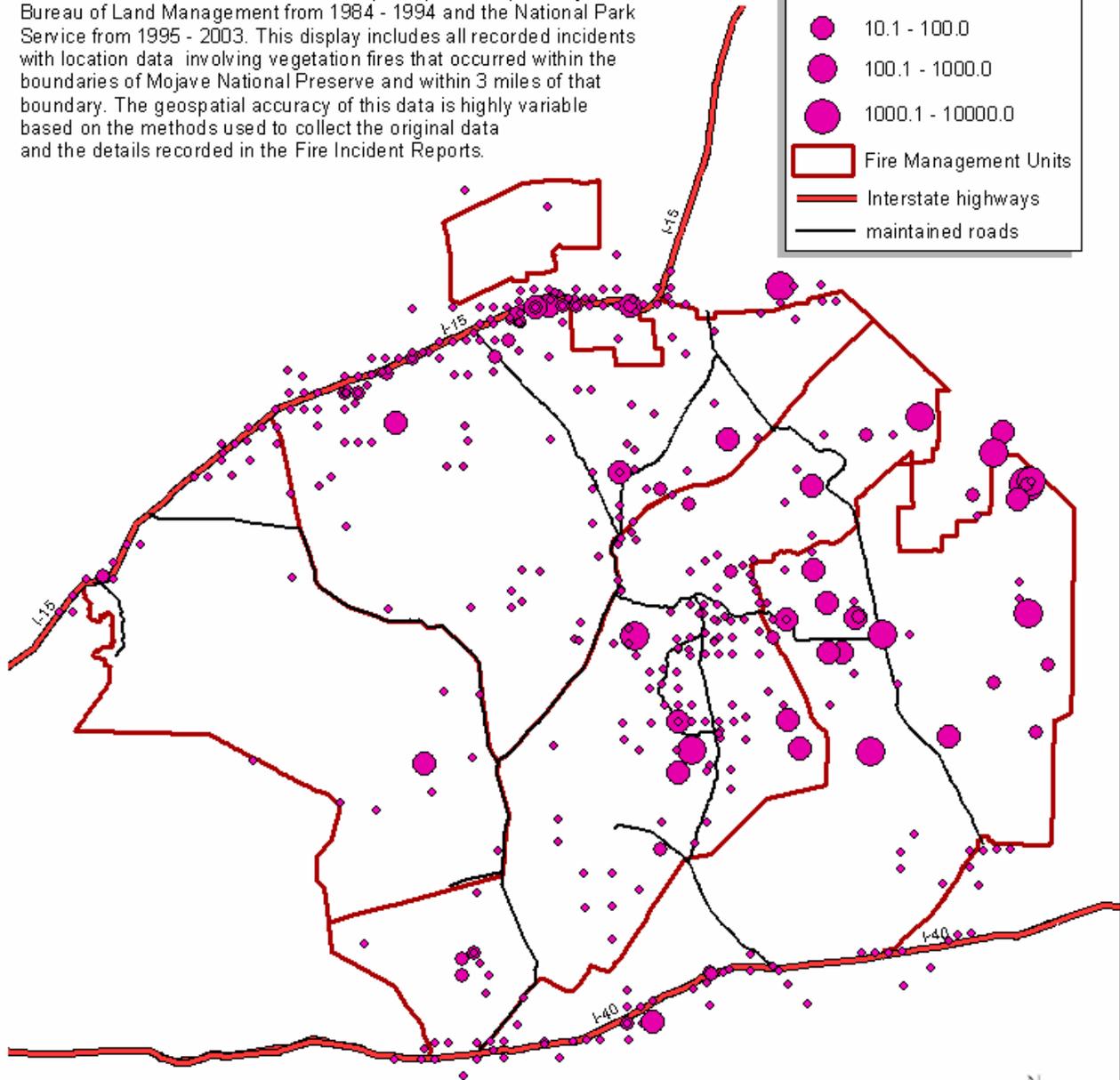
This data is based on Individual Fire Reports (DI-1202s) filed by the Bureau of Land Management from 1984 - 1994 and the National Park Service from 1995 - 2003. This display includes all recorded incidents with location data involving vegetation fires that occurred within the boundaries of Mojave National Preserve and within 3 miles of that boundary. The geospatial accuracy of this data is highly variable based on the methods used to collect the original data and the details recorded in the Fire Incident Reports.

Legend

acres burned

- ◆ 0.0 - 1.0
- 1.1 - 10.0
- 10.1 - 100.0
- 100.1 - 1000.0
- 1000.1 - 10000.0

- ▭ Fire Management Units
- Interstate highways
- maintained roads



0 5 10 20 30 40 Miles



Produced by S. Dingman, Biologist, Mojave National Preserve

June 18, 2004

FILE: C:\GIS\RMP\figures\firehistory.mxd



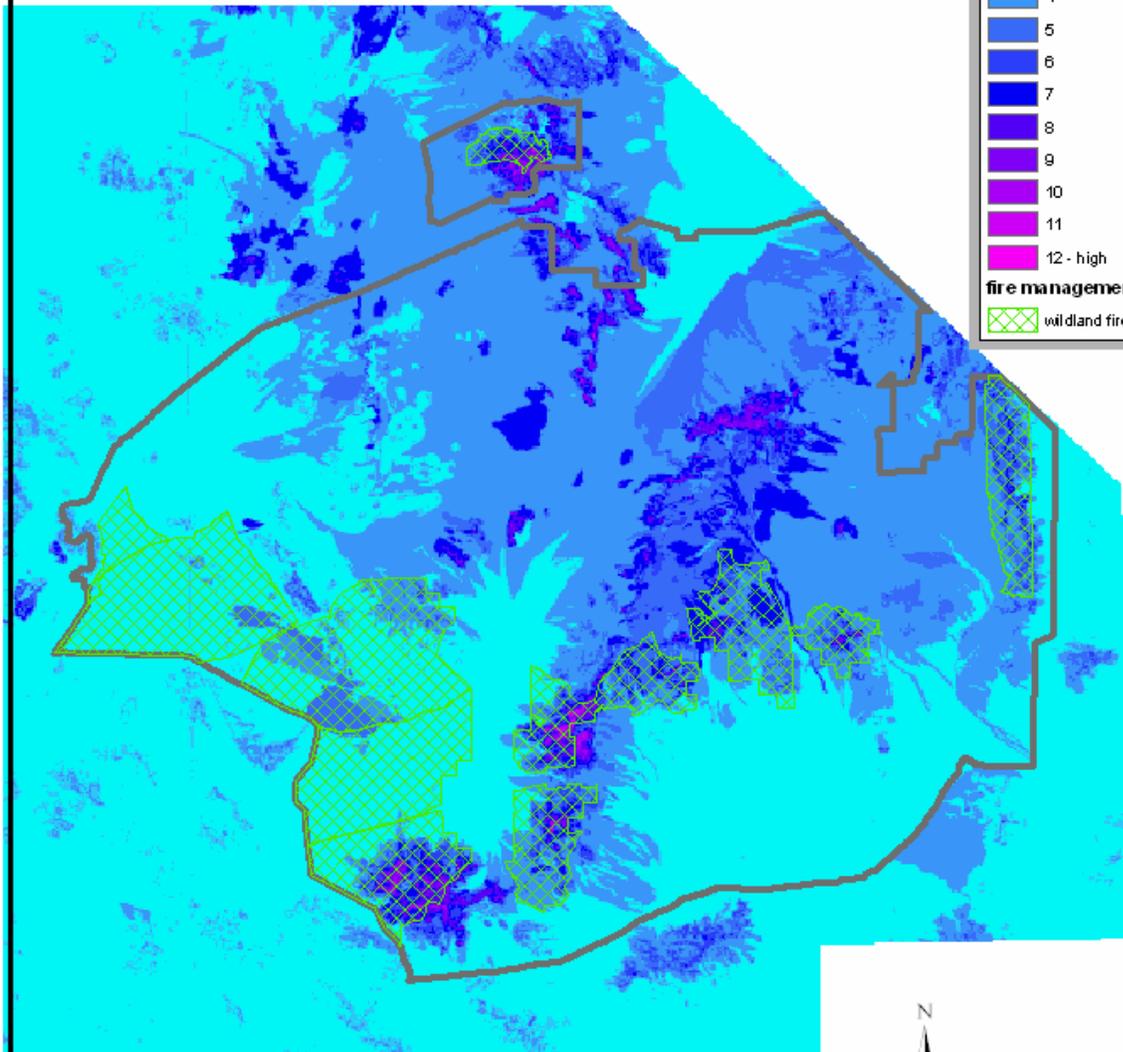
Fire Management Plan

Figure 11: Fire Behavior

This composite fire behavior analysis was completed by J.R. Matlack and M. Brooks of the U.S. Geological Survey, Las Vegas Field Office. This analysis is based on geospatial vegetation data developed by the Mojave Desert Vegetation Mapping Project (Thomas, 2004), derived from 1:300,000 aerial photography with a 5 km minimum mapping unit and photo interpretation based on the National Vegetation Classification System. Fire spread rate and intensity rankings were assigned to each vegetation type. This yielded two coverage: 1) relative ranking of fire intensity, adjusted for slope with values of 1-6, and 2) relative ranking of the spread, adjusted for slope with values of 1-6. These two values were then summed to yield a composite fire behavior value ranging from 2-12.

Legend

- Preserve boundary
- composite fire behavior value**
- 2 - low
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12 - high
- fire management strategy**
- wildland fire use



0 4 8 16 24 32 Miles



Produced by S. Dingman, Biologist, Mojave National Preserve

June 17, 2004

FILE: C:\GIS\FMP\figures\treb behave.mxd

Mojave National Preserve
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To better understand potential fire behavior, the computer program BehavePlus was used to model expected fire behavior for the four fuel models that cover most of the Preserve. BehavePlus (Andrews et al. 2003) is the most recent evolution of a widely used fire modeling system that is a collection of mathematical models that describe the fire and the fire environment. Tables 1, 2 and 3 show the expected rate of spread and flame height under a range of wind conditions as predicted by BehavePlus.

Table 1: Expected fire behavior under light (0-10 mph) winds

Fuel model	Local fuel description	Rate of Spread (chains/hour)	Flame Height (feet)
1	Annual grasses	297.3	9
2	Open Pinyon-juniper stands with grass/sage understory	115.8	11
4	Coastal chaparral, closed stand pinyon-juniper	131.5	25
8	Rocky Mtn. white fir; high elevation timber stands	5.2	5

Table 2: Expected fire behavior under moderate (11-20 mph) winds

Fuel model	Local fuel description	Rate of Spread (chains/hour)	Flame Height (feet)
1	Annual grasses	297.3	9
2	Open Pinyon-juniper stands with grass/sage understory	406	20
4	Coastal chaparral, closed stand pinyon-juniper	346.8	40
8	Rocky Mtn. white fir; high elevation timber stands	5.2	5

Table 3: Expected fire behavior under high (21+ mph) winds, sustained or downdraft

Fuel model	Local fuel description	Rate of Spread (chains/hour)	Flame Height (feet)
1	Annual grasses	297.3	9
2	Open Pinyon-juniper stands with grass/sage understory	850.3	28
4	Coastal chaparral, closed stand pinyon-juniper	614.5	50
8	Rocky Mountain white fir; high elevation timber stands	5.2	5

Fire weather and fire danger

Three weather stations that are designed specifically for fire weather needs are located within the Preserve. The Mid Hills and Mojave River Sink stations are remote automated weather stations (RAWS) that collect weather data year-round and transmit it hourly via satellite to computer

Mojave National Preserve Fire Management Plan

systems for analysis and storage. The Hole-in-the-Wall station is manual and is operated by Hole-in-the-Wall Interagency Fire Center staff only during the fire season (April – October).

The two remote automated weather station (RAWS) are located within the Preserve boundary. Both stations are manufactured by Handar and the sensors are maintained by interagency fire personnel through the RAWS depot at the National Interagency Fire Center in Boise, Idaho. The stations collect, store and transmit hourly weather data to the National Interagency Fire Center via the Geostationary Operational Environmental Satellite operated by the National Oceanic and Atmospheric Administration. The data is forwarded to the Weather Information Management System for processing through the National Fire Danger Rating System to quantify and predict daily fire danger. The data is also transmitted to the Western Regional Climate Center in Reno, Nevada for storage.

The Mid Hill RAWS is located just east of the Mid Hills campground in the approximate center of the Preserve, at 5400 ft. elevation. The Mojave River Sink RAWS is located just inside the southwest corner of the Preserve, south of Zzyzx and Soda Lake. The Mid Hills RAWS was installed in 1991 and the Mojave River Sink RAWS was installed in 1988. Both stations were installed by Bureau of Land Management and are now operated and maintained by interagency fire personnel.

The Hole-in-the-Wall weather station is a manual NFDRS station and is operated by Hole-in-the-Wall Interagency Fire Center staff only during the fire season (April –October). Data is collected daily at 1400 hours and is entered into the Weather Information Management System by dispatchers at the Federal Interagency Communication Center. Actual and forecast fire danger indices are given during the daily 1600 hour weather forecast transmission by the Federal Interagency Communication Center.

The National Fire Danger Rating System uses daily fire weather observations and forecasts to produce indices that estimate current and forecasted fire danger throughout the United States. The system is designed to produce “worst-case” outputs based on hot, dry, windy conditions.

The best overall indicator of fire danger rating in this area is the burning index. This index takes into account the Spread Component which is used for light fuels that dry quickly and are affected most by the wind, but also incorporates the energy release component which is influenced by heavy fuels and long-term seasonal drying. Since the burning index reflects both short and long-term drying, but also accounts for the daily affect of wind on the fuels, it is a good indicator overall of general fuels conditions in a broad area.

Mojave National Preserve participates in an interagency fire weather program that includes the latest technical tools for obtaining and analyzing fire weather data. This program is outlined in a detailed document named the “California Fire Weather Annual Operating Plan, 2004” and it is updated periodically. The Mojave Fire Management program will continue to utilize whatever tools and expertise are made available through the interagency fire weather program.

Aviation Management

There is a variety of aircraft used in fire operations within Mojave National Preserve, although no aircraft are permanently or seasonally stationed within the Preserve.

It is the policy of Mojave National Preserve to use its aircraft for activities involving life or health-threatening emergencies, the administration and/or protection of resources, research, and for individually approved special purpose missions. The objective of every flight is to be the safest, most efficient, economic and effective method of performing the required task, consistent with National Park Service goals. All administrative use of aircraft will comply with the policies and guidelines contained in the Departmental Manual 350-354, Director's Order/Reference Manual #60: Aviation Management; applicable Office of Aircraft Services (OAS) policies and the operational procedures outlined in this plan. *Everyone* is responsible for becoming familiar with and applying correct procedures in all phases of aircraft use. The number one concern at all times is **SAFETY**.

For safety purposes, low altitude flights, helicopter or fixed wing, will be avoided to the extent practicable. Furthermore, low altitude flight directly over wild animals or areas of visitor concentration will be avoided at all times unless such an activity is the express purpose of the flight (e.g., wildlife census flights).

There are specific restrictions regarding the use of unimproved and improved landing zones in designated wilderness. These restrictions and additional details of aviation management in Mojave National Preserve are found in the Aviation Plan (Appendix E).

Fire Readiness

Interagency Fire Readiness Reviews are conducted at all California Desert stations annually in late May or early June. Resources are not to be made available for off-District fire assignments until the reviews are successfully completed. The reviews include all aspects of fire operations, including facilities, equipment, training, record-keeping, and cache inventories. Performance drills are also conducted and include fire shelter deployments.

All fire equipment and supplies are stored and maintained at the Hole-in-the-Wall Interagency Fire Center. The cache inventory is maintained by the designated Cache Managers and has sufficient supplies and equipment to fully re-stock both Type 3 engines at once, and additional personal protective equipment and tools for ten firefighters. Access to the fire cache is limited and all supplies and equipment are considered accountable to assure that adequate supply levels are maintained. Defective, unsafe or worn-out items should be turned in to one of the Cache Managers for replacement. All individuals who carry fire gear with them are responsible for assuring that it is serviceable and fire-ready at all times, including monthly fire shelter inspections.

The Fire Management Plan and its appendices will be reviewed annually by the Fire Management Officer and other park or fire personnel as requested by the Fire Management

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Officer. The review will take place after the current fire season and before the next fire season. The purpose of this review is to assure that fire management planning documents are pertinent and up-to-date with current policy and operational procedures. Revisions will be undertaken as necessary to assure this purpose is met.

Table 4: Annual calendar of readiness activities

Month(s)	Readiness Activity
January-February	Order training materials for upcoming local courses Submit Mobilization Guide updates
February-March	Inventory cache and order replacement supplies/ equipment Order crew uniform t-shirts/sweatshirts Conduct pre-season risk analysis
April	Confirm local vendor availability Obtain current EERA's from Federal Interagency Communication Center National & Regional Mobilization Guides issued Annual California Desert District Operations Plan review Confirm radio frequencies and programming
April-October	Conduct daily "6 minutes for Safety" sessions Conduct weekly readiness drills Maintain cache inventory Maintain equipment in fire-ready condition Replace/rehab supplies/equipment used on incidents Conduct after-action reviews for all incidents
May	Conduct Interagency Readiness Review
November	Refurbish all equipment, including radios Conduct annual engine maintenance Review Fire Management Plan and its appendices, revise as necessary

Detection

Mojave National Preserve uses three primary methods to detect fire starts:

- 1) The San Bernardino Federal Interagency Communication System supports a lightning detection system with near real-time data availability that is accessible via the Internet. The data is available graphically or by latitude/longitude and denotes whether the strike is a positive or negative charge. Statistically, positive charges are more likely to ignite fires, due to their higher temperature, and strike "clusters" are common and would indicate a higher probability of ignition. However, many of the fires within the Preserve that have been correlated to strike data have been ignited by negative strikes. Locations are accurate within 30 meters, but this data can only be used to determine the most efficient use of aerial detection and land-based patrols, not to locate actual fires. "Sleeper" or "holdover" fires that are not detected immediately have been located up to nine days after lightning and are most common in the pinyon-juniper fuels. The lightning data can be accessed by FICC, the Fire Management Office, or the fire crews at Hole-in-the-Wall.

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- 2) Reconnaissance flights may be ordered after periods of lightning activity. If done on a CDD-wide basis, the flights are usually conducted by an air attack or reconnaissance aircraft from the San Bernardino Air Attack Base or Lancaster (Fox Field) Air Attack Base. For activity specific to the east Mojave Desert, the Death Valley National Park aircraft is more cost-effective and timely. All aircraft orders are processed through the Federal Interagency Communication Center. Aircraft operations are conducted in compliance with the National Park Service aviation policies and procedures.
- 3) As described in the California Desert District Operating Plan, fire suppression and prevention units are normally extended for additional vehicle and foot patrols during periods of lightning activity.

Initial Attack

During the designated fire season (April 1 - September 30) and during duty hours (0900-1830 hrs.) the engines at Hole-in-the-Wall are expected to maintain three-minute readiness for responses within the California Desert District. Outside of duty hours and for responses outside the District, a two-hour response is expected.

Immediately upon arrival at all fires, the Incident Commander (IC) will complete an incident size up report (see Appendix H) and provide the information to the Federal Interagency Communication Center with a size-up. In the event of fires requiring resources beyond the means of the Preserve, the Fire Management Officer may request additional resources via Federal Interagency Communication Center.

A confinement strategy may be implemented during attack action to maximize firefighter safety, minimize suppression costs, or maximize availability of critical suppression and management resources to protect values at risk threatened by other fires in the California Desert District. Confinement can also be a strategic selection through the Wildland Fire Situation Analysis process when the fire is expected to exceed initial attack capability or planned management capability.

Extended Attack

While over 90% of all wildland fire incidents never exceed initial attack, in the event that a suppression response exceeds one operational period (24 hours), the incident will transition to extended attack. Fire operations will be determined through a Wildland Fire Situation Analysis (Appendix H). The Incident Commander will revalidate the incident complexity regularly and transition to a higher complexity level when necessary as provided for in the Incident Complexity Analysis found in Appendix H. A Delegation of Authority, also found in Appendix H, will be used to convey incident management responsibilities.

During emergency incidents additional supplies and equipment beyond the capabilities of the local cache may be needed. Cache items may be obtained from the Southern California National Interagency Support Cache in Ontario, CA and all emergency cache orders will be processed through the Federal Interagency Communications Center or Expanded Dispatch.

Prevention and Education

The Fire Prevention and Education program at Mojave National Preserve has consisted primarily of public contacts in the park and school programs in the Barstow, Victorville and Needles areas. Under this plan, the campaign will expand to target private landowners within the Preserve. Firewise, a non-profit organization that promotes fire prevention and preparedness, will be the basis for this campaign. The campaign will include an annual open house at the Hole-in-the-Wall Fire Center, a Firewise library, and annual mailings.

Mojave National Preserve observes the same staged campfire restrictions as the participating public lands of the California Desert. Specific guidance is found in the Bureau of Land Management California Desert District Fire Prevention Orders and generally includes restricted use of campfires and barbeques from May 15 to the end of fire season. Such restrictions are posted on the bulletin boards at visitor centers as well as the campsite registration bulletin boards at the Mid Hills Campground and the Hole-in-the-Wall Campground. During the fire season, firefighters regularly patrol the established campgrounds and occupied campsites and advise visitors of fire danger conditions. They also issue fire permits for Bureau of Land Management lands, as needed. The majority of the contacts are made during the late summer and early fall as visitor use increases prior to and during the hunting seasons.

Fire training

The National Wildfire Coordinating Group incident qualification and training standards will be followed. To support the interagency qualification and certification standards, training is a year-round effort.

Table 5: Annual calendar of training activities

Month(s)	Training Activity
January-April	Training classes occur
February-May	Mandatory 8-hour wildland fire safety refreshers and work capacity test (pack test) Fire Shelter Deployment practice Desert Tortoise awareness training
April-October	Local on-going operations training Daily "Six Minutes for Safety" sessions Weekly drills and hose lays Monthly fire shelter deployment practice S/I-100 and 200-level courses based on local needs Class B firefighter exemption driver training Interagency Aviation User Training (B-3)
May	Training Needs Analysis development - courses identified for upcoming training season
September-October	Course calendar development and allotment of training slots
November 1	Course nominations to training centers
November-December	Training classes occur

Wilderness Considerations

The California Desert Protection Act of 1994 (CDPA) designated 695,200 acres of Mojave National Preserve as wilderness. This comprises 49% of the Preserve's lands. About half of these wilderness lands will be treated under a fire use prescription as described in the next section of this document. However, 352,273 acres of wilderness will be treated as full suppression for the protection of other values at risk, most notably habitat for the threatened desert tortoise and cultural resources.

Management of wilderness is guided by Director's Order #41, Wilderness Preservation and Management. The order directs "Potential disruption of wilderness character and resources and applicable safety concerns will be considered before, and given significantly more weight than, economic efficiency and convenience. If a compromise of wilderness resources or character is unavoidable, only those actions that have localized, short term adverse impacts will be acceptable." In the Mojave Desert, additional guidance is found in the Desert Managers Group's "Principles for Wilderness Management in the California Desert" and its annexes, including "Annex 5 – Principles for Fire Management within Wilderness Areas of the California Desert."

Certain fire management activities must be carefully evaluated before implementation within designated wilderness. Generally, these activities include the use of motorized equipment or mechanized transport. Generally prohibited activities will be considered with a minimum requirements analysis, such as the one prepared for the implementation of this Plan (Appendix B). In the event that fire poses an imminent threat to life or property, fire suppression activities can be classified as "Emergency Needs" and, as such, do not require documented analysis prior to approval of a generally prohibited activity or use in wilderness. Authority for approval of emergency use of motorized access or mechanized transport can be re-delegated to the Fire Management Officer who must provide a written report with justification and alternatives considered to the Superintendent. Rationale for authorization will be documented and placed in the incident documentation file. Guidelines for such emergency decisions are as follows:

- A Resource Advisor will be assigned to all extended attack fires, including those occurring in or near wilderness.
- Fire camps and incident command centers will be located outside of wilderness.
- Throughout the Preserve, motor vehicle use is restricted to existing roads.
- Throughout the Preserve, hand lines will be located to make full advantage of natural barriers such as rock outcroppings, trails, and dry washes. Handlines will be no wider than necessary to stop the spread of fire.
- Within wilderness chain saws, helicopters, or pumps will only be used when essential to meet suppression objectives, but with due consideration to impacts on wilderness character and subject to minimum tool determination.
- Establishment of heliports and helipads are not allowed in wilderness.
- For fire management purposes, it is generally possible to use unimproved helispots in wilderness and walk into the work site if such an unimproved helispot is available within a 15-minute walking distance.

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- To the extent possible, non-emergency use of helispots in wilderness will be avoided. If it cannot be avoided, the decision to use a helispot in wilderness will be detailed in a Wilderness Minimum Requirements Analysis as well as an environmental compliance document (i.e., Environmental Assessment or Categorical Exclusion).

Additional details regarding aviation and wilderness can be found in the Aviation Plan (Appendix E).



Fire Management Plan

Figure 12: Wilderness

In 1994, the California Desert Protection Act designated 695,200 acres of Wilderness in Mojave National Preserve.

Legend

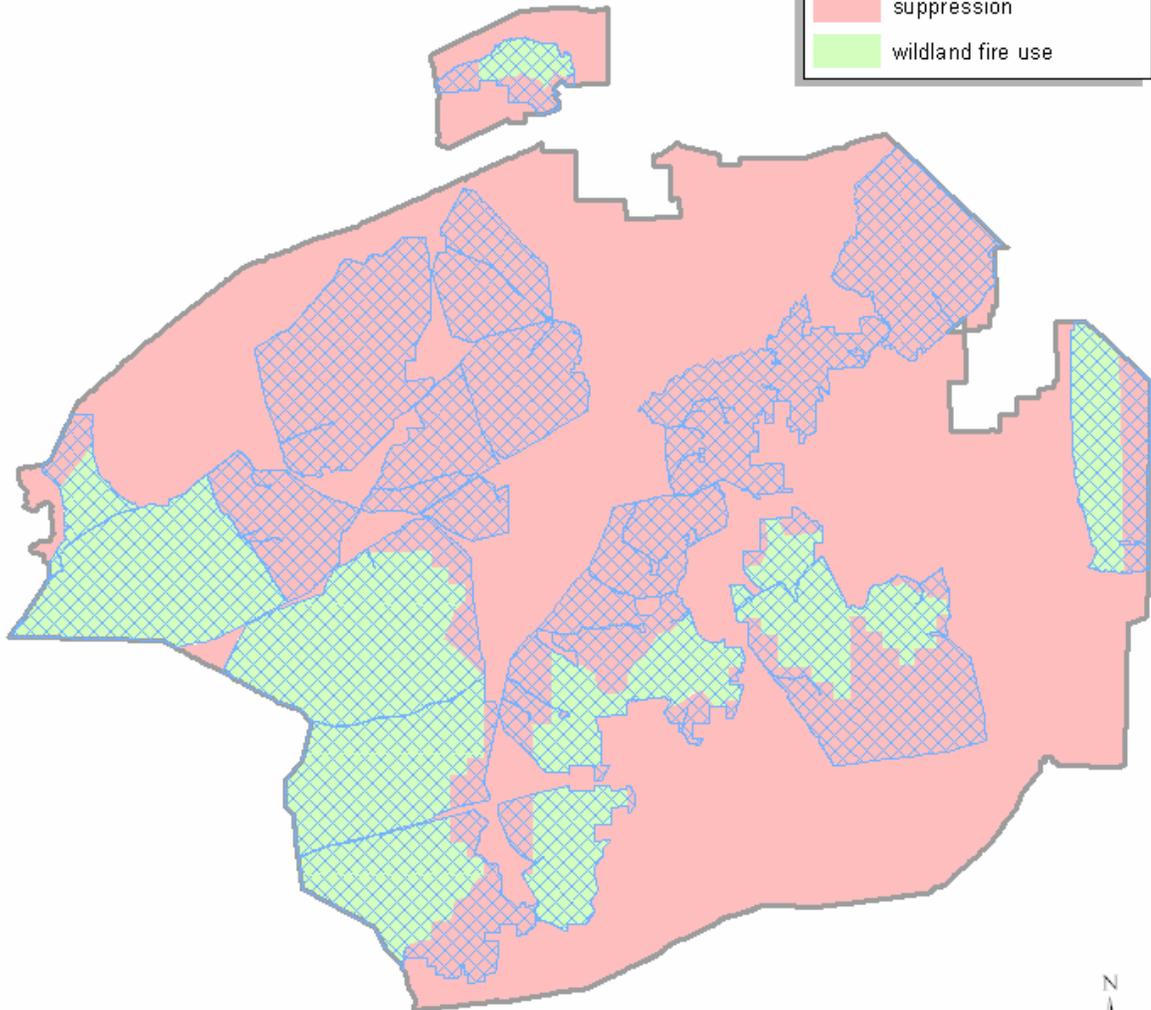
 designated Wilderness

 Preserve boundary

fire management strategy

 suppression

 wildland fire use



0 5 10 20 30 40 Miles



Produced by S. Dingman, Biologist, Mojave National Preserve

June 18, 2004

FILE: C:\GIS\PMF\figures\wilderness.mxd

Desert Tortoise Considerations

Approximately 772,454 acres of the Mojave National Preserve is designated critical habitat for the threatened Desert Tortoise (*Gopherus agassizii*). A Recovery Plan was developed in 1994 by the U.S. Fish and Wildlife Service. This plan delineates critical habitats and recommends management actions to assist in recovery of the species. Protocols for fire management actions in Desert Tortoise habitat have been developed by U.S. Geological Survey biologists and are highlighted here.

- A Wildland Fire Resource Advisor will be assigned to all extended attack fires, including those occurring in or threatening designated critical desert tortoise habitat. The role of the advisor is to advise the Incident Commander of concerns and policies for protection of desert tortoise. All personnel on the fire shall be informed and educated about the desert tortoise and the importance of protecting habitat and minimizing take. The incident Resource Advisor will follow chain of command.
- Campsites should be located outside of desert tortoise habitat, or in locations that have been disturbed previously.
- Heavy equipment (bulldozers, graders) will not be used in Mojave National Preserve.
- Handcrews will use conventional tools and chainsaws for fireline construction. A Resource Advisor will be consulted about fire line locations in sensitive areas.
- All suppression vehicles will be driven only on pre-existing roads. Driving standards for speed and locations of turnarounds will be provided to the Incident Commander by the Resources Advisor. Prior to moving a vehicle, personnel shall inspect under the vehicle for desert tortoise. Engines, water tenders and portable pumps may be used to support fireline construction through hose lays where possible.
- Burning out of unburned pockets of vegetation will be avoided to the extent that it does not compromise control strategies. Such pockets provide refugia for tortoises during and after fire. The Resource Advisor will be consulted prior to any burn out operations to assure that there are no feasible alternatives and to provide the opportunity to take any actions necessary to minimize impacts to tortoises.
- Helicopters may be used when necessary for water drops or personnel transport. Existing helispots will be used. The Delegation of Authority may specify that new helispots may be constructed by handcrews or that non-improved natural areas suitable for landing may be used if the proposed sites are approved by the Resource Advisor.
- The effectiveness of suppression activities and desert tortoise impact mitigation measures will be evaluated after a fire. Procedures will be revised as appropriate.

In addition to the mitigation measures listed above, preseason training of firefighting personnel stationed at Hole-in-the-Wall Fire Center will be conducted by a qualified biologist to teach firefighters how to recognize and avoid tortoises and their burrows.

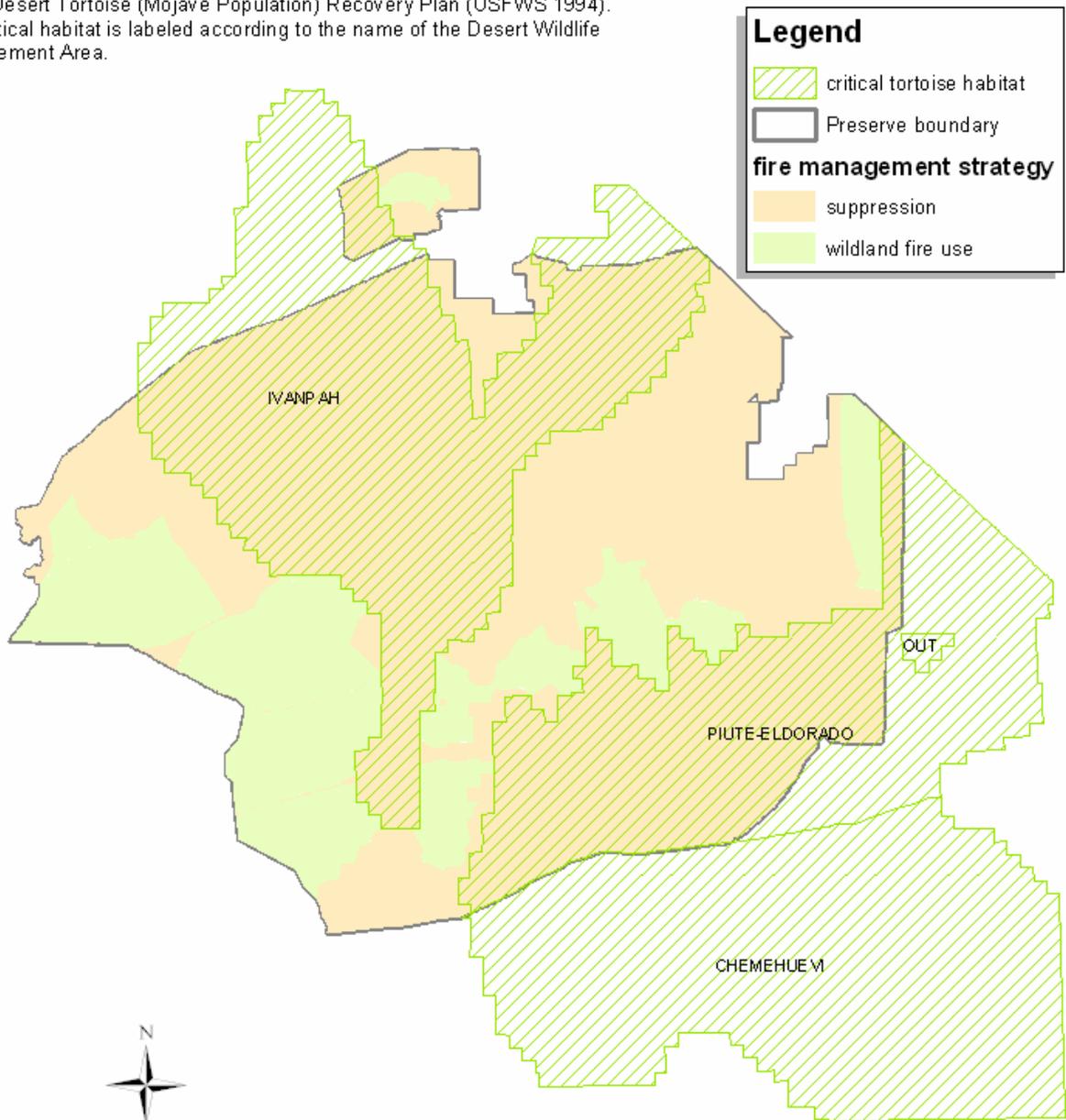
Additional information regarding fire and tortoise can be found in the Biological Assessment prepared for this Fire Management Plan (Appendix A) and the Biological Opinion issued by the US Fish and Wildlife Service (expected in December 2004).



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Figure 13: desert tortoise habitat

Critical tortoise habitat is defined by the U.S. Fish and Wildlife in the Desert Tortoise (Mojave Population) Recovery Plan (USFWS 1994). The critical habitat is labeled according to the name of the Desert Wildlife Management Area.



0 5 10 20 30 40 Miles

Produced by S. Dingman, Biologist, Mojave National Preserve

June 18, 2004

FILE: C:\GIS\RMP\figures\tortoise.mxd

B. Wildland Fire Use

Opportunities for Wildland Fire Use

Fire is not thought to play as significant a role historically in the Mojave desert as it does in other western ecosystems, most notably the southern chaparral or Sierran mixed conifer zones. Within the true Mojave Desert vegetation types, small infrequent fires characteristic of the historic fire regime are a function of the low fuel loads and wide spacing that characterizes the Mojave Desert flora. Within the Mojave Preserve, however, a number of vegetative communities reflect a transition between Mojave and Sonoran or Great Basin desert types. These communities do support fire and their historic fire regimes and characteristic fire adaptations differ from true Mojave plant communities. Lightning ignitions do occur and resulting fires are a natural, albeit relatively infrequent, disturbance regime.

The objective for wildland fire use within Mojave National Preserve is to allow the natural process of fire to occur with minimal interference, thus fostering landscape and biotic diversity. Acceptable results include the creation of vegetative mosaics and edges, removal of decadent shrubs and grasses to encourage growth of new and vigorous individuals, promotion of nutrient cycling, and creation of improved short and long-term foraging opportunities for certain species of animals.

Fires from natural ignitions will be allowed to burn within given areas and under specific circumstances where there are minimal values at risk. Approximately 342,927 acres are zoned for fire use, including portions of all Fire Management Units except the Cima Unit. In all cases, fire use zones are coincident with designated wilderness. In these areas, a timely suppression response would be unlikely or has the potential to result in adverse impact to wilderness values. Natural ignitions in these areas are expected to be infrequent and isolated with fire spread contained by natural barriers. Fire use will only be implemented where the current spot weather forecasts indicate no wind events that could cause spread or spotting that would pose a risk to life, property, or sensitive resources. A number of pre-determining factors would also be weighed, including national preparedness levels, air quality restrictions, and current local resource availability. Maximum manageable area per wildland fire use incident will not exceed 200 acres. In all cases, wildland fire use incidents will be monitored by fire personnel. The fire management strategy will transition from fire use to suppression when a) conditions change, b) the fire threatens to exceed the maximum manageable area, c) or the fire poses a threat to other values.

Fire Use Implementation

A Wildland Fire Implementation Plan (WFIP) will be initiated for all wildland fires. Included in Appendix H, the full WFIP is a three-stage document, progressively developed for all wildland fires managed for resource benefits. The Fire Management Officer or designee will be responsible for completing the Stage 1: Initial Fire Assessment that provides the decision framework for selecting appropriate management response. Operational management decisions are described in the WFIP. Specific WFIP requirements are outlined in Chapter 4 of the

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Wildland and Prescribed Fire Management Policy Implementation Procedures Reference Guide, hereafter referred to as the Implementation Guide.

The Stage I: Initial Fire Assessment includes the Fire Situation and the Decision Criteria Checklist for the initial "go/no-go" decision. It documents the current and predicted situation, documents all appropriate administrative information, and aids managers by providing them with decision criteria to make the initial decision whether to manage the fire for resource benefits or to take suppression action. In addition to the checklist shown in the Implementation Guide, other unit-specific management criteria may be added if managers feel they contribute to the decision process.

Based on historic fire occurrence within the Preserve, most fires managed for resource benefit will require only a Stage I Plan: Initial Fire Assessment, and Stage II Plan, Short-Term Implementation Actions, as they involve only a single tree or yucca in very sparse fuels, isolated by natural barriers, and burning out naturally within 24 hours. Approximately 10% of the fires may have some potential beyond 24 hours and the single stem, and will require an initial Stage III Need Assessment Charts and regular revalidation. Due to comparatively sparse fuels, and low risk of significant spread over a long time period, it is highly unlikely that fires will require a Stage III Plan, Long-Term Assessment and Implementation Actions.

Pre-planned Implementation and Initial Action Procedures

Fire management activities are associated with several interagency efforts that have already been discussed and wildland fire use implementation has been communicated as appropriate to our partners.

The following tools are being developed using a software tool called Fire Family+ for reference in wildland fire use implementation at Mojave National Preserve: run cards, weather analysis, and pocket cards. These tools will be updated and redistributed as needed to reflect current knowledge of fuel and fire weather.

Smoke management activities are coordinated with the Mojave Desert Air Quality Management District. Required actions are specified in Appendix D, but generally require that the Fire Management Officer conduct annual planning and reporting while the Incident Commander is responsible for incident specific communication and smoke mitigation efforts.

A resource advisor will be ordered for all wildland fire use fires that exceed 10 acres. At the discretion of the Incident Commander, a resource advisor may be ordered for any wildland fire use incident.

Public information regarding wildland fire use

Public information regarding wildland fire use is necessary to address concerns of park residents and neighbors as well as the visiting public. To this end, a press release will be prepared and distributed for each wildland fire use incident. In addition to the standard press release contacts, the press release will also be posted in park visitor contact stations and in park campgrounds. Due to the remoteness of Mojave National Preserve and the localized nature of most fires, it is unlikely that a fire use event will generate significant media or political interest. Nonetheless, should public, media, or political interest exceed the Park's normal public information capabilities a Fire Information Officer will be assigned from the local area or ordered through the Federal Interagency Communication Center.

Wildland Fire Use Administration

Wildland fires are funded through normal accounting procedures using individual project accounts. The Fire Management Program Assistant will establish the fire account and advise the Regional Fire Management Program Assistant so that any resources ordered from outside the park will be charged to the appropriate account. Documentation of all expenditures to the account will be included in the final fire package.

Each wildland fire use project will have a permanent record developed which will be maintained in the permanent Fire Management Office files at Park Headquarters. This record will include: 1) Wildland Fire Implementation Plan (Stage I, II, III as applicable) including all amendments and revisions; 2) Wildland Fire Situation Analysis (if required), 3) digital fire maps with fire perimeter, 4) Monitoring reports and summaries of findings, along with a summary of all monitoring activities including a monitoring schedule as prescribed in the Mojave National Preserve Fire Effects Monitoring and Research Plan (Appendix C), and 5) cost accounting documents.

C. Prescribed Fire

No prescribed fires are planned for implementation at Mojave National Preserve under this Fire Management Plan.

D. Non-fire Fuels Treatment

The only fuel treatments proposed in Mojave National Preserve are hazard fuel reduction immediately adjacent to park owned structures and hazard fuel reduction in the campsites in the Mid Hills Campground. Specific locations and projects are outlined in the Five-Year Work Plan (Appendix F)

E. Emergency Stabilization and Rehabilitation

The Department of Interior Office of Wildland Fire Coordination has issued policy to authorize and provide the means for managing emergency stabilization and rehabilitation following

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wildland fire on lands or threatening lands under the jurisdiction of the Department of the Interior, or lands adjacent thereto (620 DM 3). The three primary components of this policy are listed below.

Emergency Stabilization: To determine the need for and to prescribe and implement emergency treatments to minimize threats to life or property or to stabilize and prevent unacceptable degradation to natural and cultural resources resulting from the effects of a fire.

Rehabilitation: (1) To evaluate actual and potential long-term post-fire impacts to critical cultural and natural resources and identify those areas unlikely to recover naturally from severe wildland fire damage. (2) To develop and implement cost-effective plans to emulate historical or pre-fire ecosystem structure, function, diversity, and dynamics consistent with approved land management plans, or if infeasible, to restore or establish a healthy, stable ecosystem in which native species are well represented. (3) To repair or replace minor facilities damaged by wildland fire.

Fire Suppression Activity Damage Repair: (1) To evaluate and plan fire suppression activity damage repair. (2) To fund and implement projects that meet specific Department of Interior criteria found in section 3.10 of 620 DM3 as well as agency administrator criteria.

National Park Service emergency rehabilitation plans are of two types:

A. Short-Term Emergency Rehabilitation Plans

Short-term rehabilitation plans are written by the Park's Resource Advisor or the Planning Section on the incident. They are approved by the Superintendent and are implemented by the incident overhead team and the demobilization patrol and mop-up personnel. Such plans describe the rehabilitation efforts required to immediately stabilize a fire-impacted area as a prerequisite to the natural healing process or to restore the visual quality of site disturbance activities taken during the suppression effort. All fires that exceed initial attack should be assessed for short term emergency rehabilitation. Appropriate rehabilitation actions may be simply inserted into daily shift plans for the incident. As these actions are considered part of the suppression effort, no separate funds are identified.

A typical short-term rehabilitation plan would address the following concerns:

- Hand lines will be rehabilitated by recontouring of any berms or cuts, relocation of rocks (if removal in any area has been significant), scuffing of surface debris over the fireline to reduce erosion and stimulate revegetation, and construction of waterbars as needed.
- All trash and debris will be policed from camps, bases, staging areas, firelines, helispots and heliports.
- Revegetation of constructed fire lines may be necessary to mitigate impacts of suppression activities. If revegetation is required, native plants will be used following the recommendations of park resource management personnel.
- All helispots and heliports will be rehabilitated by scattering natural debris over the bare area.

B. Long-Term Emergency Rehabilitation Plans

Long-term rehabilitation plans are usually prepared by a team of interdisciplinary rehabilitation specialists, are recommended by the park Superintendent and the Pacific West Field Area Director, Branch of Fire Management, approved by the Director, NPS Branch of Fire Management, NIFC, and implemented by park staff over a period not to exceed two full growing seasons following the fire. Such plans generally involve major expenditures of funds and are implemented to rehabilitate large fires that have impacted the natural environment in a manner that jeopardizes the future integrity of this environment and/or poses specific threats to human life and property. For example, a severely burned slope may not be able to absorb precipitation due to chemical changes in the soil and the lack of vegetation. This may result in increased flooding, mud slides, debris flows, and other watershed events that may threaten homes, bridges, and public water supplies well beyond the perimeter of the fire. Federal fire funds are made available through established channels for assessment and implementation of approved actions. Exact procedures for approval and management of post-fire actions vary from year to year.

While it is not possible to forecast future fire locations, below are some values at risk from fire and potential watershed response to fire at Mojave National Preserve that should be considered during emergency stabilization and rehabilitation assessments.

- The threatened desert tortoise (*Gopherus agassizii*) and their designated critical habitat, covering 772,454 acres of the Preserve.
- The endangered fish species, Mohave tui chub (*Gila bicolor mohavensis*), that lives in small ponds at Zzyzx Desert Studies Center.
- Human communities at Round Valley, Pinto Valley, Fourth of July Canyon, Mountain Pass and scattered homes throughout the Preserve that are located on or adjacent to steep slopes.
- The large, operational Molycorp Mine located outside of the Preserve at Mountain Pass.
- Abandoned industrial mining sites located in various locations - of particular concern are those that include leach piles that may become destabilized and move downslope.
- Numerous cultural resources, including both historic and prehistoric sites.
- Numerous rare plant species and communities, particularly those concentrations of rare species found in the New York Mountains, Granite Mountains, and Providence Mountains.
- The inactive, large, industrial mine sites, such as Viceroy Mine and Morningstar Mine, due to the potential for leach piles to be destabilized and/or industrial chemicals to be released in the environment.
- The concentration of park developments in the Hole-in-the-Wall vicinity, including the Interagency Fire Center, Visitor Contact Station, and campgrounds.

Other issues of concern include the potential for spread of non-native plants, primarily Saharan mustard (*Brassica* spp.), cheatgrass (*Bromus* spp.), and Mediterranean grass (*Schismus arabicus*). These invasive plants occupy the spaces between desert shrubs, including areas that are not naturally vegetated, thus creating a continuous fuel load and changing the fire frequency of the environment. Related to this concern, is the common use of grass seeding post-fire to protect watersheds from soil erosion and to provide competition with the invasive grass species. When

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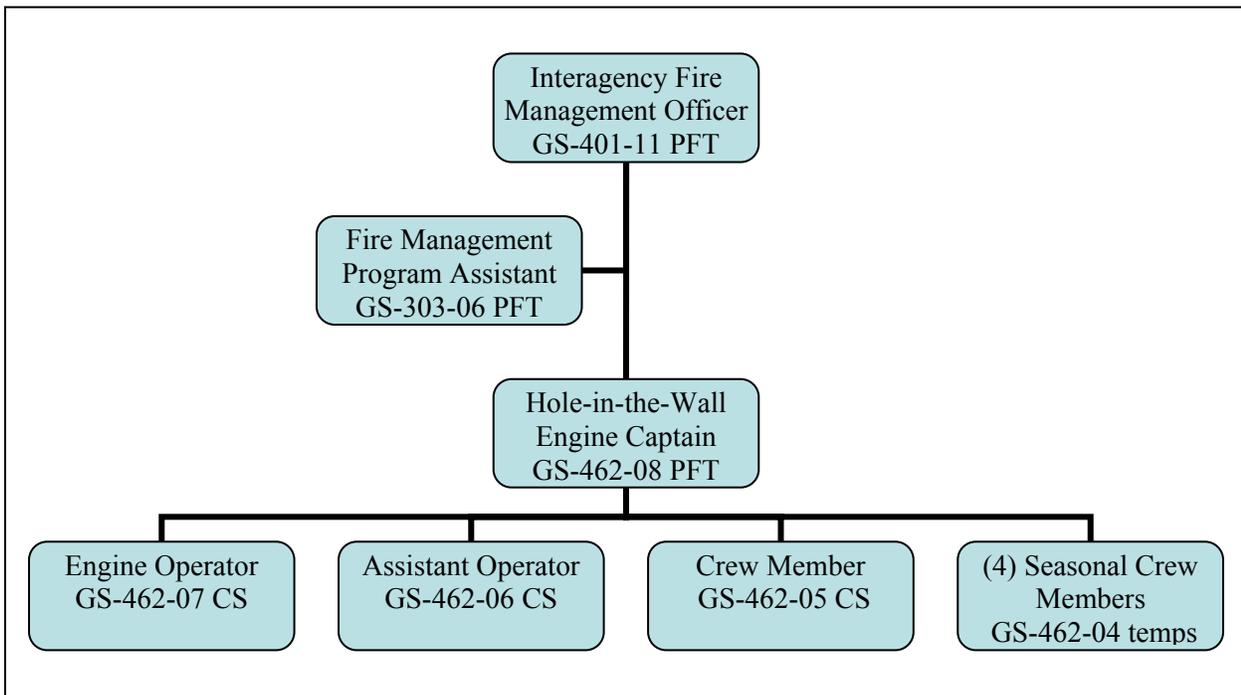
writing post-fire seeding treatments, special attention should be given to the flammability and competitiveness of the seeded species. There is some indication that the seeding of native grass species may be less effective than seeding of non-native perennial grass species in suppressing the growth of invasive grasses (Brooks and Minnich, in press).

V. Organization and Budget

A. Fire Management Organizational Structure

The following formal positions have direct responsibility for the implementation of the fire management program at Mojave National Preserve.

Figure 14. Organization chart for FirePro funded personnel duty stationed at Mojave National Preserve as of 2004. PFT = permanent full time, CS = career seasonal, temp = temporary



The Fire Management Officer and Fire Management Program Assistant are duty stationed at the Preserve headquarters at Barstow, California. The Engine module, including the Engine Captain, Engine Operator, Assistant Operator, and crewmembers, are duty stationed at Hole-in-the-Wall Interagency Fire Center located in the south central portion of the Preserve. Hole-in-the-Wall houses two Type III engine modules, one NPS and one BLM.

Fire Management Officer

The Fire Management Officer is responsible for direct coordination and management of all wildland fire activities, planning, implementing and monitoring fire used for resource benefits and wildland fire suppression. The Fire Management Officer reports directly to the Chief Ranger of Mojave National Preserve. As of August 2004 this position is shared with Joshua Tree National Park and the Needles Field Office of the Bureau of Land Management. The Fire Management Officer is a Fire funded position meaning that funding for the salary and support of

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this position does not come from park operating funds but rather a central funding source used only for fire positions.

The Fire Management Officer is responsible for all wildland fire operations, including the following:

- Directly supervises and coordinates the prevention, preparedness, management/ suppression of fire programs within the Preserve.
- Maintains a minimum qualification at the Incident Commander Type 3 level with an ideal qualification level at Division/Group supervisor of Operations or Plans Chief level.
- Prepares the fire program budget and coordinates/manages all fire funding and accounts.
- Serves as the lead Interagency Wildfire Contact for the Preserve, maintaining frequent communication with other units of the California Desert Fire Planning Unit as well as state partners.
- Coordinates Preserve activities with regional fire staff.
- Oversees training and related documentation and record keeping of classes, out-unit assignments and on-site fire management.
- Oversees procurement and maintenance of equipment, apparatus, and supply compliment for the Hole-in-the-Wall Fire Center.
- Directly supervises all park fire staff, both permanent and seasonal, who are supported by fire funds.
- Coordinates maintenance and computer input of records including fire reports fire weather and fire indices.

Fire Management Program Assistant

The Fire Management Program Assistant is a Fire funded permanent full-time employee who assists and supports the Fire Management Officer and fire programs. This position is responsible for:

- Tracking and updating employee training, incident experience, certifications, qualifications and issuance of "red cards."
- Entering data into various fire-related data bases.
- Payroll for fire employees.
- Tracking expenditures charged to fire accounts.
- Other duties as assigned.

Engine Captain and Engine Operators

The Engine Captain supervises a seven-person engine module and provides leadership in accomplishing fire management objectives. This position is responsible for the day-to-day operation of the fire engine module, directing the engine to fire locations and positioning the engine in appropriate locations in consideration of safety of crew and equipment. The Engine Captain, or in their absence a qualified Engine Operator, serves as the Incident Commander for initial attack, evaluates on-site conditions, makes tactical decisions, and determines appropriate response in compliance with the guidelines of this Fire Management Plan. The Engine Captain and Engine Operators also maintain fire readiness and implement fuel management projects. All positions of the engine module are fire funded.

Regional Director, Pacific West Region

Authority for the approval of the environmental compliance document for this Fire Management Plan rests with the Regional Director of the Pacific West Region, National Park Service. This position is base-funded by the Pacific West Region and is not a fire-funded position.

Superintendent

The Superintendent of Mojave National Preserve is responsible for providing oversight for the implementation of this Fire Management Plan. The park superintendent is responsible to periodically assessing and certifying by signature that continued management of wildland fire use actions is acceptable.

Implementation authority and responsibility can be delegated to the Chief Ranger for fires within the Preserve. This position is base-funded by Mojave National Preserve and is not a fire-funded position.

Chief Ranger

The Chief Ranger directly supervises the Fire Management Officer and directs and coordinates support activities between the FMO and District Rangers. This position is base-funded by Mojave National Preserve and is not a fire-funded position.

Resource Management Specialist

The Resource Management Specialist, in coordination with the Chief Ranger and FMO, is responsible for the periodic review and revision, if necessary, of the Preserve's fire management plan. Additionally the Resource Management Specialist, directly or through delegation, will coordinate the monitoring of fire effects in accordance with the Fire Monitoring Handbook (NPS 2003), and will develop rehabilitation plans required following suppression actions. The Resource Management Specialist will also propose and secure funding for fire ecology research in support of subsequent plan revision. The Resource Management Specialist serves as the Preserve's Resource Advisor to the Incident Commander or Incident Team. Specifically, the Resource Management Specialist will advise the IC on compatibility of actions with NPS policy, guidelines and plans pertaining to cultural and natural resources within the Preserve. This position is base-funded by Mojave National Preserve and is not a fire-funded position.

B. Funding

In FY04, the base fire budget for Mojave National Preserve was \$445,841 and the fire program has been funded at a similar level for several years. Currently, the fire budget is planned and dispersed via FirePro but will be transitioning to the new interagency Fire Program Analysis system over the next three years.

C. Interagency Coordination for FMP implementation

Mojave National Preserve is part of the California Desert Fire Planning Unit. The California Desert Fire Planning Unit is chartered to work cooperatively to implement Fire Program Analysis to achieve fire management objectives in a cost effective manner on an

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interagency landscape scale. Fire management goals and objectives as well as geographic fire management units described in the plan were reviewed by the Fire Planning Unit.

As of August 2004 this planning unit includes 32 acres of federal land in 14 administrative units managed by four federal agencies. Specific partners are:

- National Park Service: Mojave National Preserve, Death Valley National Park, and Joshua Tree National Park.
- Bureau of Land Management: Barstow Field Office, El Centro Field Office, Needles Field Office, Palm Springs/South Coast Field Office, and Ridgecrest Field Office; all part of the California Desert District.
- Fish and Wildlife Service: Salton Sea National Wildlife Refuge and Coachella Valley National Wildlife Refuge.
- Bureau of Indian Affairs: four reservations including Torres-Martinez Reservation and Cabazon Reservation.

Specific responsibilities for the Fire Planning Unit are defined in the charter. The Fire Planning Unit will meet at least twice annually to review the charter, resolve interagency issues, and formulate budget requests. Fire management resources are allocated on an interagency basis within the Fire Planning Unit. Fire management needs within the Fire Planning Unit are evaluated using standardized protocols of the Fire Program Analysis and funding priorities are negotiated within the Fire Planning Unit.

D. Fire-related agreements, contracts, etc.

The most current fire-related agreement is the charter for the California Desert Fire Planning Unit for the Fire Program Analysis. Other interagency and mutual aid agreements pre-date the establishment of the Fire Planning Unit. These agreements are revised annually or at other self-defined intervals.

There is a four-party cooperative fire protection agreement between the 1) Bureau of Land Management, California and Nevada; 2) National Park Service, Pacific West Region, 3) Forest Service, Regions 4, 5, and 6; and 4) State of California Department of Forestry and Fire Protection.

Mojave National Preserve works within the California Desert Interagency Fire Operations Plan and has access to a variety of fire management resources including the Federal Interagency Communication Center, (dispatch), water tenders, helicopters, and additional engines.

Additional resources may be secured via contract sources. Emergency Equipment Rental Agreements are honored on an interagency basis with the BLM, NPS, USFS, and CDF in California. Master lists of these resources are kept at the Federal Interagency Communication Center.

VI. Monitoring and Evaluation

A. Operational reviews

Annual readiness reviews of the Hole-in-the-Wall Interagency Fire Center are conducted in the spring by the Bureau of Land Management. The purpose of these annual readiness reviews is to assess preparedness of personnel, facilities, documentation, and equipment to assure that the field operation is in compliance with standards established by the National Wildfire Coordinating Group. Mojave National Preserve participates fully in these reviews.

Every five years, a national readiness review is conducted by the National Interagency Fire Center. This review is similar to the annual readiness review.

After action reviews are conducted after every fire incident following the standards found in the Incident Response Pocket Guide.

This Fire Management Plan and its appendices will be reviewed annually by the Fire Management Officer and other park or fire personnel as requested by the Fire Management Officer. The review will take place after the current fire season and before the next fire season. The purpose of this review is to assure that fire management planning documents are pertinent and up-to-date with current policy and operational procedures. Revisions will be undertaken as necessary to assure this purpose is met. Environmental documents will be revised or new documents will be prepared when plan revisions result in anticipated changes in the intensity or frequency of environmental impacts than discussed in the 2004 documents.

B. Fire Effects Monitoring Program

National Park Service Wildland Fire Management policy (NPS 1998) directs managers to monitor all prescribed and wildland fires. Fire effects monitoring must be done to evaluate the degree to which objectives are accomplished. Long-term monitoring is required to document that overall programmatic objectives are being met and undesired effects are not occurring. Evaluation of fire effects data are the joint responsibility of fire management and natural resource management personnel.

Fire monitoring within Mojave National Preserve follows the recommended standards described in the Fire Monitoring Handbook (NPS 2003). These standards are based on four levels of monitoring:

- Level 1: Environmental This level provides a basic overview of the baseline data that can be collected prior to a burn event. Information at this level includes historical data such as weather, socio-political factors, terrain, and other factors useful in a fire management program. Some of these data are collected infrequently (e.g., terrain); other data (e.g., weather) are collected regularly.
- Level 2: Fire Observation Document fire observations during all fires. Monitoring fire conditions calls for data to be collected on ambient conditions as well as on fire and

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smoke characteristics. These data are coupled with information gathered during environmental monitoring to predict fire behavior and identify potential problems.

- Level 3: Short-term Change Monitoring short-term change (level 3) is required for all prescribed fires. Monitoring at this level provides information on fuel reduction and vegetative change within a specific vegetation and fuel complex (monitoring type), as well as on other variables, according to your management objectives. These data allow you to make a quantitative evaluation of whether a stated management objective was met. Vegetation and fuels monitoring data are collected primarily through sampling of permanent monitoring plots. Monitoring is carried out at varying frequencies— pre-burn, during the burn, and immediately postburn; this continues for up to two years post-burn.
- Level 4: Long-term Change Long-term change (level 4) monitoring is also required for prescribed fires, and often includes monitoring of short-term change (level 3) variables sampled at the same permanent monitoring plots over a longer period. This level of monitoring is also concerned with identification of significant trends that can guide management decisions. Some trends may be useful even if they do not have a high level of certainty. Monitoring frequency is based on a sequence of sampling at some defined interval (often after five, then ten years, then every ten years) past the year-two postburn monitoring. This long-term change monitoring continues until the area is again treated with fire.

At Mojave National Preserve environmental monitoring (level 1) is required for all fire management activities and most of this monitoring is on-going and not tied to a specific fire incident. Environmental monitoring provides the basic background information needed for decision-making. The following types of environmental data are collected: weather, fire danger rating, fuel conditions, and values to be protected. Data collection related to weather, fire danger rating, and fuel conditions has already been described in this document. Data specific to values to be protected is collected opportunistically. As cultural resources, rare or endangered species, or research plots are located, that information is shared with the Mojave National Preserve Fire Management Program. If fire or fire suppression poses a risk, strategies are developed to mitigate that risk.

At Mojave National Preserve, fire observation monitoring (level 2) is required for both fire suppression and wildland fire use. Fire suppression requires only reconnaissance monitoring while wildland fire use requires both reconnaissance and fire condition monitoring. Reconnaissance monitoring includes the following variables: fire cause (origin) and ignition point, fire location and size, logistical information, fuels and vegetation description, current and predicted fire behavior, potential for further spread, current and forecasted weather, resource or safety threats and constraints, smoke volume and movement. Fire condition monitoring includes the following variables: topography, ambient conditions, fuel model, fire characteristics, smoke characteristics, holding options, and resource advisor concerns. Post-burn reports will be prepared by the resource advisor where assigned. Details for collecting and recording this data are described in the Fire Effects Monitoring and Research Plan (Appendix C).

This Fire Management Plan does not include prescribed fire for Mojave National Preserve so there are no plans to systematically implement level 3 or level 4 monitoring, although some aspects may be incorporated into fire ecology research as described in Appendix C.

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