Death Valley National Park

Inyo and San Bernardino Counties, California
Nye and Esmeralda Counties, Nevada

Fire Management Plan

September 2007

Executive Summary

Death Valley National Park is a vast desert landscape that encompasses almost 3.4-million acres, of which 95% is designated wilderness. The Park is administers by the National Park Service (NPS) and is surrounded entirely by Federal lands administered by the Bureau of Land Management, the U.S. Forest Service, and the U.S. military. The Park includes lands co-managed with the Timbisha Shoshone Tribe. In addition to National Park status, the area is a designated part of the Mojave and Colorado Deserts Biosphere Reserve.

While much of the Park is barren or sparsely vegetated, it also contains almost 600,000 acres of vegetation that is capable of carrying fire. Fuels include desert montane forest, pinyon-juniper woodland, sagebrush steppe and woodland, Joshua tree woodland, blackbrush shrublands and mesquite bosques.

The 2007 Fire Management Plan for Death Valley National Park will guide management of wildland fire over the next ten years. This plan fulfills responsibilities under several directives including the Federal Wildland Fire Management Policy, the National 10-year Comprehensive Strategy Implementation Plan for Reducing Wildland Fire Risks to Communities and the Environment, the Interagency Fire Management Plan Template, and NPS Director's Order #18: Wildland Fire Management. This plan also incorporates the most current fire science.

This plan replaces the Park's previous Fire Management Plan that was approved in1990. The previous Fire Management Plan focused on suppression and did not include the 1.3 million acres of park land added in 1994, nor did it address wilderness (also established in 1994), nor the endangered riparian birds or desert tortoise. The purpose of this new Fire Management Plan is to implement a broader range of fire management strategies within a comprehensive wildland fire management program consistent with Death Valley's General Management Plan, national interagency fire policies, and NPS directives. The overall goal of the fire management program at Death Valley National Park is to facilitate natural fire processes while ensuring firefighter and public safety as well as the protection of significant natural and cultural resources.

This Fire Management Plan includes the following fire management strategies:

- 2,473,000 acres of wilderness will be managed for fire use where lightning-caused fires are allowed to burn under specific conditions in order to perpetuate the ecological roles of natural fire
- 912,000 acres will be managed for suppression of all ignitions, primarily for the protection of the threatened desert tortoise, structures, and private lands.
- Throughout the Park, all human caused fires will be suppressed.
- Prescribed fire will be used at specific sites to perpetuate traditional cultural practices of the Timbisha Shoshone, and the implementation of each burn will be guided by an approved burn plan.
- Hazard fuel reduction will be implemented by mechanical methods around Park owned structures to decrease either the volume or flammability of fuels immediately adjacent to structures.

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I. INTRODUCTION

Death Valley National Park is located in eastern California and in Nevada (Figure 1). It encompasses approximately 3,350,000 acres (1,356,275 ha), predominately in Inyo County, (California) with portions in San Bernardino (California), Nye (Nevada), and Esmeralda (Nevada) counties. Private inholdings total over 4,880 acres (1,976 ha), and have all been derived from patented mining claims. Within the boundaries of Death Valley National Park, 314 acres near Furnace Creek are held in trust as a homeland for the Timbisha Shoshone Tribe and the NPS co-manages additional park lands as the Timbisha Shoshone Natural and Cultural Preservation Area. Ninety-four percent of the Park (approximately 3,150,000 acres or 1,275,300 hectares) is designated wilderness. The Park is surrounded entirely by Federal lands administered by the Bureau of Land Management, the U.S. Forest Service, and the U.S. military. The Park is also a designated part of the Mojave and Colorado Deserts Biosphere Reserve.

Extensive visitor services, residential and administrative facilities exist at Furnace Creek, Cow Creek, Stovepipe Wells, Grapevine and Scottys Castle. The Park has a resident population of about 1,400 and an annual visitation of about 1,000,000 people.

Death Valley is widely perceived as an arid desert environment in which, at first glance, fire would seem to play a limited ecological role. However, Death Valley contains a number of plant assemblages that can and do support fire. It is estimated that almost 600,000 acres (242,915 ha) of Park lands are capable of sustaining wildfires.

I.A. Reason for the Plan

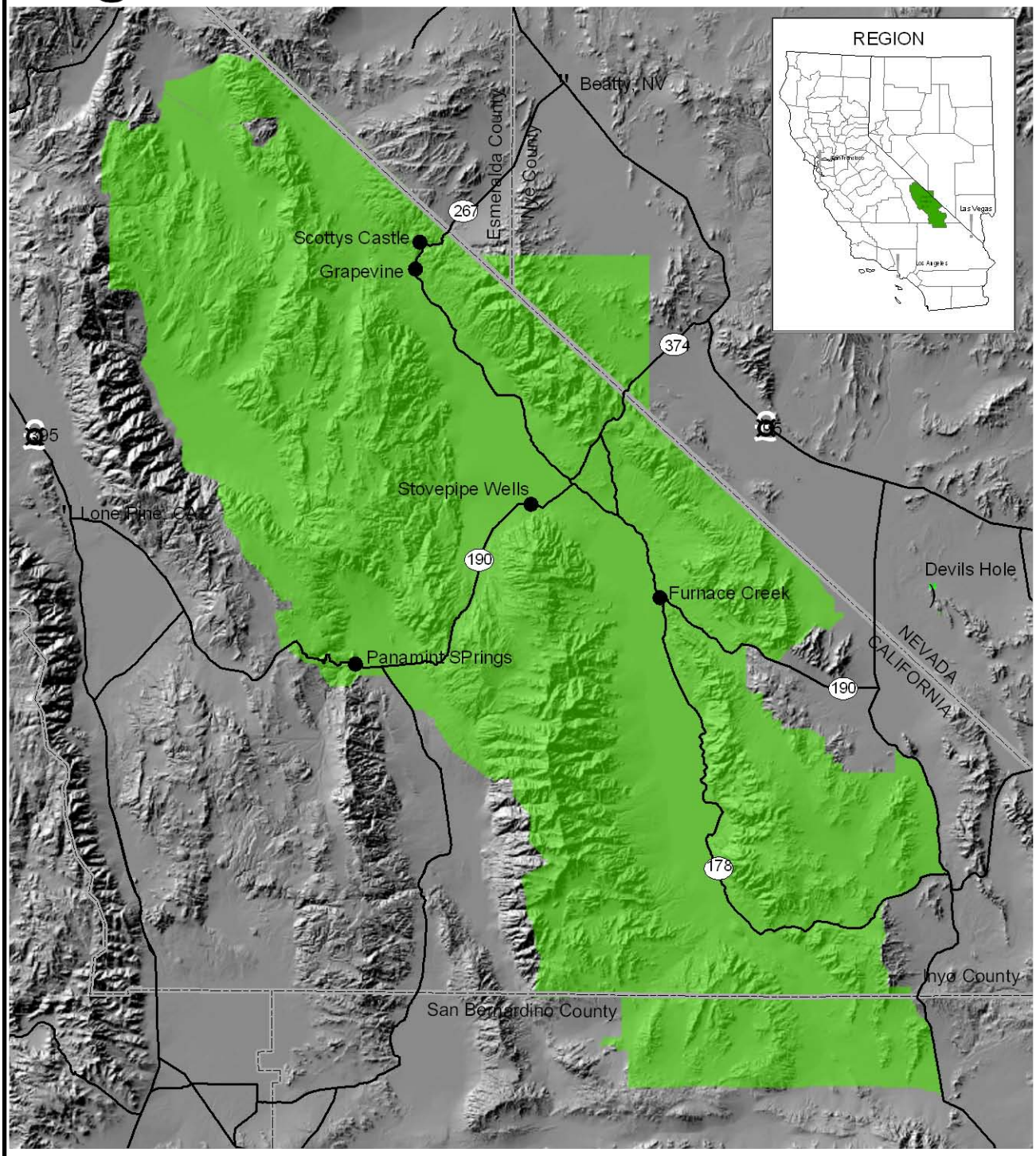
As described in the existing Fire Management Plan (NPS 1990), the current fire management strategy in use at Death Valley is focused on suppression with limited opportunities for use of wildland fire and prescribed fire. The purpose of this Fire Management Plan is to implement a broader range of fire management strategies within a comprehensive wildland fire management program consistent with Death Valley's General Management Plan, national interagency fire policies and NPS directives. This plan does not address structural firefighting except as related to wildland fuels. Specifically, this plan fulfills responsibilities under:

- *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-year Comprehensive Strategy Implementation Plan* (Wildland Fire Leadership Council 2002) to improve fire prevention and suppression, reduce hazardous fuels, restore fire-adapted ecosystems, and promote community;
- 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* (NPS 1998) that directs park management to achieve multi-dimensional objectives, with a balance between suppression and fire use to regulate fuels and maintain healthy ecosystems.

Death Valley National Park
California and Nevada
Fire Management Plan

National Park Service
U.S. Department of the Interior

Figure 1: Overview



Produced by S. Dingman, NPS Biologist

May 2005

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I.B. Relationship to Environmental Compliance

General Management of Death Valley National Park, 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 2001 (NPS 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 of the Fire Management Plan is documented in a separate Environmental Assessment.

Because the threatened desert tortoise (*Gopherus agasizii*) as well as the endangered least Bells vireo (*Vireo bellii pusillus*) and potentially the endangered southwestern willow flycatcher (*Empinodax trailli extimus*) are known to occur within Death Valley National Park in habitats that might be affected by fire, the National Park Service assumes additional compliance responsibilities under Section 7 of the Endangered Species Act (ESA); 7 U.S.C. 136; 16 U.S.C. 460 et seq. (1973). In fulfillment of those responsibilities, potential impacts of the proposed fire management actions were analyzed in a biological assessment prepared for the Park's General Management Plan. A biological opinion was issued by the U.S. Fish and Wildlife Service (2001) that identified non-discretionary terms and conditions that have been incorporated throughout this Fire Management Plan and its appendices. Project specific consultation will be initiated as needed for fuel treatments and prescribed fires that have the potential to impact endangered species.

Death Valley includes numerous cultural resources (described in more detail in the environmental assessment) and the National Park Service is responsible for conserving, protecting, preserving and managing the cultural resources in its care for long-term scientific research, public interpretation and education (Wells 1994). National Park Service Management Policies (NPS 2006, page 50) direct:

> "Environmental and cultural resource compliance documentation developed in support of the plan will consider the effects of fire on air quality, water quality, and human health and safety. It will also discuss the influence of fire, fire management and the potential consequences and effects of fire exclusion on the ability of the park to meet its natural and cultural resource management objectives. Preparation of the plan and supporting documents will include collaboration with appropriate NPS natural and cultural resource offices, adjacent communities, interest groups, state and federal agencies, and tribal governments, with cooperating agency status granted when requested by eligible adjacent communities, state, and federal agencies, and tribal governments."

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. Additional laws that ensure that the NPS fulfills its obligations to cultural resources in the context of this fire management plan include: section 2(a) of Executive Order 11593, section 14 of the Archeological Resources Protection Act, the American Indian Religious Freedom Act, and the Native American Graves Protection Act.

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. A separate Smoke Management document (Appendix E) has been prepared to describe critical air quality receptors and weather patterns as well as to establish a communication and coordination protocol for smoke management on a fire incident. Our partners in this effort are the Great Basin Unified Air Pollution Control District and the Mojave Desert Air Quality Management District.

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 approximately 3,150,000 acres of Death Valley National Park. 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 (NPS 1999) 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. Furthermore, National Park Service policy (NPS 1999) 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 requirement analysis for implementation of this Fire Management Plan can be found in Appendix C. 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. The final perimeter of the designated wilderness in Death Valley National Park has not yet been established so throughout this document, the preliminary wilderness perimeter as of April 14, 2005 has been used.

I.C. Collaboration

As of 2004, Death Valley National Park is in the California Desert Fire Planning Unit, with the exception of the geographically disjunct Devils Hole area which is in the Southern Nevada Fire Planning Unit. The California Desert Fire Planning 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 Timbisha Shoshone Homeland Act of 2000 (Public Law 106-423) provides for the tribe's living permanently on lands held in trust within their ancestral homeland, including 314 acres located near Furnace Creek. The act also provides special use areas, including the Timbisha Shoshone Natural and Cultural Preservation Area, for sustaining the tribe's traditional cultural and religious activities. The NPS and the Timbisha Shoshone Tribal Council co-manage lands for this purpose. As fire management decisions will affect these co-managed lands, the Tribe is an important collaborator in the Fire Management Plan.

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.

The mission of the California Desert Managers Group is to:

- Develop coordinated and complementary 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; 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. Death Valley National Park is administratively assigned to the Bureau of Land Management Fire Management Officer located in the Ridgecrest Field Office. An Annual Fire Operations Plan (Bureau of Land Management 2006a) 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 U.S. Geological Survey Las Vegas Field Office. Likewise, this office is an important partner in the fire effects monitoring and research program.

I.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 (NPS 2006)

- National Park Service Director's Order #18: Wildland Fire Management (NPS 1998)

II. RELATIONSHIP TO LAND MANAGEMENT PLANNING AND POLICY

II.A. NPS Management Policies

NPS Management Policies (NPS 2006, page 49) states: "Fire management consists of a program of activities designed to meet management objective for protection of resource values, life, and property, and where appropriate, for using naturally ignited and human-ignited wildland fires as management tools. Park fire management programs designed specifically to meet park resource management objectives- including allowing fire to perform its natural role as much as practicable-will ensure that firefighter and public safety are not compromised."

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 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.

Management direction for Death Valley National Park is found in the Park's General Management Plan. This general planning document provides overall direction for the programs and activities within the Park. Additional guidance and specific goals for the Park's fire management program can be referenced in the Resource Management Plan (NPS 1994). The Resource Management Plan sets the overall framework for goals and objectives for the Fire Management Plan. The Fire Management Plan is intended as an operational document providing specific guidance and approved actions to successfully manage fire events at Death Valley National Park. Additionally, the Fire Management Plan also ensures that approved actions and direction meet Federal Wildland Fire Policy and National Park Service policies for wildland fire management.

II.B. Enabling Legislation

Death Valley National Monument was established by presidential proclamation under the Antiquities Act of 1906, on February 11, 1933 (Proclamation No. 2028). The original monument contained approximately 1,601,800 acres (648,500 ha). Supplementary proclamations in March 1937 (No. 2228) and January 1952 (No. 2961) increased the monument's acreage to 2,067, 793 acres (837,163 ha). The monument was subsequently enlarged to 3,158,038 acres (1,278,558 ha) and changed to Death Valley National Park by Congressional action on October 31, 1994, with the passage of the California Desert Protection Act (16 U.S.C. 410aaa-83, PL 103-433).

The California Desert Protection Act (1994) was enacted in part to:

- Preserve unrivaled scenic, geologic, and wildlife values associated with these unique natural landscapes.
- Protect and preserve historical and cultural values of the California desert associated with ancient Indian cultures, patterns of western exploration and settlement, and sites exemplifying the mining, ranching and railroading history of the Old West.
- Provide opportunities for compatible outdoor public recreation, protect and interpret ecological and geological features and historic, paleontological, and archeological sites, maintain wilderness resource values, and promote public understanding and appreciation of the California desert.
- Retain and enhance opportunities for scientific research in undisturbed ecosystems.

II.C. Park-wide Goals and Objectives as they pertain to Fire Management

The following management objectives outlined in the Death Valley General Management Plan for resources and wilderness values pertain to fire management:

- Protect the significant natural and cultural resources and values of the Park, including geologic features, and to foster an improved understanding of natural processes through monitoring efforts and scientific research.
- Perpetuate native plants and animal life for their essential roles in the natural ecosystem.
- Strive to reduce or eliminate alien species to ensure long-term survival of the native ecosystem.
- Eliminate existing and prohibit new occurrences of all activities inconsistent with the protection of the natural ecosystem, except in the Park's developed areas, as noted in the Park's management plans.
- Restore to natural appearance, to the extent that it is feasible, land surfaces disturbed by man, recognizing that significant cultural values must be preserved.
- Protect the Park's collections of natural and cultural objects from deterioration, natural disaster, misuse, and loss.
- Support research programs pertaining to natural and cultural resources and to social sciences, consistent with the Park's resource protection and visitor services mission.
- Manage and protect wilderness values and resources so as to ensure public understanding and appreciation of the vast wilderness values and resources so as to ensure public understanding and appreciation of the vast wilderness assets of the Park.

II.D. Resource Stewardship Plan Objectives as they pertain to Fire Management

The current approved Resource Management Plan (1994) for Death Valley National Park does not specifically address fire management, but the objectives below are not inconsistent with the intent or purpose of the plan. At this time, a revised Resource Management Plan is being drafted. The guiding resource objective for fire management will be to perpetuate biodiversity created through natural processes, including the influence of fire, while protecting cultural resources from direct harm. Resource management objectives for Death Valley National Park relating to fire management are the following (the new RMP will include these):

- Manage the Parks resources to ensure the perpetuation of the natural and cultural aspects for which the Park was established. This includes the reduction of hazard fuels and the maintenance of traditional resources through prescribed fire, mechanical thinning, or other appropriate means. It also includes the maintenance and/or restoration of cultural landscapes through the appropriate use of fire.
- Restore fire to its natural role in ecosystem maintenance. Study the role of fire and determine changes or traditional practices that have occurred through historic and pre-historic times.
- Allow, where possible, the natural functioning of environmental processes by maintaining the natural diversity of ecological communities while managing threats from non-native species and other detrimental influences.

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

With the implementation of the Fire Management Plan, which includes a continuum of fire management procedures, ecological processes are allowed to proceed as prescribed in the General Management and Resource Management plans. Selected sensitive structures, some of which are utilized and maintained on an informal basis by the public, will be protected from wildland fires whenever possible.

This fire management plan provides detailed guidelines to implement the preceding policies, goals, and objectives in an integrated, logical fashion, tailored to the resources of the Park. The Park's fire management program is fundamentally based on utilizing a continuum of management procedures while protecting human life, facilities and cultural resources, sensitive species (including Federal and State listed species) and natural systems and their associated processes.

III. WILDLAND FIRE MANAGEMENT STRATEGIES

III.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 2005 California Desert Interagency Fire Operations Plan and the General Management Plan for Death Valley National Park, this Fire Management Plan delineates fire management units and identifies appropriate fire management strategies within Death Valley National Park for the protection of life and property as well as preservation of natural and cultural resources.

III.B. Wildland Fire Management Goals

The Death Valley National Park fire management program goals and objectives are aligned with the Park's 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.

The overall goal of Death Valley's fire management program is to:

Facilitate natural fire processes while ensuring firefighter and public safety as well as the protection of significant natural and cultural resources.

This overall goal includes three major components as outlined below:

1) Make all fire management decisions following existing policies and based on the best available scientific knowledge of fire effects and management in order to meet resource objectives.
    a. Use appropriate procedures to determine if naturally-ignited wildland fires can be safely managed to meet objectives or if they will be suppressed.
    b. Plan fuels treatments based on potential for ignition and values at risk.
    c. Monitor fire behavior and effects, and adjust fire management based on accumulated data.

   d. Use prescribed fire to promote traditional cultural practices based on ethnographic research while preserving ecological health.
   e. Support and encourage fire research programs pertaining to natural and cultural resources and desert region fire ecology, consistent with the Park's resource protection and visitor services missions.

2) Minimize negative impacts to natural/cultural resources and wilderness values from suppression activities and unwanted fire effects.
   a. Protect water resources by identifying and protecting surface water and groundwater recharge areas on each fire incident. After each fire, evaluate effects of fire on long-term productivity of the aquatic resources.
   b. Protect air quality values by maintaining air quality monitoring to facilitate implementation of means to prevent deterioration of air quality values.
   c. Ensure that each fire incident has at least one Resource Advisor present with expertise in cultural and natural resources.
   d. Inventory areas of wildland fire potential and evaluate resources at risk from fire suppression activities or fire effects.
   e. Utilize minimum impact suppression techniques in wilderness areas.
   f. Assess need for mitigating measures to reduce post-fire impacts to significant resources, recommend treatment actions, and develop activity plan.
   g. Protect cultural resources from fire and fire suppression impacts, including archeological, historical, and ethnographic sites illustrating the continuing human history of Death Valley.
   h. Utilize best emergency stabilization and rehabilitation techniques to protect soil and to enhance natural recovery, to minimize spread of non-natives, and to eliminate any signs of human influence on burned sites.

3) Provide for the efficient and cost-effective management of all fires.
   a. Actively promote public and firefighter safety.
   b. Promote an interagency approach to fire management.
   c. Minimize fire suppression costs.
   d. Using the Incident Command System, clearly define roles and responsibilities for all personnel assigned to a fire incident.
   e. Make appropriate notifications to assure that Park neighbors and partners are informed of any fire incident that could pose a risk to private property or transportation corridors.
   f. Utilize educational materials and opportunities to promote a broad public understanding of the natural role of fire and the fire management program.

III.C. Wildland Fire Management Strategies

Concept of Response to Wildland fire

Response to Wildland Fire is defined in the Glossary of Wildland Fire Terminology (National Wildfire Coordinating Group 2008) as: "Any specific action suitable to meet Fire Management Unit (FMU) objectives. Typically, the Response to Wildland Fire ranges across a spectrum of tactical options (from monitoring to intensive management actions). The Response to Wildland Fireis developed by using Fire Management Unit strategies and objectives identified in the Fire Management Plan."

In practice, the response to wildland fire allows fire managers to use the most appropriate strategy to manage a fire given the values at risk and the firefighting resources available. For example, even in initial response fire managers can choose to use a containment strategy as opposed to a more aggressive control strategy. The Glossary of Wildland Fire Terminology (National Wildfire Coordinating Group 2006) defines confinement as: "The strategy employed in appropriate management responses where a fire perimeter is managed by a combination of direct and indirect actions and use of natural topographic features, fuel, and weather factors." In other situations, an aggressive control strategy may be warranted based on the potential for the fire to spread to other areas where human safety may become a concern.

Wildland Fire Suppression

Wildland fire suppression is a response to 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.

Under this Fire Management Plan, 911,915 acres (approximately 27% of the Park) are zoned for suppression to protect desert tortoise habitat, developed areas, and cultural resources. This includes all non-wilderness lands as well as 617,234 acres of wilderness. Additionally, all human caused ignitions will be suppressed regardless of their location. Approved suppression tactics consist of fire engines, hand crews, helicopters for crew transport and water drops, and judicious use of fixed-wing aircraft or helicopters for retardant drops (clear or fugitive retardant only). 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.

An informal minimum tool 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.

Resource advisors, personnel trained to identify and mitigate suppression impacts and recommend post-fire rehabilitation measures, will assess burned areas that exceed 10 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, bristlecone pine and limber pine forest. Resource advisors will also assess burned areas that are known or likely to contain cultural resources. Emergency stabilization or burned area rehabilitation actions will be prescribed to mitigate post-fire resource impacts.

Use of Wildland Fire

Use of wildland fire is the management of either wildfire or prescribed fire to meet objectives specified in Land/Resource Management Plans in pre-defined geographic areas outlined in Fire Management Plans

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. However, our understanding of natural fire regimes in the Park is further complicated by an incomplete understanding of aboriginal burning. While it is documented that American Indians ignited fires in the Mojave Desert and gathered fuel wood (Fowler et al. 1995), it is unclear the extent to which their activities modified pre-European settlement fire regimes. Another complicating factor is the recent invasion of non-native plants. This increase in fine fuels has increased the flammability of the landscape in general but 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 and salty soils that characterize much of the low elevation lands, 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, 2,473,255 acres of designated wilderness are zoned for use of wildland fire. This is approximately 73% of total lands within Death Valley National Park and 80% of Park lands that are designated wilderness. These use of wildland fireareas are located in lands not occupied by developed areas, historic resources, or desert tortoise habitat.

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, perpetuation of traditional cultural practices, or removal of non-native plant species.

At Death Valley, prescribed fire will be used for fuel disposal (burning slash piles), to reduce hazardous fuels, removal of invasive saltcedar stands, to restore natural plant communities, and to promote specific plants as needed to maintain the traditional cultural practices of the Timbisha Shoshone.

With the exception of burning slash piles, each prescribed fire will be identified in a five-year work plan with implementation subject to funding. Each proposed prescribed fire will be reviewed in an environmental screening form and all compliance documents and consultations will be completed prior to implementation. A burn plan will be prepared for each treatment (including burning of slash piles)and will describe why the prescribed fire is needed, what the fire will accomplish, when conditions will permit the achievement of desired effects, how specific fire application will occur, and how the progress and results will be monitored and evaluated.

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 primary fuel treatments proposed in Death Valley National Park are hazard fuel reduction immediately adjacent to Park owned structures and hazard fuel reduction in developed campgrounds. Fuel removal as a traditional cultural practice of the Timbisha Shoshone may also occur in specific cultural use areas identified through on-going consultation with the Tribe. Priority for implementation of fuel treatments will be based on the potential for ignition and the values at risk. Those locations where hazardous fuels pose the greatest risk to human life or safety are highest priority, those locations that pose a risk to irreplaceable natural or cultural resources are medium priority, and other sites are lowest priority. Fuel removal for cultural purposes will be undertaken only in close cooperation with the Timbisha Shoshone. No fuels in riparian areas will be removed that have the potential to provide

habitat for the endangered least Bell's vireo or the endangered southwestern willow flycatcher without consultation with the U.S. Fish and Wildlife Service. Each fuel treatment project will be identified in a five-year work plan with implementation subject to funding. Each proposed fuel treatment will be reviewed in an environmental screening form and all compliance documents and consultations will be completed prior to implementation.

The Park will also incorporate hazard fuel reduction and fire preparedness requirements into various permits and agreements that involve structures managed by others on Park lands. Examples include utility rights-of-way substations and communication sites as well as concessions operations. Any private or public inholding located within the Park that is not legally subject to permits or agreements cannot be required to adhere to hazard fuel reduction standards. To encourage such owners/operators to voluntarily implement fire prevention measures, the Park will implement a fire prevention and education campaign and work with property owners and residents to reduce fuel hazards.

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

Fire Management Units (FMUs) identify areas of the Park 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 six Fire Management Units within Death Valley National Park (Figure 2, Table 1). 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.

Table 1. Summary of Fire Management Units

Fire Management Unit	Total Acres	Burnable Acres	Map
Devils Hole	40	38	Figure 5
Eureka Valley	708,600	156,000	Figure 6
Hunter Mountain	557,600	140,700	Figure 7
Panamint Range	893,400	157,500	Figure 8
Black Mountain	886,400	52,900	Figure 9
Grapevine Mountains	339,200	82,800	Figure 10

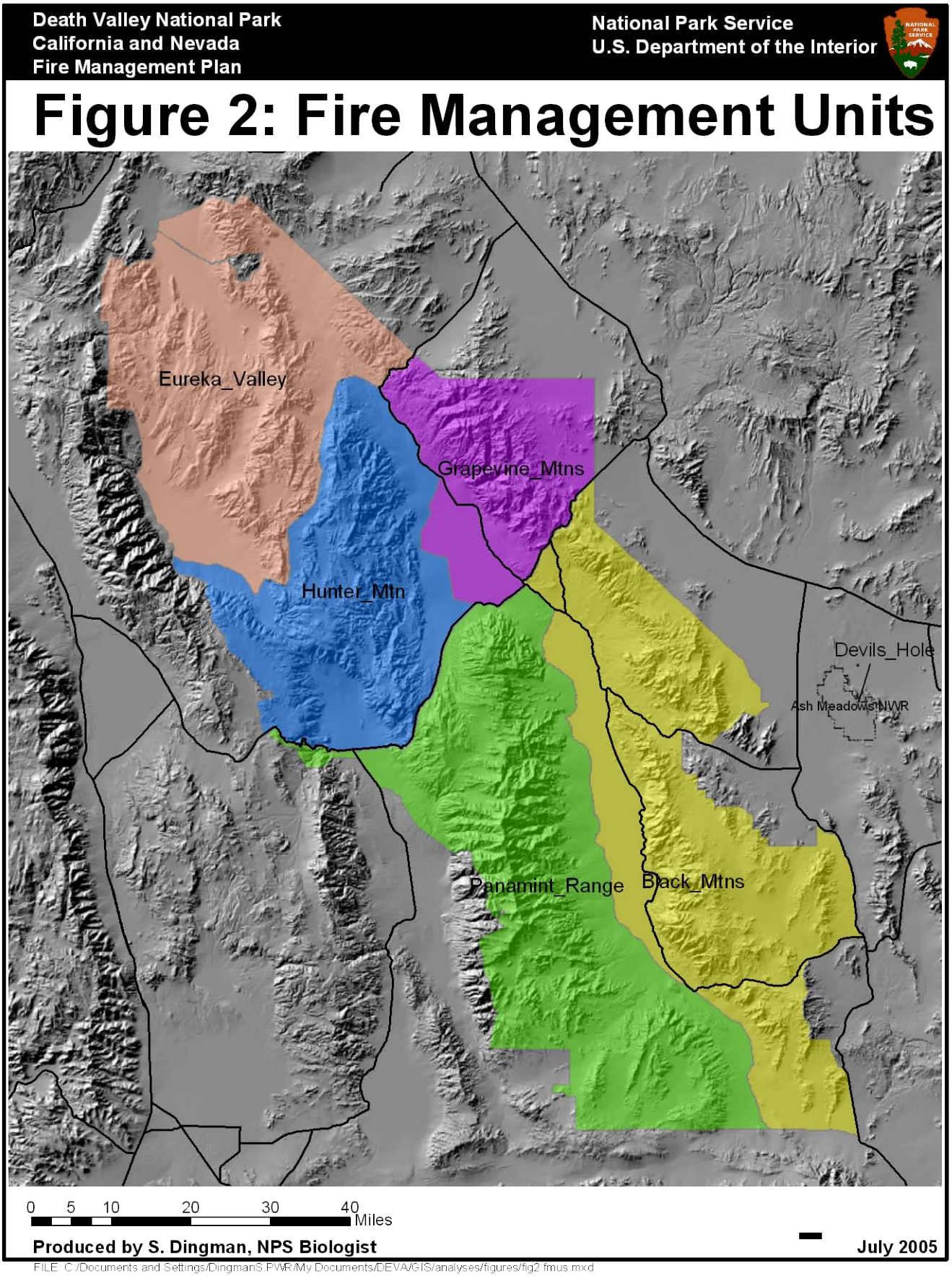
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Figure 2: Fire Management Units
Eureka_Valley
Grapevine_Mtns
Hunter_Mtn
Devils_Hole
Ash Meadows NWR
Panamint_Range
Black_Mtns
0 5 10 20 30 40
Miles
Produced by S. Dingman, NPS Biologist
July 2005
FILE: C:/Documents and Settings/DingmanS.PWR/My Documents/DEVA/GIS/analyses/figures/fig2 fmus.mxd

One key variable in the delineation of fire management units is vegetation type (Figure 3). 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 2006) that approximate fire regimes (Table 2, Figure 4). Additionally, the Central Mojave Vegetation Mapping Project coupled with field knowledge of Death Valley staff was used to delineate "burnable areas," that is vegetated zones with adequate fuel load and fuel continuity to allow fire to carry beyond the point of ignition.

Table 2. Fire regimes based on ecological zones (Brooks and Minnich 2006)

Ecological Zone	Characteristic vegetation	Fire regime	Concerns
Low elevation desert shrubland	- Alkali sink - Creosote bush scrub below 900 m	Infrequent surface fires due to very sparse and discontinuous fuels, although fuel loads can be significantly increased following wet winters due to the increased fine fuel load.	Where invaded by non-native grasses, increased fuel continuity leads to increased fire frequency and size which can potentially harm some fire intolerant native species.
Middle elevation desert shrubland and grassland	- creosote bush scrub above 900 m - Joshua tree woodland - shadscale scrub - blackbrush shrublands - desert scrub-steppe	Moderately infrequent surface and crown fires due to discontinuous fuels, although some areas with native grass and/or closed canopy shrublands can carry fire well. Somewhat affected by ephemeral plant production following wet winters.	Where invaded by non-native grass, namely red brome, increased fuel load and depth can carry fire into shrub crowns thus leading to increased fire size. Brome carried fires often lead to re-invasion by red brome and in extreme cases can result in type conversion to non-native grassland.
High elevation	- sagebrush scrub - pinyon-juniper woodland - desert chaparral	Moderately infrequent crown fires but can be large and intense when woody fuel moistures are low and winds are high. Fire size greatly influenced by canopy closure and slope.	Where invaded by non-native cheatgrass, fire return intervals can be shortened, although such affects are highly localized and probably less significant than in other ecological zones.
Desert montane	- bristlecone-limber pine forest - white fir	Frequent single-tree torching from lightning. Very infrequent crown fire and almost no surface fire due to low productivity resulting in very low fuel loads and continuity.	No specific alteration of this fire regime is documented.

The extreme north end of the Park as well as Park lands in Nevada were not mapped as part of the Central Mojave Vegetation Mapping Project and so are not treated to the same analysis described above. Digital Orthographic Quarter Quadrangles were used to estimate the extent of burnable vegetation within these unmapped areas, but lack of detail prevents further classification or analysis.

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.

Common to all Fire Management 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.

Prescribed fire and fuel management treatments can be undertaken in any Fire Management Unit. Prescribed fires will be subject to a burn plan. Fuel management projects are very site specific and are outlined in a five-year work plan (Appendix F).

Fire management objectives for each Fire Management Unit describe operational objectives that are considered realistic under typical fuel loads and fire behavior. Note that under unusually heavy fuel loads, such as those that follow extremely wet winters, the suppression goals may not be realistic. The intent is to identify objectives that meet resource protection needs and are operationally feasible most of the time, not necessarily all of the time.

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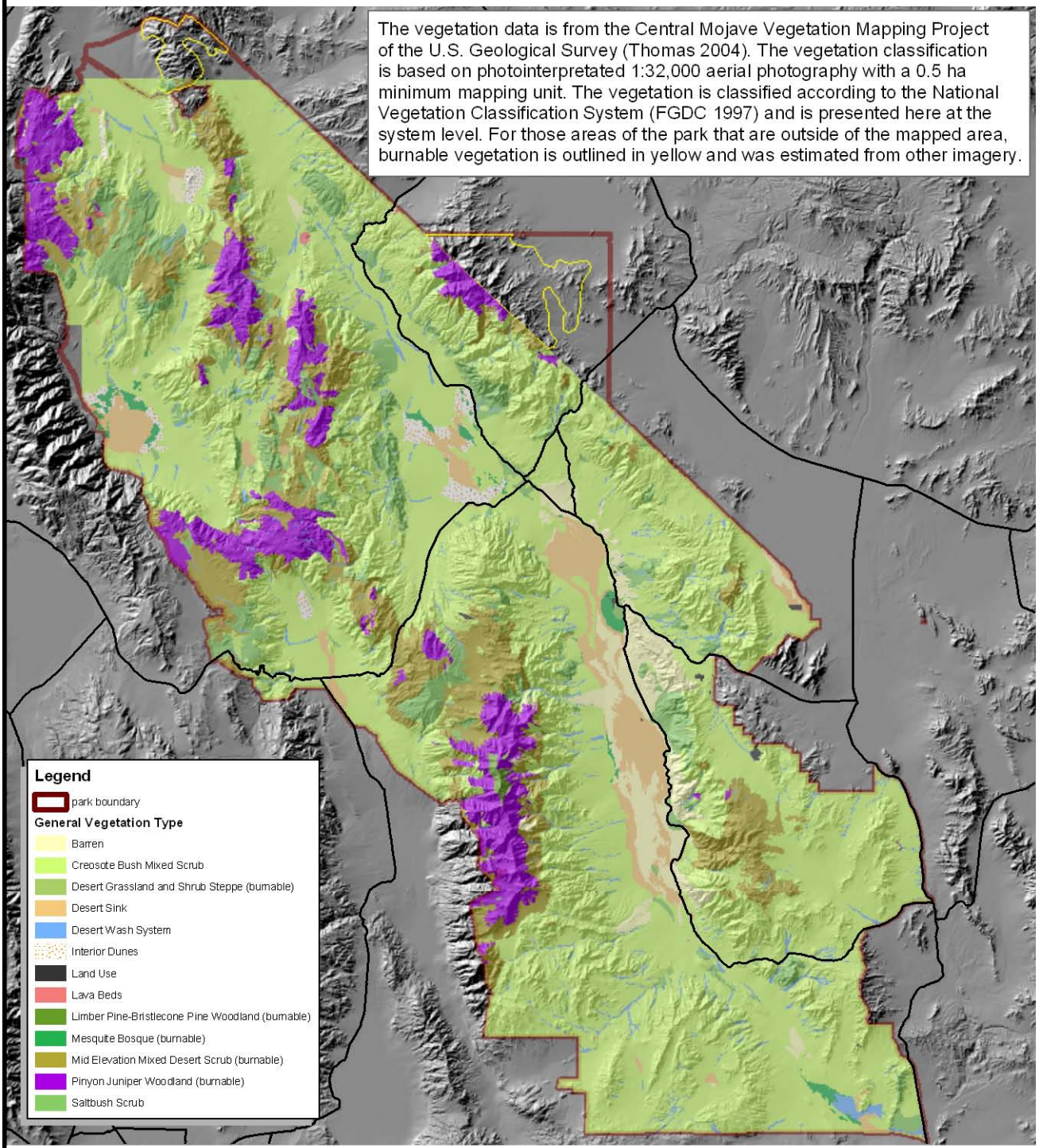
Figure 3: Vegetation



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May 2005

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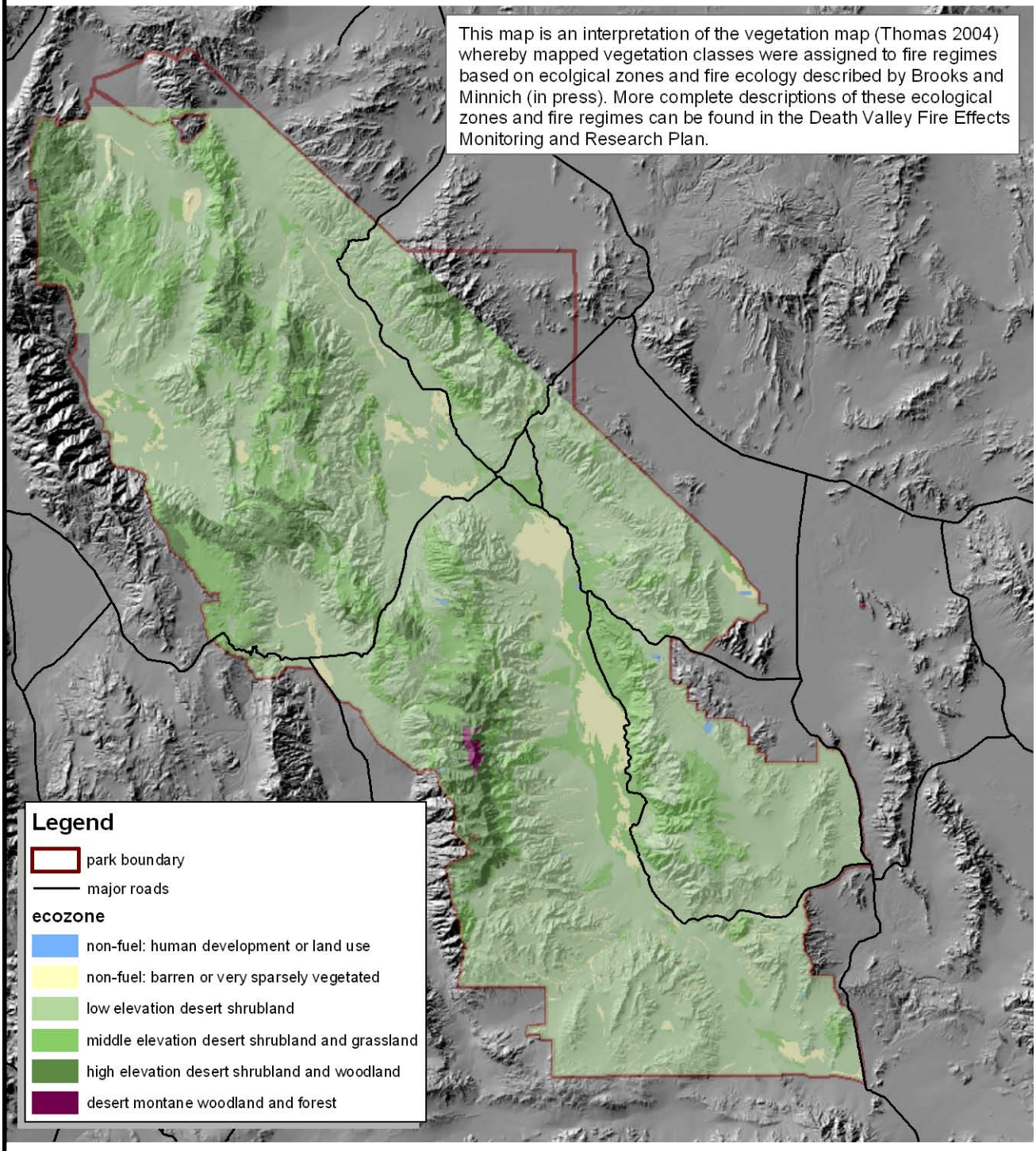
Figure 4: Fire Regime

This map is an interpretation of the vegetation map (Thomas 2004) whereby mapped vegetation classes were assigned to fire regimes based on ecolgical 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 the Death Valley Fire Effects Monitoring and Research Plan.



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III.D.1. Devils Hole Fire Management Unit

a) Physical characteristics of Devils Hole Fire Management Unit

Table 3. Summary of Devils Hole FMU

Total size	40 acres
Wilderness	0 acres
Suppression	40 acres
Fire Use	0 acres
Elevational Range	580 feet above sea level
Burnable Vegetation	38 Acres

Devils Hole Fire Management Unit is coincident with the disjunct Park lands of the same name. This 40 acre parcel (Table 3, Figure 5) is located in Nye County, Nevada and is surrounded by the 23,000-acre Ash Meadows National Wildlife Refuge. To establish the landscape context in which this FMU will be managed, the historic role of fire and wildland fire management situation descriptions were drawn from the Ash Meadows National Wildlife Refuge Fire Management Plan (USFWS 2004). However, the values at risk, management considerations, and fire management strategies for the Devils Hole FMU were developed by the NPS and apply only to the 40 acre parcel managed as Devils Hole.

Ash Meadows National Wildlife Refuge is managed as part of the larger Ash Meadows Fire Management Unit, which includes both the refuge as well as surrounding lands managed by the Bureau of Land Management.

The primary resource at Devils Hole is the endangered Devils Hole pupfish (*Cyprinodon diabolis*) that inhabits a pool in a limestone cavern. There are also other species of concern that inhabit the terrestrial and/or aquatic habitats of Ash Meadows, and potentially the Devils Hole FMU.

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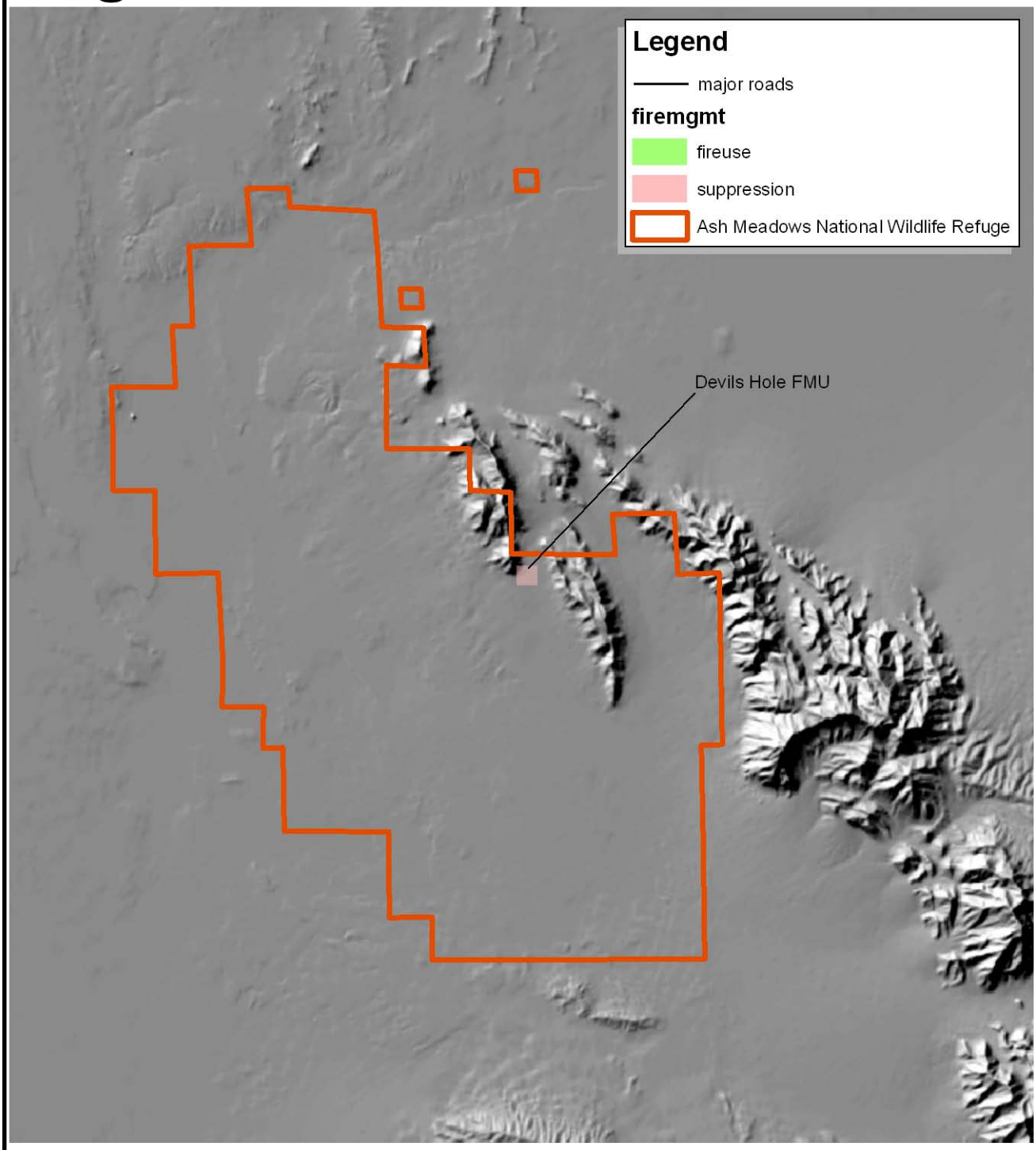
Figure 5: Devils Hole FMU



Produced by S. Dingman, NPS Biologist

July 2005

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b) Historic role of fire in Devils Hole Fire Management Unit

Note: this section was excerpted from the Ash Meadows National Wildlife Refuge Fire Management Plan (USFWS 2004).

Ash Meadows National Wildlife Refuge currently lacks the site-specific histories of fire and forest structure that are necessary for scientifically based land-management planning in this region. Site-specific fire histories provide the physical evidence of historical conditions that is critical to assessing the need for active management of specific watersheds, e.g., mechanical fuel treatment, prescribed fire or use of wildland fire, and justifying such management actions within agencies and to the public. In general, fire regimes varied across space in response to variation in factors such as topography and climate. While archival records reveal the modern factors such as fuel structure through fire exclusion, the influence of factors on past fire regimes is not fully understood. Extrapolating historical fire regimes across Nevada is further hampered by the nearly complete lack of information on historical fire regimes in any watershed in this region.

Records from the BLM for the Ash Meadows Fire Management Unit, which covers about 52,600 acres, indicate an average of 0.3 ignitions per year between 1980 and 2002, with an average of 63 acres burned per year. Fires ranged in size from 0.3 to 1,100 acres, and 71% were less than 100 acres in size. Median wildfire size is 206 acres. An average of approximately 628 acres burns per decade. Human causes account for 86% of all fires, with the remaining 14% attributed to lightning.

c) Wildland fire management situation in Devils Hole Fire Management Unit

1) Historical weather analysis:

Most precipitation in Death Valley National Park comes in late winter and early spring, occurring as rain in the lower elevation and snow in the higher elevations. Summer precipitation occurs primarily as localized and generally heavy thunderstorms. It usually occurs in the afternoon and evening after diurnal heating of the land sets up convection type air movements. These storms move fast; the period of rainfall is of short duration and is accompanied by high winds, thunder and lightning. Usually these storms begin by the beginning of July under a monsoon type pattern that persists until the end of September.

The Ash Meadows Fire Management Plan relies on the Red Rocks RAWS located 52 miles to the southeast of Devils Hole. This RAWS station is managed by the Bureau of Land Management and sits at an elevation of 3760 feet in yucca and creosote vegetation.

2) Fire Season:

Note: this section was excerpted from the Ash Meadows National Wildlife Refuge Fire Management Plan (USFWS 2004).

Fires generally occur from April through October, but can occur at any time of year in fine fuels when relative humidity is low. The extreme heat and very low relative humidity of summer allows fire to readily burn in woody fuels including saltcedar, willow, cottonwood, and mesquite.

3) Fuel characteristics in relation to fire behavior:

Note: this section was excerpted from the Ash Meadows National Wildlife Refuge Fire Management Plan (USFWS 2004).

Approximately two-thirds of Ash Meadows is riparian and marsh vegetation. In undisturbed areas of this habitat, saltgrass is the carrier fuel and will burn at moderate intensity and spread. The remainder of the land is predominantly creosote bursage and saltbush, with scattered stands of mesquite/acacia. Wildfires in desert vegetation communities of Ash Meadows are rare and generally depend upon ephemeral buildups of red brome and other introduced fine fuels.

Most wildfires at Ash Meadows involve saltcedar as the carrier fuel. Saltcedar fires tend to be fuel driven, rather than wind dependent. Aside from saltcedar, the other vegetative type that is prone to fire within Ash Meadows consists of scattered stands of mesquite/acacia woodland. Saltcedar fires here have exhibited high intensity and spread, whereas fires in the mesquite/acacia are usually single tree. The large fires recorded in Ash Meadows have all been human-caused ignitions.

4) Fire regime alteration:

Note: this section was excerpted from the Ash Meadows National Wildlife Refuge Fire Management Plan (USFWS 2004).

Fire occurrence in the desert areas of Ash Meadows has been historically infrequent. However, fire frequencies may increase, due both to increased human-caused fires and due to increased continuity of fine fuels caused by the growing dominance of introduced annual grasses.

Some riparian/marsh areas are infested with saltcedar, mainly along a series of irrigation channels. These introduced non-native fuels allow transport of fire into the interior of the marsh system. Saltcedar and other undesirable plant species also promote wildfires of larger size and intensity, versus the historical norm for this ecosystem.

5) Control Problems:

Note: this section was excerpted from the Ash Meadows National Wildlife Refuge Fire Management Plan (USFWS 2004).

Saltcedar fires here have exhibited high intensity and spread, whereas fires in the mesquite/acacia are usually single tree. The dense thickets are hot (summer temperatures exceed 100 degrees F) and dry (relative humidity is often less than 10 %) so fire occurs

easily (with infrequent lightning) and spreads rapidly. Fire favors saltcedar. Saltcedar's extensive and deep root structure is largely unharmed by fire, allowing it to recover more quickly than native plants and fill in the burned area thus increasing its susceptibility to fire.

In the summer months, fires will readily burn in saltcedar, willow, cottonwood, and mesquite. Fires in these fuels will be intense with rapid rates of spread under windy conditions. Flare-ups in these fuels under low relative humidity conditions will create spot fires and make fires difficult to control. Spot fires can occur at 1/2 mile or more. Indirect tactics may be necessary to bring them under control. Intermixed with saltcedar and mesquite are annual and perennial grasses that will support fire spread and intensity.

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

The primary resource at Devils Hole is the endangered Devils Hole pupfish (*Cyprinodon diabolis*) that inhabits a pool in a limestone cavern. Protection of this highly valued resource includes both the protection of the water as well as the surrounding lands as necessary to maintain the health of the aquatic habitat.

Ash Meadows National Wildlife Refuge and/or Devils Hole provide habitat for 24 endemic species, including eleven species protected under the Endangered Species Act U.S. Fish and Wildlife Service 1990). The habitat for these listed species is the springs, streams, or wet meadows found in this unique desert oasis. Protection of these species during fire management activities is also addressed in the Fire Management Plan for Ash Meadows National Wildlife Refuge (U.S. Fish and Wildlife Service 2004).

Federally listed species:
Ash meadows Amargosa pupfish (*Cyprinodeon nevadensis mionectes*) - endangered
Warm Springs pupfish (*Cyprinodon nevadaensis pectoralis*) - endangered
Ash Meadows speckled dace (*Rhinichthys osculus nevadensis*) - endangered
Amargosa niterwort (*Nitrophila mohavensis*) - endangered
Spring-loving centaury (*Centaurium namophilum namophilum*) - threatened
Ash Meadows milk-vetch (*Astragalus phoenix*) - threatened
Ash Meadows sunray (*Enceliopsis nudicaulis* var. *corrugata*) - threatened
Ash Meadows gumplant (*Grindelia fraxino-pratensis*) - threatened
Ash Meadows blazing star (*Mentzelia leucophylla*) - threatened
Ash Meadows ivesia (*Ivesia eremica*) - threatened
Ash Meadows naucorid (*Ambrysus amargosus*) - threatened

In addition to all of the endemic species, a few pairs of endangered Southwestern willow flycatcher (*Empidonax traillii extimus*) use Ash Meadows as breeding habitat from June through August each year. Two endangered species success stories, the peregrine falcon (*Falco peregrinus anatum*) and bald eagle (*Haliaeetus leucocephalus*) also use Ash Meadows seasonally as a migration stop over.

d) Fire management objectives for Devils Hole Fire Management Unit.

- Suppress all fires and contain each ignition to less than 1 acre.
- Actively protect the shoreline of Devils Hole from burning.
- Regardless of fire size or location, assess each burned area for potential affect to listed species, including the potential for mud or ash to flow from the burned area into the water at Devils Hole.

e) Management considerations to operational implementation in Devils Hole Fire Management Unit.

- As the site is easily accessible, fire suppression should be conducted using engines with hoselays on roadways and/or hand crews.
- Under no circumstances should water be drafted or dipped for firefighting purposes from Devils Hole.
- Under no circumstances should foam or retardant be used in this FMU due to the potential for chemical contamination of Devils Hole.
- Water drafted or dipped from other natural sites should not be discharged into or adjacent to Devils Hole due to the potential for biological contamination of this critical habitat.

f) Fire Management strategies in Devils Hole Fire Management Unit.

Suppression: 40 acres will be managed for full suppression.

Fire Use: There are no acres to be managed for fire use.

Mechanical Fuel Reduction: There are no mechanical fuel reduction projects identified for Devils Hole.

Restoration and Rehabilitation: The primary issue regarding any restoration or rehabilitation response at Devils Hole is the protection of the endangered Devils Hole pupfish and their habitat as well as other listed species.

III.D.2. Eureka Valley Fire Management Unit

a) Physical characteristics of Eureka Valley Fire Management Unit

Table 4. Summary of Eureka Valley FMU

Total size	708,600 acres
Wilderness	670,300 acres
Suppression	38,300 acres
Fire Use	670,300 acres
Elevational Range	1070 to 8455 feet above sea level
Burnable Vegetation	156,000 acres
Fire Regime based on Vegetation Communities (Taken from Thomas et al. 2004, but does not include classification of western or northern edges)	140 acres non-fuel: human development or land use 17,500 acres non-fuel: barren or very sparsely vegetated 411,200 acres low elevation desert shrublands 147,700 acres middle elevation desert shrublands and woodland 76,700 acres high elevation desert shrublands and woodland

The Eureka Valley FMU is 708,600 acres (Table 4, Figure 6) and covers the entire north end of Death Valley National Park. The west, north, and east boundaries of the FMU are coincident with the Park boundary. The eastern edge of the southern boundary is defined by the Scotty's Castle Road (Inyo County's Bonnie Claire Road). The remaining portion of the southern boundary follows the Ubehebe Crater road to the gravel, high clearance Racetrack Road, then south along that road through the Racetrack Valley. It continues westerly along the 4x4 Lippincott Road to the gravel Saline Valley road, and then follows that road northwest to the park boundary.

The Eureka Valley FMU includes 670,300 acres of wilderness. It is bisected north-south by the Last Chance Range, a rugged mountain range that supports a variety of vegetation communities. On the west side of the Last Chance Range, lies the Eureka Valley and the Saline Valley. The Eureka Valley includes the Eureka Dunes, which are the highest dunes in California and the second highest in North America. On the east side of the Last Chance Range lays the northern reach of Death Valley. The extreme western margin of the FMU includes the edge of the Inyo Mountains. Other smaller named ranges and valleys are interspersed within this north-south trending series of basins and ranges. Elevation in this FMU ranges from 1070 feet above sea level in the south end of Saline Valley to 8455 feet at Last Chance Mountain in the northern most area of the FMU.

A large area of non-Park land is located in the north central portion of this FMU, directly south of Last Chance Mountain. This area includes a portion of the paved and gravel Big Pine / Death Valley Road, and an old sulfur mining site and the land surrounding it that is administered by the Bureau of Land Management.

The Eureka Valley FMU is contiguous with Inyo National Forest (CA) and Bureau of Land Management Ridgecrest Field Office (CA) on the west side, and the Bureau of Land Management Bishop Field Office (CA) on the north side, and the Bureau of Land Management Tonopah Field Office (NV) on the east side.

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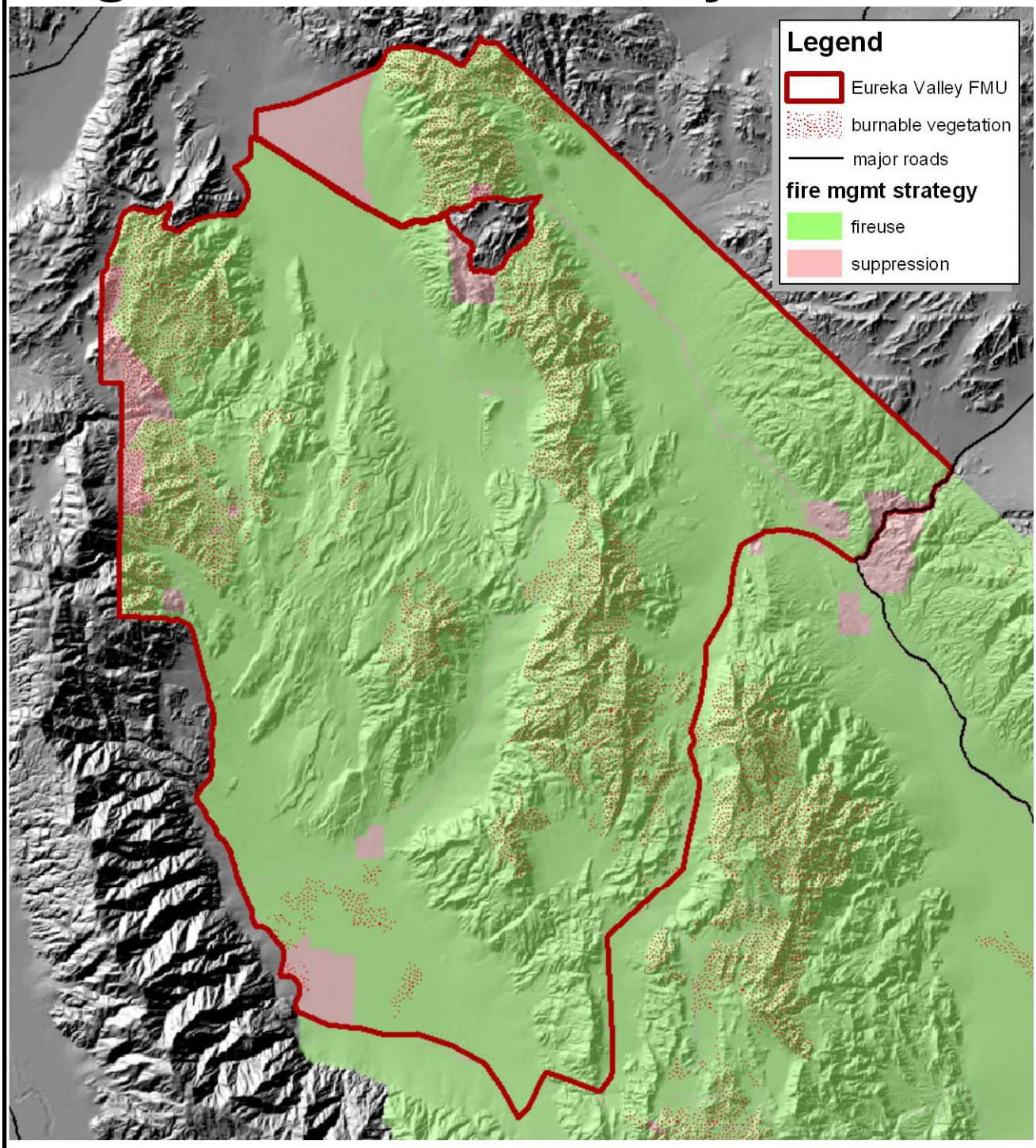
Figure 6: Eureka Valley FMU



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May 2005

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b) Historic role of fire in Eureka Valley Fire Management Unit

As much of the land within this FMU was only added to Death Valley National Park with the passage of the California Desert Protection Act in 1994, the records of fire occurrence are incomplete.

The Eureka Valley FMU includes approximately 156,000 acres of burnable vegetation. These burnable acres are concentrated in the Last Chance Range and Inyo Mountains. The highest elevations include significant expanses of pinyon woodlands and big sagebrush woodlands. The mountain slopes support desert shrublands of blackbrush, shadscale, or hopsage. In some areas Joshua trees are interspersed in other shrublands and in a few areas a true Joshua tree woodland exists. The southern end of the Saline Valley includes mesquite bosque. The Scottys Castle developed area also includes some burnable vegetation including both natural vegetation communities associated with the springs as well as planted cultural landscape elements.

While there is much that is not known about natural fire regimes of desert vegetation communities, fire certainly is part of the natural ecology of at least some communities. Brooks and Minnich (2006) have recently characterized historic fire regimes of the California desert. The historic fire regime of pinyon woodlands was likely characterized by relatively large, patchy to complete, moderate intensity surface to crown fires, and a long fire return interval. Fires in sagebrush woodlands are patchy to complete, moderate intensity passive crown to crown fires, depending on the continuity of the woody shrub fuels. At the interface between sagebrush and pinyon woodlands a surface to passive crown fire regime is the norm as fire spreads through woody and herbaceous surface fuels and occasionally torches individual trees. Most fires in these communities are stand-replacing events where most of the individual plants die and recovery takes decades. Joshua tree woodland and blackbrush shrublands have high fuel continuity. The historic fire regime was likely characterized by relatively moderate to large sized, patchy to complete, moderate intensity, surface to crown fires, and a long fire return interval. The heavy fuel load and high fuel continuity of mesquite bosques result in high intensity crown fires with limited capacity to spread due to the sparse desert fuels surrounding the bosques.

c) Wildland fire management situation in Eureka Valley Fire Management Unit

1) Historical weather analysis:

Most precipitation in Death Valley National Park comes in late winter and early spring, occurring as rain in the lower elevation and snow in the higher elevations. Summer precipitation occurs primarily as localized and generally heavy thunderstorms. It usually occurs in the afternoon and evening after diurnal heating of the land sets up convection type air movements. These storms move fast; the period of rainfall is of short duration and is accompanied by high winds, thunder and lightning. Usually these storms begin by the beginning of July under a mon-soon type pattern that persists until the end of September.

Two weather stations are most relevant to the Eureka Valley FMU: 1) the manual station at Scottys Castle is in desert scrub at 3280 feet in elevation, and 2) the Oak Creek RAWS maintained by Inyo National Forest which lies outside the Park at 4855 feet in elevation in sagebrush woodland.

2) Fire Season:

Lower elevation vegetation communities can and do burn at any time of year, although fire is unlikely to carry at any time due to the widely spaced fuels. Mesquite bosques can likewise burn at any time of year, but are most likely to burn during the hot dry winds of late summer. The Joshua tree woodland and blackbrush shrublands can generally carry fire after the spring annual vegetation cures, generally early May through September. The sagebrush woodland and pinyon woodlands can carry fire after winter snow is gone, generally mid-May through September although it may vary significantly based on annual snowfall patterns.

3) Fuel characteristics in relation to fire behavior:

Brooks and Minnich (2006) characterized fuel conditions in relation to fire behavior for California desert fuels. Fire spread can occur most any time of year in sagebrush steppe, although it is more likely when live fuel moisture is low during prolonged drought or fine fuel loads are high following winter moisture, or during periods of high winds and low relative humidity. Fire spread in pinyon woodlands is most probable when live fuel moisture and relative humidity are low and winds are high. Under extreme burning conditions characterized by high wind and low relative humidity, both communities may experience high intensity crown fires with rapid rates of spread. Joshua tree woodland and blackbrush shrublands can carry fire in any year, but fire frequency and size may be increased by abundant winter moisture which serves to increase the fine fuel load between the shrubs. The high flammability of blackbrush allows most fires to crown in this community.

Mesquite bosques grow in wet areas and thus are less influenced by live fuel moisture than by weather. Observations indicate that high winds and low relative humidity allow fire to carry through this community aided by the thick accumulations of duff between plants and tightly spaced crowns.

4) Fire regime alteration:

Where cheatgrass (*Bromus tectorum*) is established in sagebrush, it serves to carry fire along the surface between widely spaced shrub crowns. This can greatly increase fire size, changing a single shrub torching to a spreading fire. The influence of cheatgrass is less pronounced in closed canopy sagebrush where the canopy itself carries the fire. In pinyon woodlands, cheatgrass has a limited influence due to the self-pruning of the trees; however, on steep slopes it can

serve as a ladder fuel carrying surface fire into the crown. As pinyon has thin bark, individual trees might be killed by burning cheatgrass around their bases even if the fire does not reach the crown.

Where red brome (*Bromus madritensis* ssp. *rubens*) has invaded, it can increase fuel continuity within the Joshua tree woodlands and blackbrush shrublands. Its effect is most pronounced in years of abundant winter moisture and in the lower elevational zones of these communities where the native fine fuels tend to be widely spaced.

Where saltcedar (*Tamarix* spp.) has invaded mesquite bosques, they can greatly increase the flammability of the site and will readily re-invade after fire. However, prescribed fire can be used to force saltcedar to re-sprout and herbicide can then be used for effective control.

5) Control Problems:

Fires are most likely to be caused by lightning strikes in the high mountain areas or from human ignitions in and around developed sites. Most fires are wind driven events of short duration that can generate very high rates of spread (over 100 chains per hour), flame lengths that exceed 15-30 feet with spotting distances in excess of one mile ahead of the fire on relatively flat ground. Terrain in much of this FMU is rugged and inaccessible by vehicle, and in some cases on foot, resulting in delayed detection and long response times. The Park has few suppression resources and firefighters available in-house. The closest staffed engines are over an hour and a half away from the central section of the Park. The closest Helitack resource has a 40-minute response to the same area of the Park.

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

The southeastern corner of the Eureka Valley FMU includes the Death Valley Scotty Historic District, a listed historic property in the National Register of Historic Places. This site has been developed for substantial visitor and administrative use, including a visitor center operation, concessions operation, employee offices, and employee housing. The District also includes Lower Vine Ranch, which has numerous historic structures but is not open to the public. There are significant fuels, including cultural landscape elements, around both Lower Vine Ranch and Scottys Castle that could carry fire.

The western portion of the Eureka Valley FMU includes the Saline Valley, an area of concentrated visitor use associated with the natural hot springs. There is a continuous human presence in this area resulting in a variety of ad-hoc improvements and developments. There are significant fuels in this area that have been known to carry human-caused fires in the past.

There are no active grazing allotments in this FMU, although the Hunter Mountain Allotment is located immediately south of this FMU in the Hunter Mountain FMU. The allotment boundary is contiguous with the FMU boundary; however, there is potential for cattle to stray into the Eureka Valley FMU.

There are a number of rare species in this FMU, particularly in the Eureka Dunes. While the dunes are not burnable and these species are not at risk from fire, any off-road travel for fire response in and around the Eureka Dunes area should be avoided to the extent possible. There are a few special status species known to occur in the burnable areas of this FMU, although survey is incomplete. The Resource Advisor Guide (Appendix B) includes species specific lists and information. A brief summary is provided here in Table 5.

Table 5. Special status resources in the Eureka Valley FMU.

Burnable Area	Vertebrate Animals	Vascular Plants	Cultural Resources
Inyo Mountains	3 bird species	None	2 historical 1 unknown
Last Chance Range North	2 bird species	27 species	1 historical 1 unknown
Last Chance Range South	2 bird species	21 species	1 unknown
Saline Valley	9 bird species 1 bat species	10 species	1 archaeological
Scottys	9 bird species 1 bat species	4 species	1 historical 1 ethnographic 1 ethno/hist/arch 1 prehistoric

d) Fire management objectives for Eureka Valley Fire Management Unit.

- In the Death Valley Scotty Historic District, implement full suppression with a control strategy.
- In areas to be managed for suppression, contain fires to less than 10 acres.
- Monitor lightning-caused fires in the fire use zones and manage fires for resource benefits where there is minimal risk to other values.
- Record and document fire behavior, fire effects, burn severity, and post-fire succession when possible.
- As needed, conduct hazard fuel reduction around Park owned structures while preserving cultural landscape elements.

e) Management considerations to operational implementation in Eureka Valley Fire Management Unit.

- Avoid suppression impacts to special status plant and animal species. Of particular concern is the endangered least Bell's vireo which is known to use riparian woodlands in this FMU.

- Protect identified cultural resources from both fire and fire suppression impacts. Avoid using fire retardant and avoid direct bucket drops over specific cultural resource sites as identified by the resource advisor.

- Retardant and foam use should be avoided in water collection areas, including Palm Spring and Lower Warm Spring in the Saline Valley and Steininger Spring in the Scottys Castle area.

- Communicate with Park Rangers regarding fires that could potentially threaten the Scottys Castle area or Saline Valley hot springs areas so that they can coordinate timely evacuations from these sites.

- Safety issue: There are numerous old mines in this FMU which may include such hazards as open shafts and adits as well as unstable explosives.

f) Fire Management strategies in Eureka Valley Fire Management Unit.

Suppression: 38,300 acres will be managed for full suppression. These acres are in developed areas and./or contain historic resources. There are no wilderness acres in this FMU that will be managed for suppression.

Fire Use: 670,300 acres will be managed for fire use. These acres are in wilderness in remote locations where suppression action is not practical and there are no structures or known resources at risk from fire. There are many plant communities that will benefit from natural fire, namely pinyon woodland and sagebrush woodland. However, local cultural or natural resources may exist and a resource advisor should be consulted before an ignition is managed for fire use.

Mechanical Fuel Reduction: Death Valley Scotty Historic District presents many issues that should be addressed in a site specific fire protection plan for that District. Such a plan should include treatments at Scottys Castle and Lower Vine Ranch to remove hazardous fuels that could result in direct flame impingement of buildings or other cultural properties. As needed, fuel may be cleared around the water collection gallery as well. All mechanical fuel reduction in this area must be coordinated with cultural resource management staff to protect cultural landscape elements, and natural resource staff to protect natural elements, especially habitat for Least Bell's Vireo.

Restoration and Rehabilitation: Burned area emergency response should focus on post-fire watershed effects on water collection areas due to their importance to human use of

Saline Valley and Scottys Castle areas. Suppression rehab should focus on evaluation of impacts to special status resources. Emergency stabilization efforts should include consideration of the numerous mine shafts, adits, and structures that may represent both historic resources as well as safety hazards.

III.D.3. Hunter Mountain Fire Management Unit

a) Physical characteristics of Hunter Mountain Fire Management Unit

Table 6. Summary of Hunter Mountain FMU

Total size	557,600 acres
Wilderness	537,800 acres
Suppression	19,800 acres
Fire Use	537,800 acres
Elevational Range	70 to 8950 feet above sea level
Burnable Vegetation	140,700 acres
Fire Regime based on Vegetation Communities (Taken from Thomas et al. 2004)	6 acres non-fuel: human development or land use 13,000 acres non-fuel: barren or very sparsely vegetated 337,600 acres low elevation desert shrublands 130,400 acres middle elevation desert shrublands and woodland 76,600 acres high elevation desert shrublands and woodland

The Hunter Mountain FMU is 557,600 acres (Table 6, Figure 7) and covers the northwest area of Death Valley National Park. The western boundary of the FMU is coincident with the Park boundary. The northern boundary follows the Ubehebe Crater road to the gravel, high clearance Racetrack road then south along that road through the Racetrack Valley. It continues westerly along the 4x4 Lippincott Road to the Saline Valley gravel road, and then follows that road northwest to the park boundary. It then follows the park boundary south to CA State Highway 190. The eastern boundary is defined by the Scotty's Castle Road (Inyo County's Bonnie Claire Road), then across from Red Wall Canyon it follows a historic road (now closed) southwest, then south to the Cottonwood Canyon road, then southeasterly on that road to CA State Highway 190 at Stovepipe Wells. The southern boundary is defined by CA State Highway 190.

The Hunter Mountain FMU includes 537,800 acres of wilderness. It is bisected north-south by the Cottonwood Mountains, a part of the Panamint Range. On the west side of the Cottonwood Mountains, lies the southern end of the Saline Valley separated by a low pass from the Panamint Springs Valley. On the east side of the Cottonwood Mountains lays Death Valley. The extreme western margin of the FMU includes the Nelson Range and the Darwin Plateau. Elevation in this FMU ranges from 70 feet above sea level along the margin of Death Valley in the eastern edge of the FMU to 8950 feet at Tin Mountain in the Cottonwood Mountains in the northern most area of the FMU. Another noteworthy feature of this FMU is Hunter Mountain, a broad, heavily vegetated mountain at an elevation of 7454 feet located in the south-central portion of the FMU.

This FMU surrounds Panamint Springs, a small private inholding that includes a year-round commercial and residential development along Highway 190.

The Hunter Mountain FMU is contiguous with Bureau of Land Management Ridgecrest Field Office (CA) on the west side. All other boundaries of this FMU are inside the Park.

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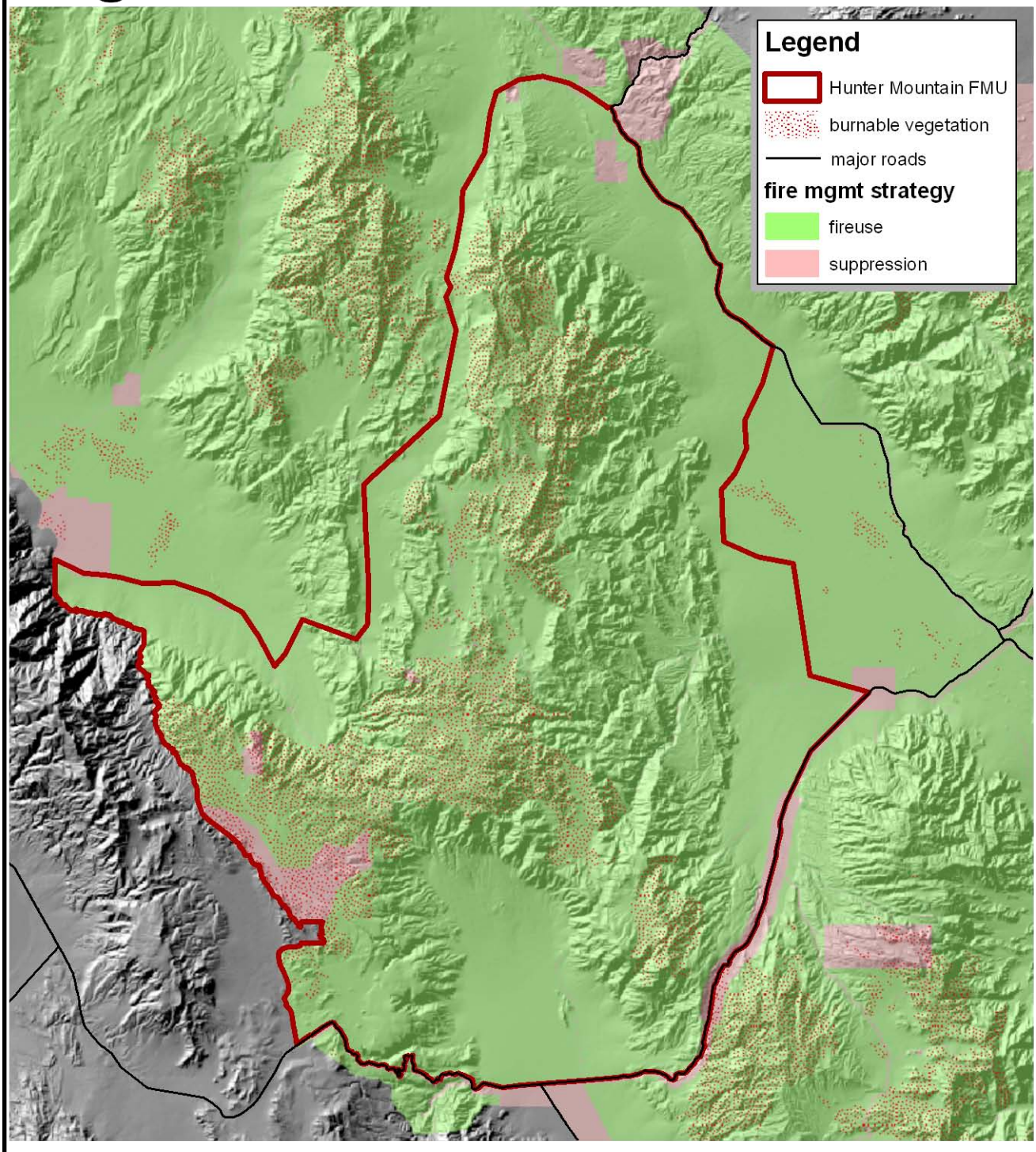
Figure 7: Hunter Mountain FMU



Produced by S. Dingman, NPS Biologist

May 2005

FILE: F:/DEVA/GIS/analyses/figures/fig 7 Hunter Mountain FMU.mxd

b) Historic role of fire in Hunter Mountain Fire Management Unit

Fire history analysis indicates that the Hunter Mountain FMU has supported seven relatively large fires in recent years: the 181 acre Sandy Fire in Lemoigne Canyon in 1983 which burned in Joshua tree woodland; the 600 acre Butte Fire in 1984 which burned in Joshua tree woodland with a significant Nevada joint-fir component; the 6000 acre Saline Fire in 1984 which burned in pinyon-juniper woodland and bitterbrush community; the 833 acre White Horse Fire in Lemoigne Canyon in 1984 which burned in Joshua tree woodland; the 1987 Saline 2 Fire which burned 400 acres of an undisclosed fuel type; the 140 acre Hunter Fire in 1990 which burned in pinyon woodland, and the 2006 Saline Fire which burned 70 acres in Joshua tree woodland and pinyon-juniper woodland.

The Hunter Mountain FMU includes approximately 140,700 acres of burnable vegetation. These burnable acres are concentrated in the following areas: Hunter Mountain, northern Cottonwood Mountains, Nelson Range, Lee Flat, and Darwin Plateau. The highest elevations include significant expanses of pinyon-juniper woodlands interspersed with monotypic stands of either pinyon or juniper. There are also large expanses of big sagebrush woodlands. The mountain slopes support desert shrublands of blackbrush, shadscale, or hopsage. In some areas true Joshua tree woodland exists. Fuels in developed areas consist primarily of planted species.

While there is much that is not known about natural fire regimes of desert vegetation communities, fire certainly is part of the natural ecology of at least some communities. Brooks and Minnich (2006) have recently characterized historic fire regimes of the California desert. The historic fire regime of pinyon juniper woodlands was likely characterized by relatively large, patchy to complete, moderate intensity surface to crown fires, and a long fire return interval. Fires in sagebrush woodlands are patchy to complete, moderate intensity passive crown to crown fires, depending on the continuity of the woody shrub fuels. At the interface between sagebrush and pinyon woodlands a surface to passive crown fire regime is the norm as fire spreads through woody and herbaceous surface fuels and occasionally torches individual trees. Most fires in these communities are stand-replacing events where most of the individual plants die and recovery takes decades. Joshua tree woodland and blackbrush shrubland have high fuel continuity. The historic fire regime was likely characterized by relatively moderate to large sized, patchy to complete, moderate intensity, surface to crown fires, and a long fire return interval.

Anecdotal evidence suggests that fire is a frequent occurrence in this area of the Park. The California Desert Plan Staff conducted an interview with the present permittee using the Hunter Mountain Allotment, Mr. Roy Hunter, in 1978. At the time of the interview, Mr. Hunter commented that a large fire occurred on the top of Hunter Mountain in the 1880s and that the effects were noticeable in many areas until the 1940s. The area around Spanish Spring showed the most evidence of fire and the Inyo Mountains have had many lightning caused fires, far too many for him to pinpoint.

Historically, fires were intentionally set by the Timbisha Shoshone to promote the growth of vegetation or as a technique for the capture of game (Fowler et al. 1995). Ethnographic data suggests that fires were intentionally set in the Hunter Mountain area specifically to promote the growth of tobacco (*Nicotiana attenuate*).

c) Wildland fire management situation in Hunter Mountain Fire Management Unit

1) Historical weather analysis:

Most precipitation in Death Valley National Park comes in late winter and early spring, occurring as rain in the lower elevation and snow in the higher elevations. Summer precipitation occurs primarily as localized and generally heavy thunderstorms. It usually occurs in the afternoon and evening after diurnal heating of the land sets up convection type air movements. These storms move fast; the period of rainfall is of short duration and is accompanied by high winds, thunder and lightning. Usually these storms begin by the beginning of July under a monsoon type pattern that persists until the end of September.

Two weather stations are most relevant to the Hunter Mountain FMU: 1) the Hunter Mountain RAWS maintained by NPS at 6880 feet in elevation in pinyon-juniper woodland with sagebrush and 2) the NOAA automated station at Stovepipe Wells (http://www.ncdc.noaa.gov/crn/hourly?stidx=1105) which sets at sea level in creosote bush shrublands. The manual station at Stovepipe Wells is no longer in operation; however, its past records are in Cow Creek curatorial storage.

2) Fire Season:

Lower elevation vegetation communities can and do burn at any time of year, although fire is unlikely to carry at any time due to the widely spaced fuels. The Joshua tree woodland and blackbrush shrublands can generally carry fire after the spring annual vegetation cures, generally early May through September. The sagebrush woodland and pinyon woodlands can carry fire after winter snow is gone, generally mid-May through September although it may vary significantly based on annual snowfall patterns.

3) Fuel characteristics in relation to fire behavior:

Brooks and Minnich (2006) characterized fuel conditions in relation to fire behavior for California desert fuels. Fire spread can occur most any time of year in sagebrush steppe, although it is more likely when live fuel moisture is low during prolonged drought or fine fuel loads are high following winter moisture, or during periods of high winds and low relative humidity. Fire spread in pinyon-juniper woodlands is most probable when live fuel moisture and relative humidity are low and winds are high. Under extreme burning conditions characterized by

high wind and low relative humidity, both communities may experience high intensity crown fires with rapid rates of spread. Joshua tree woodland and blackbrush shrublands can carry fire in any year, but fire frequency and size may be increased by abundant winter moisture which serves to increase the fine fuel load between the shrubs. The high flammability of blackbrush allows most fires to crown in this community.

4) Fire regime alteration:

Where cheatgrass (*Bromus tectorum*) is established in sagebrush, it serves to carry fire along the surface between widely spaced shrub crowns. This can greatly increase fire size, changing a single shrub torching to a spreading fire. The influence of cheatgrass is less pronounced in closed canopy sagebrush where the canopy itself carries the fire. In pinyon woodlands, cheatgrass has a limited influence due to the self-pruning of the trees; however, on steep slopes or where juniper is common it can serve as a ladder fuel carrying surface fire into the crown. As pinyon has thin bark, individual trees might be killed by burning cheatgrass around their bases even if the fire does not reach the crown.

Where red brome (*Bromus madritensis* ssp. *rubens*) has invaded, it can increase fuel continuity within the Joshua tree woodlands and blackbrush shrublands. Its effect is most pronounced in years of abundant winter moisture and in the lower elevational zones of these communities where the native fine fuels tend to be widely spaced.

5) Control Problems:

Fires are most likely to be caused by lightning strikes in the high mountain areas or from human ignitions in and around developed sites. Most fires are wind driven events of short duration that can generate very high rates of spread (over 100 chains per hour), flame lengths that exceed 15-30 feet with spotting distances in excess of one mile ahead of the fire on relatively flat ground. Terrain in much of this FMU is rugged and inaccessible by vehicle, and in some cases on foot, resulting in delayed detection and long response times. The Park has few suppression resources and firefighters available in-house. The closest staffed engines are over an hour and a half away from the central section of the Park. The closest Helitack resource is the U.S. Forest Service in Bishop, CA and has a 40-minute response to the same area of the Park.

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

The private inholding at Panamint Springs contains residential as well as commercial developments, including a campground, motel, and restaurant. Natural fuels surrounding the property are sparse creosote bush shrublands.

The southern edge of the FMU along State Highway 190 includes Emigrant Campground, a small roadside NPS campground with sparse desert shrubs. Near the campground are the historic ranger station and restroom facility, both constructed by the Civilian Conservation Corps and featuring significant stone work.

The northeastern corner of the FMU includes the Mesquite Springs Campground on a short spur road off the Scotty's Castle Road (Inyo County's Bonnie Claire Road); it sits in a mesquite bosque capable of carrying fire.

The Park's only active grazing allotment is the 86,400-acre Hunter Mountain Allotment located in this FMU. The season of use is November 20 to June 30. The allotment is limited to having no more than 150 head of cattle for an entire season.

There are a number of rare species and known cultural resources in this FMU. There are a few special status species known to occur in the burnable areas of this FMU, although survey is incomplete. The Resource Advisor Guide (Appendix B) includes species specific lists and information. A brief summary is provided here in Table 7.

Table 7. Special status resources in the Hunter Mountain FMU.

Burnable Area	Vertebrate Animals	Vascular Plants	Cultural Resources
Cottonwood Mountains	1 bird species	26 species	1 unidentified
Panamint Range North	18 birds species 3 bats species 2 reptile species	56 species	1 prehistoric 2 historical 1 unidentified 1 ethnographic 1 ethno/historical

d) Fire management objectives for Hunter Mountain Fire Management Unit.

- In Emigrant Campground and Mesquite Springs Campground, and in areas surrounding Panamint Springs Resort, implement full suppression with a control strategy.
- In areas to be managed for suppression, contain fires to less than 10 acres.
- Monitor lightning-caused fires in the fire use zones and manage fires for resource benefits where there is minimal risk to other values.
- Record and document fire behavior, fire effects, burn severity, and post-fire succession when possible.
- As needed, conduct hazard fuel reduction around Park owned structures while preserving cultural landscape elements.

e) Management considerations to operational implementation in Hunter Mountain Fire Management Unit.

- Avoid suppression impacts to special status plant and animal species.

- Protect identified cultural resources from both fire and fire suppression impacts. Avoid using fire retardant and avoid direct bucket drops over specific cultural resource sites as identified by the resource advisor.

- Retardant and foam use should be avoided in water collection areas, including Darwin Wash for Panamint Springs, Emigrant Spring for Emigrant Campground, and Mesquite Spring for the Mesquite Spring Campground. Retardant use in other areas is limited to clear or fugitive products.

- Communicate with Park Rangers regarding fires that could potentially threaten the Panamint Springs, Emigrant Campground, or Mesquite Spring Campground areas so that they can coordinate timely evacuations from these sites.

- Safety issue: There are numerous old mines in this FMU which may include such hazards as open shafts and adits as well as unstable explosives.

f) Fire Management strategies in Hunter Mountain Fire Management Unit.

Suppression: 19,800 acres will be managed for full suppression. These acres include developed areas and historic resources. There are no acres of wilderness in this FMU that will be managed for suppression.

Fire Use: 537,800 acres will be managed for fire use. These acres are in wilderness and are in remote locations where suppression action is not practical and there are no structures or known resources at risk from fire. However, local cultural or natural resources may exist and a resource advisor should be consulted before an ignition is managed for fire use.

Mechanical Fuel Reduction: The campgrounds should be treated to remove branches that overhang fire pits.

Restoration and Rehabilitation: Burned area emergency response should focus on post-fire watershed effects on water collection areas due to their importance to human use of Panamint Springs and Emigrant Campground areas. Suppression rehab should focus on evaluation of impacts to special status resources. Emergency stabilization efforts should include consideration of the numerous mine shafts, adits, and structures that may represent both historic resources as well as safety hazards.

III.D.4. Panamint Range Fire Management Unit

a) Physical characteristics of Panamint Range Fire Management Unit

Table 8. Summary of Panamint Range FMU

Total size	893,400 acres (largest FMU in Death Valley National Park)
Wilderness	836,200 acres
Suppression	389,500 acres
Fire Use	503,900 acres
Elevational Range	217 feet below sea level to 11,049 feet above sea level
Burnable Vegetation	157,500 acres
Fire Regime based on Vegetation Communities (Taken from Thomas 2004)	600 acres non-fuel: human development or land use 19,100 acres non-fuel: barren or very sparsely vegetated 656,000 acres low elevation desert shrublands 133,400 acres middle elevation desert shrublands and woodland 80,100 acres high elevation desert shrublands and woodland 4200 acres desert montane forest

The Panamint Range FMU is 893,400 acres (Table 8, Figure 8) and covers the west central and southwest area of Death Valley National Park. The southern and western boundaries of the FMU are coincident with the Park boundary. The northern boundary is defined by California State Highway 190. The eastern boundary is defined by State Highway 267 then veers southwest along the maintained hiking trail that runs from Salt Creek along the west side of Cotton Ball Basin until it intersects with the West Side Road, then follows the West Side Road until it intersects with California State Highway 178 at Ashford Junction, then follows the 4x4 road south along the Amargosa River to the Parks southern boundary.

The Panamint Range FMU includes 836,200 acres of wilderness. It is bisected north-south by the main body of the Panamint Range. The west side of the Panamint Range has a gradual slope and the FMU terminates at the Park boundary within this mountain range. On the steep east face of the Panamint Range lies the margin of Death Valley. To the south of the Panamint Range lies the Owlshead Mountains. Elevation in this FMU ranges from 217 feet below sea level along the margin of Death Valley in the eastern edge of the FMU to 11,049 feet at Telescope Peak, the highest point in the Park, in the Panamint Range.

The Panamint Range FMU is contiguous with Bureau of Land Management Ridgecrest Field Office (CA) on the west side and almost contiguous with the China Lake Naval Weapons Center and Fort Irwin National Training Center (Army) on the south side, separated by a narrow strip of land managed by the Bureau of Land Management Barstow Field Office (CA). The north and east boundaries of this FMU are inside the Park.

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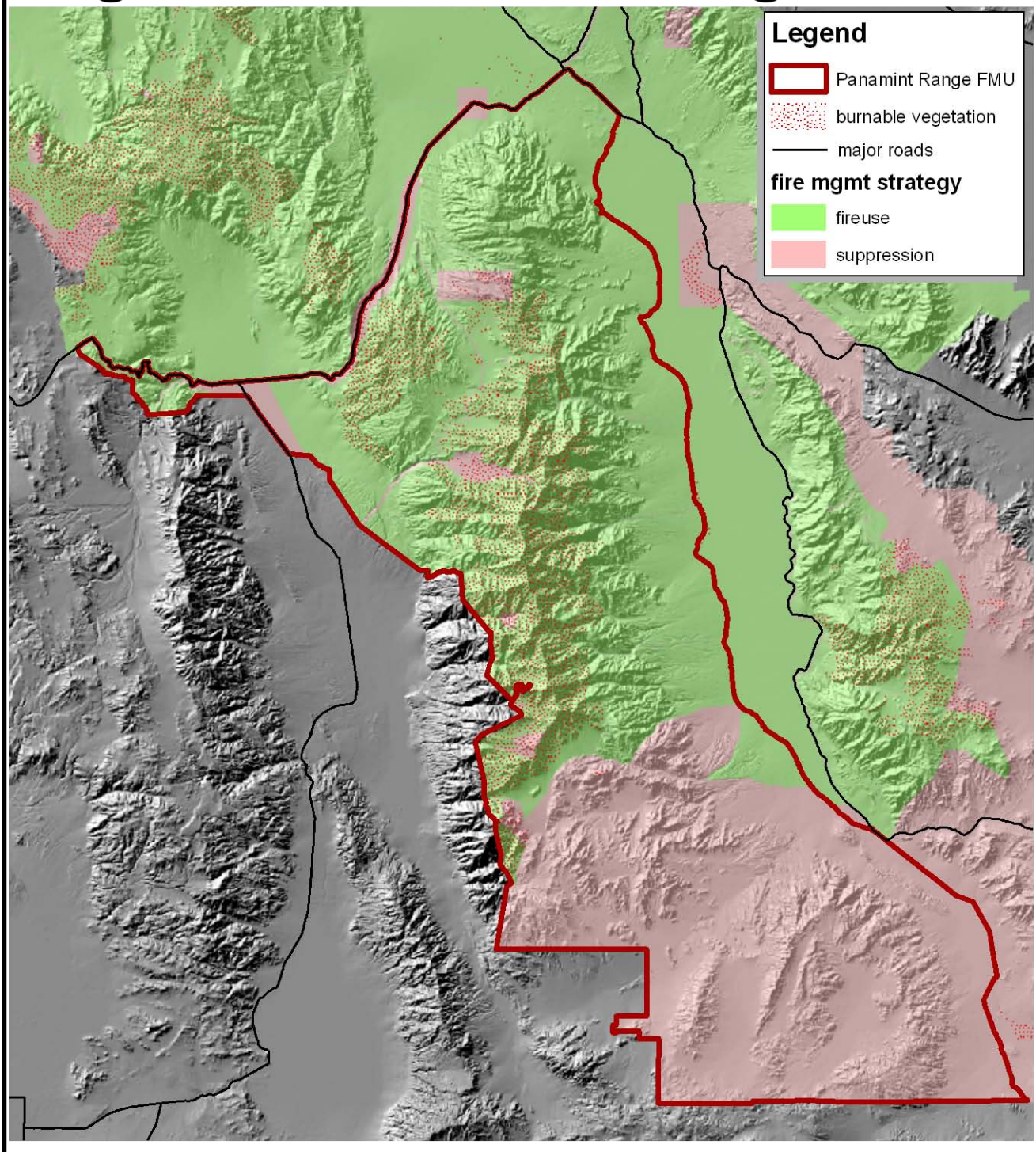
Figure 8: Panamint Range FMU



Produced by S. Dingman, NPS Biologist

May 2005

FILE: F:/DEVA/GIS/analyses/figures/fig 8 Panamint Range FMU.mxd

b) Historic role of fire in Panamint Range Fire Management Unit

Fire history analysis indicates that the Panamint Range FMU has supported two large fires. Started by people, the 5500 acre Happy Fire burned in sparse pinyon and juniper fuels in 2000. The 2039 acre Butte 2 fire was ignited by lightning and burned in blackbrush, Nevada joint-fir shrubland, and pinyon-juniper woodland. There have been over a dozen other smaller fires in the FMU, particularly in the Panamint Range north of Telescope Peak around the Thorndike and Wildrose Campgrounds.

The Panamint Range FMU includes approximately 157,500 acres of burnable vegetation. These burnable acres are concentrated in the Panamint Range which supports a continuous cover of burnable fuels. The highest elevations include desert montane forest of limber pine and bristlecone pine. The surrounding high elevation lands support continuous expanses of pinyon woodlands interspersed with pockets of juniper or pinyon-juniper woodland. There are a few pockets of big sagebrush woodlands, particularly in the north end of the FMU. The mountain slopes support continuous desert shrublands of blackbrush. In a few areas true Joshua tree woodland exists. The eastern edge of the FMU includes the mesquite bosques and wetlands that occur along the West Side Road.

While there is much that is not known about natural fire regimes of desert vegetation communities, fire certainly is part of the natural ecology of at least some communities. Brooks and Minnich (2006) have recently characterized historic fire regimes of the California desert. The historic fire regime of the limber pine and bristlecone pine forests was likely characterized by truncated small, patchy, variable intensity, passive crown fires, and a truncated long fire return interval. The historic fire regime of pinyon woodlands was likely characterized by relatively large, patchy to complete, moderate intensity surface to crown fires, and a long fire return interval. Fires in sagebrush woodlands are patchy to complete, moderate intensity passive crown to crown fires, depending on the continuity of the woody shrub fuels. At the interface between sagebrush and pinyon woodlands a surface to passive crown fire regime is the norm as fire spreads through woody and herbaceous surface fuels and occasionally torches individual trees. Most fires in these communities are stand-replacing events where most of the individual plants die and recovery takes decades. Joshua tree woodland and blackbrush shrublands have high fuel continuity. The historic fire regime was likely characterized by relatively moderate to large sized, patchy to complete, moderate intensity, surface to crown fires, and a long fire return interval. The heavy fuel load and high fuel continuity of mesquite bosques result in high intensity crown fires with limited capacity to spread due to the sparse desert fuels surrounding the bosques.

c) Wildland fire management situation in Panamint Range Fire Management Unit

1) Historical weather analysis:

Most precipitation in Death Valley National Park comes in late winter and early spring, occurring as rain in the lower elevation and snow in the higher elevations. Summer precipitation occurs primarily as localized and generally heavy thunderstorms. It usually occurs in the afternoon and evening after diurnal heating of the land sets up convection type air movements. These storms move fast; the period of rainfall is of short duration and is accompanied by high winds, thunder and lightning. Usually these storms begin by the beginning of July under a monsoon type pattern that persists until the end of September.

Two weather stations are most relevant to the Panamint Range FMU: 1) the Panamint RAWS maintained by BLM at 6880 feet in elevation in pinyon-juniper woodland and 2) the manual station at Wildrose Ranger Station at 4400 feet elevation in pinyon. This station is rarely staffed, so its records are exceedingly spotty. The NOAA station automated station at Stovepipe Wells (http://www.ncdc.noaa.gov/crn/hourly?stidx=1105) is also located in this FMU at sea level in sparse desert scrub, so it has limited applicability to the burnable vegetation in this FMU. The manual station at Stovepipe Wells is no longer in operation; however, its past records are in Cow Creek curatorial storage.

2) Fire Season:

Lower elevation vegetation communities can and do burn at any time of year, although fire is unlikely to carry at any time due to the widely spaced fuels. Mesquite bosques can likewise burn at any time of year but are most likely to burn during the hot dry winds of late summer. The Joshua tree woodland and blackbrush shrublands can generally carry fire after the spring annual vegetation cures, generally early May through September. The sagebrush woodland and pinyon woodlands can carry fire after winter snow is gone, generally mid-May through September although it may vary significantly based on annual snowfall patterns. The desert montane forest generally stays snowbound well into summer, thus limiting the fire season to only June through August.

3) Fuel characteristics in relation to fire behavior:

Brooks and Minnich (2006) characterized fuel conditions in relation to fire behavior for California desert fuels. Fuels in the desert montane forest are very discontinuous and fine fuel production in response to abundant rainfall adds very little to the fuel bed due to shallow soils, low temperatures, and a short growing season. As a result, surface fires are extremely rare. Most fires are single trees torching, although fire can carry in the crowns for short distances under extreme fire weather conditions. Fire spread can occur most any time of year in sagebrush

steppe, although it is more likely when live fuel moisture is low during prolonged drought or fine fuel loads are high following winter moisture, or during periods of high winds and low relative humidity. Fire spread in pinyon and pinyon-juniper woodlands is most probable when live fuel moisture and relative humidity are low and winds are high. Under extreme burning conditions characterized by high wind and low relative humidity, both communities may experience high intensity crown fires with rapid rates of spread. Joshua tree woodland and blackbrush shrublands can carry fire in any year, but fire frequency and size may be increased by abundant winter moisture which serves to increase the fine fuel load between the shrubs. The high flammability of blackbrush allows most fires to crown in this community.

Mesquite bosques grow in wet areas and thus are less influenced by live fuel moisture than by weather. Observations indicate that high winds and low relative humidity allow fire to carry through this community aided by the thick accumulations of duff between plants and tightly spaced crowns.

4) Fire regime alteration:

Due to the low productivity and short growing season of the desert montane forest, weeds are generally not an issue in this fuel type.

Where cheatgrass (*Bromus tectorum*) is established in sagebrush, it serves to carry fire along the surface between widely spaced shrub crowns. This can greatly increase fire size, changing a single shrub torching to a spreading fire. The influence of cheatgrass is less pronounced in closed canopy sagebrush where the canopy itself carries the fire. In pinyon woodlands, cheatgrass has a limited influence due to the self-pruning of the trees; however, on steep slopes or where juniper is common it can serve as a ladder fuel carrying surface fire into the crown. As pinyon has thin bark, individual trees might be killed by burning cheatgrass around their bases even if the fire does not reach the crown.

Where red brome (*Bromus madritensis* ssp. *rubens*) has invaded, it can increase fuel continuity within the Joshua tree woodlands and blackbrush shrublands. Its effect is most pronounced in years of abundant winter moisture and in the lower elevational zones of these communities where the native fine fuels tend to be widely spaced.

Where saltcedar (*Tamarix* spp.) has invaded mesquite bosques, they can greatly increase the flammability of the site and will readily re-invade after fire. However, prescribed fire can be used to force saltcedar to re-sprout and herbicide can then be used for effective control.

5) Control Problems:

Fires are most likely to be caused by lightning strikes in the high mountain areas or from human ignitions in and around developed sites. Most fires are wind driven events of short duration that can generate very high rates of spread (over 100 chains per hour), flame lengths that exceed 15-30 feet with spotting distances in excess of one mile ahead of the fire on relatively flat ground. Terrain in much of this FMU is rugged and inaccessible by vehicle, and in some cases on foot, resulting in delayed detection and long response times. The Park has few suppression resources and firefighters available in-house. The closest staffed engines are over an hour and a half away from the central section of the Park. The closest Helitack resource has a 40-minute response to the same area of the Park.

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

There are some patented mining claims, including some with improvements, that should be protected from fire. Most are located in canyons on the west side of the Panamint Range south of Telescope Peak.

The high elevations of the Panamint Range provide a popular respite from desert heat for many Park visitors, particularly during the peak summer months when fires are most probable. There are three NPS campgrounds along the road through Emigrant Pass toward Telescope Peak: Wildrose Campground (including a seasonal ranger station), Thorndike Campground, and Mahogany Flat Campground. In the vicinity of Wildrose Campground are several historic structures associated with the early administration of the Park as well as cultural landscapes. The road corridor between the campgrounds also contains numerous spur roads and trail heads that provide access to scenic vistas, historic sites, and hiking trails. There are many buildings, signs, and other NPS improvements in this area that should be protected from fire.

There are a number of rare species and cultural resources known to occur in the burnable areas of this FMU, although survey is incomplete. The special status species includes the occurrence of the federally listed threatened desert tortoise in the southern end of the FMU. There are also many cultural resources in this FMU that require special consideration. The Resource Advisor Guide (Appendix B) includes species specific lists and information. Table 9 is a summary. .

Table 9. Special status resources in the Panamint Range FMU.

Burnable Area	Vertebrate Animals	Vascular Plants	Cultural Resources
Panamint Range South	18 bird species 3 bat species 2 reptile species	56 species	14 historical 1 ethno/historical 1 ethnographic 1 unidentified
West Side Road	12 bird species	None	2 historical 1 ethnographic 1 unidentified

d) Fire management objectives for Panamint Range Fire Management Unit.

- In Thorndike and Mahogany Flat Campgrounds, and Wildrose implement full suppression with a control strategy.
- In areas to be managed for suppression, contain fires to less than 10 acres.
- Monitor lightning-caused fires in the fire use zones and manage fires for resource benefits where there is minimal risk to other values.
- Record and document fire behavior, fire effects, burn severity, and post-fire succession when possible.
- As needed, conduct hazard fuel reduction around Park owned structures while preserving cultural landscape elements.

e) Management considerations to operational implementation in Panamint Range Fire Management Unit.

- The northeastern edge of this FMU includes the Stovepipe Wells developed area which is where the Parks wildland fire engine is located. The development itself is not flammable as it is surrounded by very sparsely vegetated desert and dunes.
- Avoid suppression impacts to special status plant and animal species.
- In the southern end of the FMU, 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 (2001).
- Protect identified cultural resources from both fire and fire suppression impacts. Avoid using fire retardant and avoid direct bucket drops over specific cultural resource sites as identified by the resource advisor.
- Retardant and foam use should be avoided in water collection areas, including Wildrose Spring and Emigrant Spring.
- Communicate with Park Rangers regarding fires that could potentially threaten the travel corridor from Emigrant Pass to Telescope Peak so that they can coordinate timely evacuations from these sites. This corridor has a concentration of visitor destinations (campgrounds, trailheads, etc) and limited ingress/egress.
- Safety issue: There are numerous old mines in this FMU which may include such hazards as open shafts and adits as well as unstable explosives. Additionally,

unexploded ordinances associated with Fort Irwin military activities have been found in the park near its southern boundary.

f) Fire Management strategies in Panamint Range Fire Management Unit.

Suppression: 389,500 acres will be managed for full suppression, including developed areas, historic resources, and desert tortoise habitat. This includes 332,300 acres of wilderness that will be managed for suppression for the protection of desert tortoise habitat.

Fire Use: 503,900 will be managed for fire use. These acres are located in wilderness in remote locations where suppression action is not practical and there are no structures or known resources at risk from fire. These acres include many high elevation shrublands and woodland vegetation communities that could benefit from fire. However, local cultural or natural resources may exist and a resource advisor should be consulted before an ignition is managed for fire use.

Mechanical Fuel Reduction: The campgrounds should be treated to remove branches that overhang fire pits. Historical sites with structures should be treated to remove hazardous fuels that could result in direct flame impingement of buildings or other cultural properties. All mechanical fuel reduction in historical sites must be coordinated with cultural resource management staff to protect cultural landscape elements.

Restoration and Rehabilitation: Burned area emergency response should focus on post-fire watershed effects on the campgrounds and roads. Suppression rehab should focus on evaluation of impacts to special status resources. Emergency stabilization efforts should include consideration of the numerous mine shafts, adits, and structures that may represent both historic resources as well as safety hazards. For rehabilitation work in the southern end of this FMU, the U.S. Fish and Wildlife Service should be consulted regarding potential impacts to desert tortoise and 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.

III.D.5. Black Mountains Fire Management Unit

a) Physical characteristics of Black Mountains Fire Management Unit

Table 10. Summary of Black Mountains FMU

Total size	886,400 acres
Wilderness	776,900 acres
Suppression	394,400 acres
Fire Use	492,000 acres
Elevational Range	282 feet below sea level to 5033 feet above sea level
Burnable Vegetation	52,900 acres
Fire Regime based on Vegetation Communities (Taken from Thomas et al. 2004, but does not include classification of extreme northeast corner)	2100 acres non-fuel: human development or land use 69,600 acres non-fuel: barren or very sparsely vegetated 620,200 acres low elevation desert shrublands 192,000 acres middle elevation desert shrublands and woodland 1100 acres high elevation desert shrublands and woodland

The Black Mountains FMU is 886,400 acres (Table 10, Figure 9) and covers the east central and southeast area of Death Valley National Park. The southern and eastern boundaries of the FMU are coincident with the Park boundary. The northern boundary is defined by State Highway 374. The western boundary is defined by State Highway 190 then veers southwest along the maintained hiking trail that runs from Salt Creek along the west side of Cotton Ball Basin until it intersects with the West Side Road, then follows the West Side Road until it intersects with Highway 267 at Ashford Junction, then follows the 4x4 road south along the Amargosa River to the Parks southern boundary.

The Black Mountains FMU includes 776,900 acres of wilderness. It is bisected north-south by the Amargosa Range. The Black Mountains run north-south through the central and southern portions of the FMU. On the west side of the Black Mountains is the main body of Death Valley, including Badwater Basin. To the east of the Black Mountains lies the Greenwater Valley and east of that is the Greenwater Range. To the north of the Black Mountains is another member of the Amargosa Range, the northwest-southeast trending Funeral Mountains. Between the Black Mountains and the Funeral Mountains lies the Furnace Creek Wash and the Highway 190 corridor. Elevation in this FMU ranges from 282 feet below sea level at Badwater Basin (the lowest point in the United States) to 5033 feet above sea level at Winters Peak in the Funeral Mountains.

The Black Mountains FMU is contiguous with Bureau of Land Management Las Vegas Field Office (NV) on the east side and the Bureau of Land Management Barstow Field Office (CA) on the south side. The north and west boundaries of this FMU are inside the Park.

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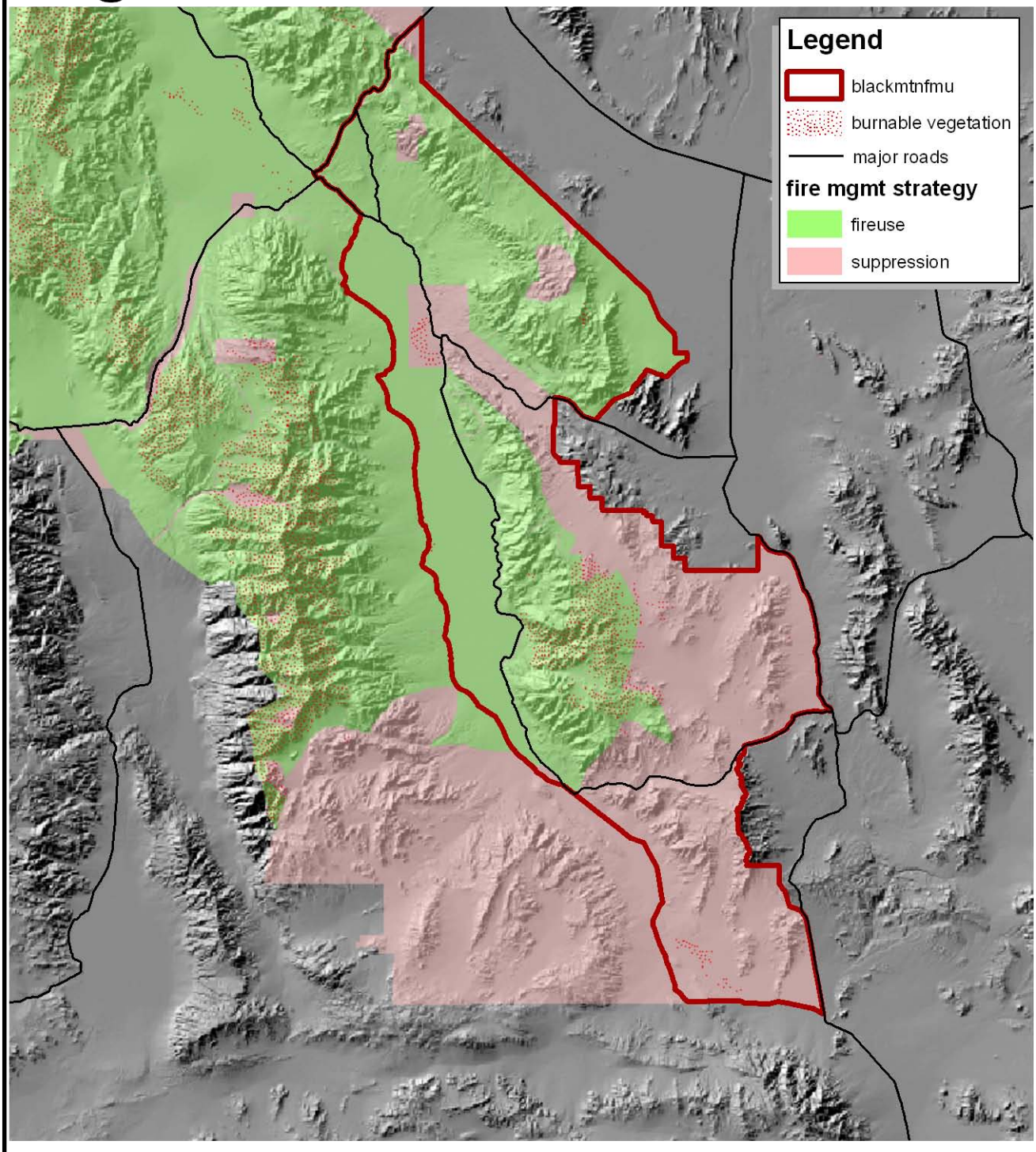
Figure 9: Black Mountains FMU



Produced by S. Dingman, NPS Biologist

May 2005

FILE: F:/DEVA/GIS/analyses/figures/fig 9 Black Mountains FMU.mxd

b) Historic role of fire in Black Mountains Fire Management Unit

Prior to 2006, fire history analysis indicates that the Black Mountains FMU had not supported any documented fires in the last 20 years. In July 2006, two large fires were started by lightning near the Calico Peaks in the Black Mountains just west of Greenwater Valley. The Gold Valley fire burned 480 acres of blackbrush shrubland and creosote bush shrubland. A few days later, the Calico Fire burned 9280 acres of blackbrush shrubland and creosote bush shrubland, making this the largest fire in the Park's history to date. The non-native red brome served as the primary carrier fuel in both of these fires.

The Black Mountains FMU includes approximately 52,900 acres of burnable vegetation. The largest concentration of burnable acres is in the Greenwater Valley and surrounding slopes which supports a fairly continuous cover of blackbrush shrublands. There are also a few very small pockets of sagebrush woodland along the eastern side of the Black Mountains and a few pockets of Joshua tree woodland in the Greenwater Range. There is a mesquite bosque at Saratoga Springs that is burnable. There are mesquite trees and various burnable landscape plants, particularly palms, in the Furnace Creek and Cow Creek developed areas.

While there is much that is not known about natural fire regimes of desert vegetation communities, fire certainly is part of the natural ecology of at least some communities. Brooks and Minnich (2006) have recently characterized historic fire regimes of the California desert. Joshua tree woodland and blackbrush shrublands have high fuel continuity. The historic fire regime was likely characterized by relatively moderate to large sized, patchy to complete, moderate intensity, surface to crown fires, and a long fire return interval. The heavy fuel load and high fuel continuity of mesquite bosques result in high intensity crown fires with limited capacity to spread due to the sparse desert fuels surrounding the bosques.

c) Wildland fire management situation in Black Mountains Fire Management Unit

1) Historical weather analysis:

Most precipitation in Death Valley National Park comes in late winter and early spring, occurring as rain in the lower elevation and snow in the higher elevations. Summer precipitation occurs primarily as localized and generally heavy thunderstorms. It usually occurs in the afternoon and evening after diurnal heating of the land sets up convection type air movements. These storms move fast; the period of rainfall is of short duration and is accompanied by high winds, thunder and lightning. Usually these storms begin by the beginning of July under a monsoon type pattern that persists until the end of September.

The only weather station in the Black Mountains FMU is the manual station at Furnace Creek at -190 feet in elevation, which is applicable to the mesquite bosques

but has limited applicability to the blackbrush shrublands in Greenwater Valley. Unfortunately there are no weather stations in or near this FMU, including those in Nevada, that are at similar elevation and fuels as the burnable areas in Greenwater Valley.

2) Fire Season:

Lower elevation vegetation communities can and do burn at any time of year, although fire is unlikely to carry at any time due to the widely spaced fuels. Mesquite bosques can likewise burn at any time of year but are most likely to burn during the hot dry winds of late summer. The Joshua tree woodland and blackbrush shrublands can generally carry fire after the spring annual vegetation cures, generally April through September in this FMU.

3) Fuel characteristics in relation to fire behavior:

Brooks and Minnich (2006) characterized fuel conditions in relation to fire behavior for California desert fuels. Joshua tree woodland and blackbrush shrublands can carry fire in any year, but fire frequency and size may be increased by abundant winter moisture which serves to increase the fine fuel load between the shrubs. The high flammability of blackbrush allows most fires to crown in this community.

Mesquite bosques grow in wet areas and thus are less influenced by live fuel moisture than by weather. Observations indicate that high winds and low relative humidity allow fire to carry through this community aided by the thick accumulations of duff between plants and tightly spaced crowns.

4) Fire regime alteration:

Where red brome (*Bromus madritensis* ssp. *rubens*) has invaded, it can increase fuel continuity within the Joshua tree woodlands and blackbrush shrublands. Its effect is most pronounced in years of abundant winter moisture and in the lower elevational zones of these communities where the native fine fuels tend to be widely spaced.

Where saltcedar (*Tamarix* spp.) has invaded mesquite bosques, they can greatly increase the flammability of the site and will readily re-invade after fire. However, prescribed fire can be used to force saltcedar to re-sprout and herbicide can then be used for effective control.

5) Control Problems:

Fires are most likely to be caused by lightning strikes in the high mountain areas or from human ignitions in and around developed sites. Most fires are wind driven events of short duration that can generate very high rates of spread (over 100

chains per hour), flame lengths that exceed 15-30 feet with spotting distances in excess of one mile ahead of the fire on relatively flat ground. Terrain in much of this FMU is rugged and inaccessible by vehicle, and in some cases on foot, resulting in delayed detection and long response times. The Park has few suppression resources and firefighters available in-house. The closest staffed engines are over an hour and a half away from the central section of the Park. The closest Helitack resource has a 40-minute response to the same area of the Park.

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

This FMU includes the Park's primary developed area at Furnace Creek which includes campgrounds, headquarters offices, and visitor center. There is also private land within the Furnace Creek developed area that supports various commercial developments such as hotels and restaurants. The Cow Creek developed area is located four miles north of Furnace Creek and includes NPS offices and maintenance facilities as well as the Park's main employee housing area. The Timbisha residential community is located immediately south of Furnace Creek. Combined these areas compose the largest concentration of commercial and residential activity in the Park.

There are a number of rare species and cultural resources known to occur in the burnable areas of this FMU, although survey is incomplete. The special status species includes the occurrence of the federally listed threatened desert tortoise in the Greenwater Valley burnable area and the state-listed Saratoga Springs pupfish in the Saratoga Springs burnable area. There are also many cultural resources in this FMU that require special consideration. The Resource Advisor Guide (Appendix B) includes species specific lists and information. A brief summary is provided here in Table 11.

Table 11. Special status resources in the Black Mountains FMU.

Burnable Area	Vertebrate Animals	Vascular Plants	Cultural Resources
Furnace Creek	23 bird species 1 bat species 1 mammal species	4 species	1 prehistoric
Greenwater Valley	7 bird species 1 reptile species	2 species	3 historical 1 archaeological
Saratoga Springs	9 bird species 1 bat species 1 fish species	1 species	1 archaeological

d) Fire management objectives for Black Mountains Fire Management Unit.

- In the developed areas implement full suppression with a control strategy.
- In areas to be managed for suppression, contain fires to less than 10 acres.

- Monitor lightning-caused fires in the fire use zones and manage fires for resource benefits where there is minimal risk to other values.

- Record and document fire behavior, fire effects, burn severity, and post-fire succession when possible.

- As needed, conduct hazard fuel reduction around Park owned structures while preserving cultural landscape elements.

e) Management considerations to operational implementation in Black Mountains Fire Management Unit.

- The Park's fixed wing aircraft is stored at the Furnace Creek Airport in this FMU. Additionally, the Park's main fire cache is located at Cow Creek Administrative Area in this FMU.

- Avoid suppression impacts to special status plant and animal species.

- In the Greenwater Valley, 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.

- In the Greenwater Valley, protect historical resources and cultural landscapes associated with the historical mining town.

- Protect identified cultural resources from both fire and fire suppression impacts. Avoid using fire retardant and avoid direct bucket drops over specific cultural resource sites as identified by the resource advisor.

- Retardant and foam use should be avoided in developed areas as well as water collection areas, including Travertine Springs, Texas Springs, and Nevares Spring.

- Avoid retardant and foam use near any springs to avoid chemical contamination of habitat for rare and endemic fish populations. This is particularly a concern at Saratoga Springs as this location has both burnable vegetation as well as rare pupfish in the same area.

- Under no circumstances should water be drafted or dipped for firefighting purposes from Saratoga Springs, Amargosa River, Salt Creek, or Cottonball Marsh.

- Water drafted or dipped from other natural sites should not be discharged into or adjacent to any spring or creek due to the potential for biological contamination of this critical habitat.

- Communicate with Park Rangers regarding fires that could potentially threaten the developed area or inhibit travel along Highway 190 so that they can coordinate timely evacuation and/or direct traffic.

- Safety issue: There are numerous old mines in this FMU which may include such hazards as open shafts and adits as well as unstable explosives. Additionally, unexploded ordinances associated with Fort Irwin military activities have been found in the Park near the southern boundary.

f) Fire Management strategies in Black Mountains Fire Management Unit.

Suppression: 394,400 acres will be managed for full suppression, including developed areas, historic resources, and desert tortoise habitat. This includes 285,000 acres of wilderness that will be managed for suppression for the protection of desert tortoise habitat.

Fire Use: 492,000 will be managed for fire use. These acres are located in wilderness in remote locations where suppression action is not practical and there are no structures or known resources at risk from fire. However, local cultural or natural resources may exist and a resource advisor should be consulted before an ignition is managed for fire use.

Mechanical Fuel Reduction: The campgrounds should be treated to remove branches that overhang fire pits. Within the developed area hazardous fuels should be removed that could result in direct flame impingement of buildings or other cultural properties. All mechanical fuel reduction in the developed area must be coordinated with cultural resource management staff to protect cultural landscape elements.

Restoration and Rehabilitation: Burned area emergency response should focus on post-fire watershed effects on the desert springs and creeks as well as the developed areas and roads. Emergency stabilization efforts should include consideration of the numerous mine shafts, adits, and structures that may represent both historic resources as well as safety hazards. Suppression rehab should focus on evaluation of impacts to special status resources. For rehabilitation work in the Greenwater Valley, the U.S. Fish and Wildlife Service should be consulted regarding potential impacts to desert tortoise and 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.

III.D.6. Grapevine Mountains Fire Management Unit

a) Physical characteristics of Grapevine Mountains Fire Management Unit

Table 12 Summary of the Grapevine Mountains FMU

Total size	339,200 acres
Wilderness	269,300 acres
Suppression	69,900 acres
Fire Use	269,300 acres
Elevational Range	Sea level to 8736 feet above sea level
Burnable Vegetation	82,800 acres
Fire Regime based on Vegetation Communities (Taken from Thomas et al. 2004, but does not include classification of eastern corner in Nevada)	2 acres non-fuel: human development or land use 17,100 acres non-fuel: barren or very sparsely vegetated 170,700 acres low elevation desert shrublands 32,600 acres middle elevation desert shrublands and woodland 14,367 acres high elevation desert shrublands and woodland

The Grapevine Mountains FMU is 339,200 acres (Table 12, Figure 10) and covers the east central and northeast area of Death Valley National Park. The eastern boundary of the FMU is coincident with the Park boundary. The northern boundary is defined by the Scotty's Castle Road (Inyo County's Bonnie Claire Road). The western boundary is defined by the Scotty's Castle Road (Inyo County's Bonnie Claire Road), then across from Red Wall Canyon it follows a historic road (now closed) southwest, then south to the Cottonwood Canyon road, then southeasterly on that road to CA State Highway 190 at Stovepipe Wells. The southern boundary is defined by California State Highway 190, a very short segment of the Scotty's Castle Road (Inyo County's Bonnie Claire Road), and the Mud Canyon / Daylight Pass Road.

The Grapevine Mountains FMU includes 269,300 acres of wilderness. It is defined by the northwest-southeast trending Grapevine Mountains of the Amargosa Range that sit along the state line between California and Nevada. On the southwest side of the Grapevine Mountains is the Mesquite Flats area of Death Valley. To the northeast of the Grapevine Mountains lies the Sarcobatus Flat. Elevation in this FMU ranges from sea level near Stovepipe Wells to 8736 feet above sea level at Grapevine Peak in Nevada.

The Grapevine Mountains FMU is contiguous with Bureau of Land Management Tonopah Field Office (NV) on the east side. All other boundaries of this FMU are inside the Park.

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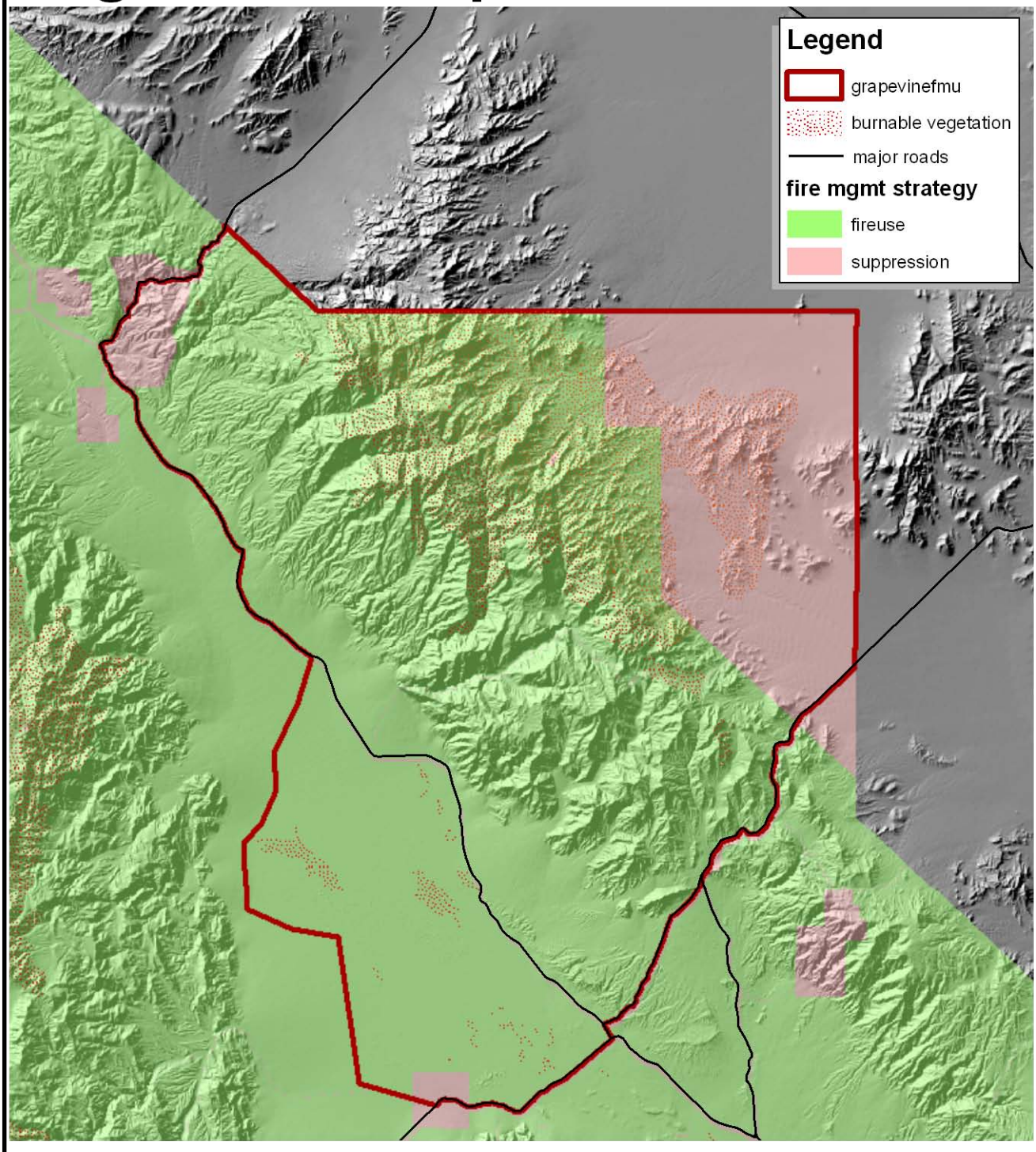
Figure 10: Grapevine Mtns FMU



Produced by S. Dingman, NPS Biologist

May 2005

FILE: F:/DEVA/GIS/analyses/figures/fig 10 Grapevine Mountains FMU.mxd

b) Historic role of fire in Grapevine Mountains Fire Management Unit

Two fires from the 1970's reported occurred near Scotty's Castle and Scotty's Ranch respectively, but information about these fires is very incomplete. In 1996 a five acre human caused fire occurred in the Grapevine Mountains, but the exact location is not known. In late July 2006, the Bullfrog Fire burned 3710 acres of creosote bush shrubland near Bullfrog Mountain.

The Grapevine Mountains FMU includes approximately 82,800 acres of burnable vegetation. These burnable acres are concentrated in the Grapevine Mountains and the Mesquite Flat. The highest elevations include significant expanses of pinyon-juniper woodlands with a few pockets of sagebrush woodlands. The mountain slopes support a fairly continuous cover of blackbrush. Mesquite Flats supports several disjunct mesquite bosques.

While there is much that is not known about natural fire regimes of desert vegetation communities, fire certainly is part of the natural ecology of at least some communities. Brooks and Minnich (2006) have recently characterized historic fire regimes of the California desert. The historic fire regime of pinyon-juniper woodlands was likely characterized by relatively large, patchy to complete, moderate intensity surface to crown fires, and a long fire return interval. Fires in sagebrush woodlands are patchy to complete, moderate intensity passive crown to crown fires, depending on the continuity of the woody shrub fuels. At the interface between sagebrush and pinyon-juniper woodlands a surface to passive crown fire regime is the norm as fire spreads through woody and herbaceous surface fuels and occasionally torches individual trees. Most fires in these communities are stand-replacing events where most of the individual plants die and recovery takes decades. Blackbrush shrublands have high fuel continuity. The historic fire regime was likely characterized by relatively moderate to large sized, patchy to complete, moderate intensity, surface to crown fires, and a long fire return interval. The heavy fuel load and high fuel continuity of mesquite bosques result in high intensity crown fires with limited capacity to spread due to the sparse desert fuels surrounding the bosques.

c) Wildland fire management situation in Grapevine Mountains Fire Management Unit

1) Historical weather analysis:

Most precipitation in Death Valley National Park comes in late winter and early spring, occurring as rain in the lower elevation and snow in the higher elevations. Summer precipitation occurs primarily as localized and generally heavy thunderstorms. It usually occurs in the afternoon and evening after diurnal heating of the land sets up convection type air movements. These storms move fast; the period of rainfall is of short duration and is accompanied by high winds, thunder and lightning. Usually these storms begin by the beginning of July under a monsoon type pattern that persists until the end of September.

There are no weather stations in this FMU. The automated NOAA station at Stovepipe Wells (http://www.ncdc.noaa.gov/crn/hourly?stidx=1105) is at sea level in desert scrub and would be the best reference for fires on Mesquite Flat. The manual station at Stovepipe Wells is no longer in operation; however, its past records are in Cow Creek curatorial storage. The Hunter Mountain RAWS is at 6880 feet in pinyon-juniper and sagebrush and would be the best reference for fires in the Grapevine Mountains, although it is some distance away.

2) Fire Season:

Lower elevation vegetation communities can and do burn at any time of year, although fire is unlikely to carry at any time due to the widely spaced fuels. Mesquite bosques can likewise burn at any time of year but are most likely to burn during the hot dry winds of late summer. The blackbrush shrublands can generally carry fire after the spring annual vegetation cures, generally April through September in this FMU. The pinyon-juniper woodlands in the Grapevine Mountains do not as much snow as in the Parks western ranges and so can generally burn anytime from April through October, but burn most readily in mid-summer after the heaviest woody fuels have dried out.

3) Fuel characteristics in relation to fire behavior:

Brooks and Minnich (2006) characterized fuel conditions in relation to fire behavior for California desert fuels. Fire spread can occur most any time of year in sagebrush steppe, although it is more likely when live fuel moisture is low during prolonged drought or fine fuel loads are high following winter moisture, or during periods of high winds and low relative humidity. Fire spread in pinyon-juniper woodlands is most probable when live fuel moisture and relative humidity are low and winds are high. Under extreme burning conditions characterized by high wind and low relative humidity, both communities may experience high intensity crown fires with rapid rates of spread. Joshua tree woodland and blackbrush shrublands can carry fire in any year, but fire frequency and size may be increased by abundant winter moisture which serves to increase the fine fuel load between the shrubs. The high flammability of blackbrush allows most fires to crown in this community.

Mesquite bosques grow in wet areas and thus are less influenced by live fuel moisture than by weather. Observations indicate that high winds and low relative humidity allow fire to carry through this community aided by the thick accumulations of duff between plants and tightly spaced crowns.

4) Fire regime alteration:

Where cheatgrass (*Bromus tectorum*) is established in sagebrush, it serves to carry fire along the surface between widely spaced shrub crowns. This can greatly increase fire size, changing a single shrub torching to a spreading fire. The

influence of cheatgrass is less pronounced in closed canopy sagebrush where the canopy itself carries the fire. In pinyon woodlands, cheatgrass has a limited influence due to the self-pruning of the trees; however, on steep slopes it can serve as a ladder fuel carrying surface fire into the crown. As pinyon has thin bark, individual trees might be killed by burning cheatgrass around their bases even if the fire does not reach the crown.

Where red brome (*Bromus madritensis* ssp. *rubens*) has invaded, it can increase fuel continuity within the blackbrush shrublands. Its effect is most pronounced in years of abundant winter moisture and in the lower elevational zones of these communities where the native fine fuels tend to be widely spaced.

Where saltcedar (*Tamarix* spp.) has invaded mesquite bosques, it can greatly increase the flammability of the site and will readily re-invade after fire. However, prescribed fire can be used to force saltcedar to re-sprout and herbicide can then be used for effective control.

5) Control Problems:

Fires are most likely to be caused by lightning strikes in the high mountain areas or from human ignitions in and around developed sites. Most fires are wind driven events of short duration that can generate very high rates of spread (over 100 chains per hour), flame lengths that exceed 15-30 feet with spotting distances in excess of one mile ahead of the fire on relatively flat ground. Terrain in much of this FMU is rugged and inaccessible by vehicle, and in some cases on foot, resulting in delayed detection and long response times. The Park has few suppression resources and firefighters available in-house. The closest staffed engines are over an hour and a half away from the central section of the Park. The closest Helitack resource has a 40-minute response to the same area of the Park.

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

This FMU includes the Grapevine Ranger Station and employee housing area, but the area is surrounded by sparsely vegetated desert that is unlikely to carry fire.

There are a number of rare species and cultural resources known to occur in the burnable areas of this FMU, although survey is incomplete. The special status species includes the occurrence of the federally listed threatened desert tortoise in the southern end of the FMU. There are a number of rare species in this FMU, including a small area of creosote bush scrubland that is occupied by desert tortoise. There are many special status species in the burnable areas of this FMU, particularly the many rare plant species found in the Grapevine Mountains. There are also a few cultural resources in this FMU that require special consideration, although cultural surveys in the recently acquired park lands are substantially incomplete and there is a very high probability that more cultural resources exist

in this area. The Resource Advisor Guide (Appendix B) includes species specific lists and information. A brief summary is provided here in Table 13.

Table13. Special status resources in the Grapevine Mountains FMU.

Burnable Area	Vertebrate Animals	Vascular Plants	Cultural Resources
Mesquite Flat	4 bird species	none	1 prehistoric/historic
Grapevine Mountains	8 bird species 3 bat species 1 mammal species 1 reptile species	50 species	1 historic 1 prehistoric 1 ethno/historic 1 unidentified

d) Fire management objectives for Grapevine Mountains Fire Management Unit.

- In the developed area implement full suppression with a control strategy.
- In areas to be managed for suppression, contain fires to less than 10 acres.
- Monitor lightning-caused fires in the fire use zones and manage fires for resource benefits where there is minimal risk to other values.
- Record and document fire behavior, fire effects, burn severity, and post-fire succession when possible.
- As needed, conduct hazard fuel reduction around Park owned structures while preserving cultural landscape elements.

e) Management considerations to operational implementation in Grapevine Mountains Fire Management Unit.

- Avoid suppression impacts to special status plant and animal species.
- In the area along the Daylight Pass Road, 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 (2001).
- Protect identified cultural resources from both fire and fire suppression impacts. Avoid using fire retardant and avoid direct bucket drops over specific cultural resource sites as identified by the resource advisor.
- Retardant and foam use should be avoided in water collection areas, including Surprise Spring.
- Communicate with Park Rangers regarding fires that could potentially threaten the Grapevine Ranger Station or inhibit travel along the Scotty's Castle Road

(Inyo County's Bonnie Claire Road) or the Daylight Pass Road so that they can coordinate timely evacuation and/or direct traffic.

- Safety issue: There are numerous old mines in this FMU which may include such hazards as open shafts and adits as well as unstable explosives.

f) Fire Management strategies in Grapevine Mountains Fire Management Unit.

Suppression: 69,900 acres will be managed for full suppression, including developed areas, travel corridors, and desert tortoise habitat. No wilderness acres will be managed for suppression.

Fire Use: 269,300 will be managed for fire use. These acres are located in wilderness in remote locations where suppression action is not practical and there are no structures or known resources at risk from fire. However, local cultural or natural resources may exist and a resource advisor should be consulted before an ignition is managed for fire use.

Mechanical Fuel Reduction: There are no hazardous fuels projects planned in this FMU.

Restoration and Rehabilitation: Burned area emergency response should focus on post-fire watershed effects on the road corridors. Emergency stabilization efforts should include consideration of the numerous mine shafts, adits, and structures that may represent both historic resources as well as safety hazards. Suppression rehab should focus on evaluation of impacts to special status resources. For rehabilitation along State Highway 374, the U.S. Fish and Wildlife Service should be consulted regarding potential impacts to desert tortoise and 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.

IV. FIRE MANAGEMENT COMPONENTS

IV.A. Wildland Fire Suppression

Fire Suppression Program

The Park has been managed for full suppression since its inception, although records have only consistently been kept in the last 20 years. The most recent fire management plan was completed in 1990 (NPS 1990) and outlined operational procedures for fire suppression.

Wildland fire is naturally restricted to areas where there is sufficient vegetation to support the active spread of fire ignited by lightning and humans engaged in a variety of activities, described as “burnable areas” within this document. Significant wildfire events have occurred in areas of higher elevation that support a variety of vegetation types that support active fire spread. These areas are generally located in remote areas far from occupied and/or developed areas of the Park. Another area where wildfire has been suppressed is in lower elevation riparian areas that usually are closer or immediately adjacent to developed areas.

Death Valley National Park provides many challenges not encountered in areas that have received more attention from fire researchers. The lack of readily scarring trees precludes dendrochronological studies. The lack of significant water bodies eliminates the possibility of sediment cores. Spotty and often incomplete historical documentation is currently the only record of fire over a temporal scale, with 54 fires recorded since 1975. Most of these fires were very small, less than 1 acre (Figure 11). But a few demonstrate the potential for very large fires that move extremely fast such as the human-caused Happy Fire in 2000 that burned around 5,000 acres of Pinyon in three hours and the Calico Fire in 2006 that burned almost 10,000 acres in two days, carried by non-native red brome.

Both the published literature and Park records (Table 14) indicate that fires in Death Valley National Park are infrequent, very small and often contained to a small clump of trees or bushes. However at the higher elevations, especially those with high densities of pinyon, large fires can be expected. With fire return intervals of 50 to more than 100 years, mature pinyon pine often experience high intensity, stand-replacing fires.

Table 14. Documented fires over 1 acre.

Yea	Fire Name	Location	Cause	Acres
1975	Scottys Ranch	Scottys Ranch	Human	70
1979	Badwater	Badwater	Unknown	2
1980	Unnamed	Mormon Point	Lightning	3
1983	Unnamed	Scottys Castle	Human	4
1983	Sandy	Lemoigne Canyon	Lightning	181
1984	Saline	Hunter Mountain	Lightning	5900
1984	White Horse	Lemoigne Canyon	Jet crash	833
1984	Butte	Panamint Butte	Lightning	600
1987	Saline2	Hunter Mountain	Lightning	400
1990	LF2	Wildrose Canyon	Lightning	10.5
1990	Hunter	Hunter Mountain	Unknown	140
1996	Grapevine	Grapevine Mountains	Human	5
1998	Unnamed	Cottonwood Mountains	Unknown	1.5
2000	Happy	Happy Canyon	Human	5500
2005	Butte Valley	Butte Valley	Lightning	100
2005	Townes Pass	Townes Pass	Lightning	350
2006	Bullfrog	Bullfrog Mountain	Lightning	3710
2006	Butte 2	Butte Valley	Lightning	2039
2006	Calico	Greenwater Valley	Lightning	9280
2006	Gold Valley	Greenwater Valley	Lightning	480
2006	Saline	Nelson Range	Lightning	70

Note that some of the older fires do not have recorded geographic coordinates, so are not displayed in Figure 11.

As fire is an infrequent occurrence in the Death Valley National Park, all extended attack and some initial action response is by resources responding from surrounding fire centers, namely the BLM fire centers in Ridgecrest, California and Pahrump, Nevada. The Park maintains a limited in-Park capacity to respond to small fires. The following resources are currently available for initial action response within the Park:

- 1 Type 6 Wildland Fire Engine, 300 gallon capacity, 2-wheel drive
- 1 water tender, 5000 gallon
- 1 fixed wing aircraft
- 2 Type I structural engines

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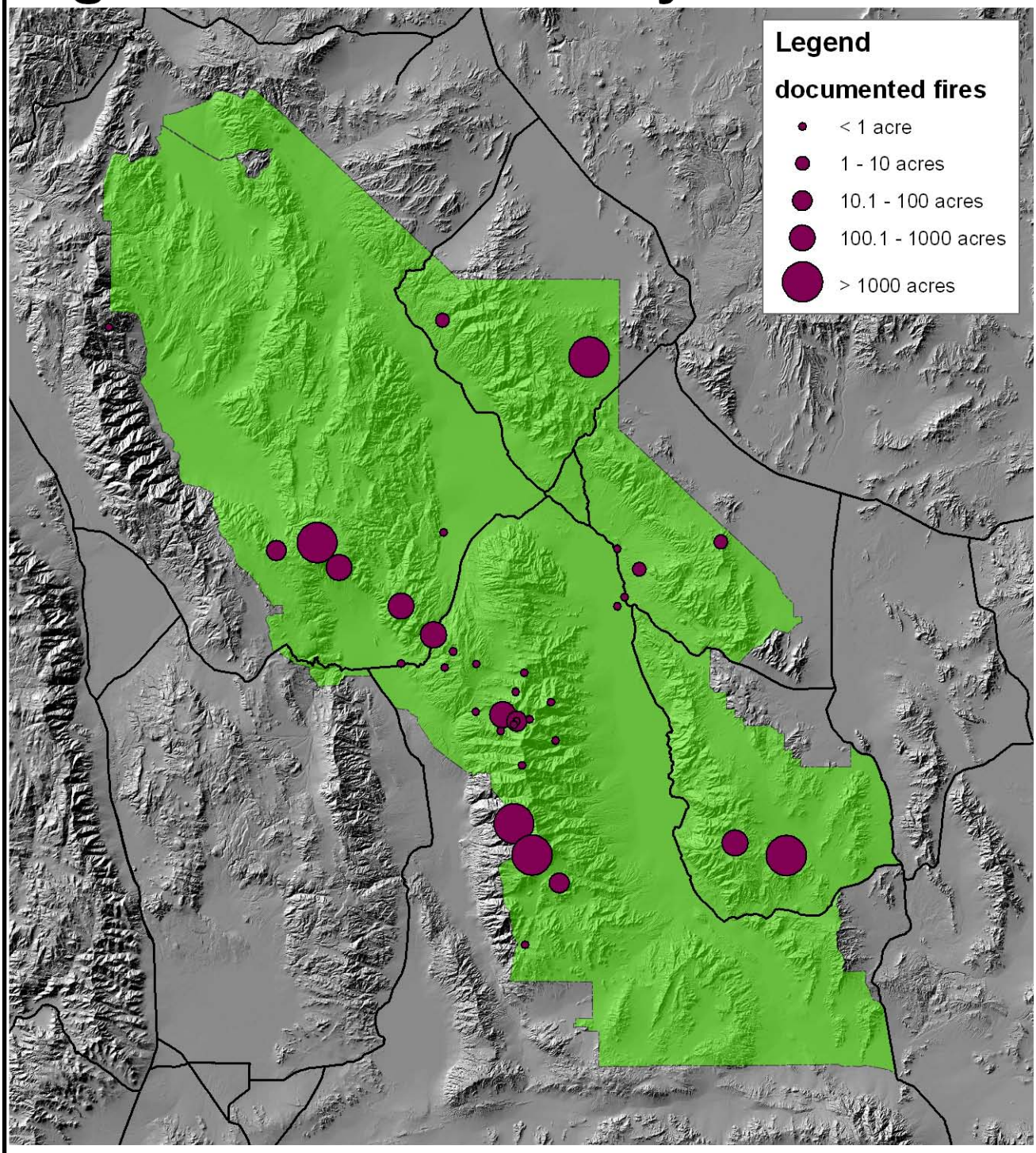
Figure 11: Fire History



Produced by S. Dingman, NPS Biologist

October 2006

FILE: D:\DEVA\GIS\analyses\figures\fig11 fire history.mxd

Fire Weather

Death Valley is the hottest and driest area of the United States. This is in part due to its location in the northern Mojave and southwestern Great Basin Deserts. Mean annual precipitation within the Park is low, less than 2 inches per year, except in the higher elevations which may exceed 14 inches per year. Year to year variation in precipitation is substantial; precipitation at Furnace Creek ranges from no precipitation in some years to over 6.44 inches in others. The annual variation in precipitation can significantly affect production of annual vegetation, and hence, capability for sustained spread of fire, (a more detailed description of regional climatic influences on vegetation and fire occurrence can be found in Rowlands (1988)).

Most precipitation comes in late winter and early spring, occurring as rain in the lower elevation and snow in the higher elevations. Summer precipitation is primarily localized and generally heavy. It usually occurs in the afternoon and evening after diurnal heating of the land sets up convection type air movements. These storms move fast; the period of rainfall is of short duration and is accompanied by high winds, thunder and lightning. Lightning is, of course, the principal cause of natural fires so it is no wonder that wildland fires caused by "dry" storms are particularly prevalent in the southwestern desert areas at this time of year. The heavy downpours often result in flash flooding due to the rapid runoff of water from the sparsely vegetated desert uplands. Up to 100 mm (4") of precipitation may fall during a single storm. Usually these storms begin by the beginning of July under a monsoon type pattern that persists until the end of September.

Temperatures within the Park are also typified by extremes. Furnace Creek temperatures can range from a low of 15 F during January to 129 F in July. During winter months, temperature inversions can occur in the valley proper. Relative humidities in the Park can reach as low as 10% during summer months on Hunter Mountain (elevation 6880 feet). Average summer temperatures at these same elevations can reach 100 F.

The Park maintains several weather stations that have recorded weather over time and have general weather data that may be useful for analysis and determining climatic trends. These stations are located throughout the Park. Continuous daily temperature and precipitation data have been collected at Furnace Creek since 1911. The Furnace Creek data is significant, because this station is the oldest weather collected in the Mojave Desert. The Wildrose Ranger Station weather station started recording in 1949, although there are significant data gaps when the Station is not staffed. The manual station at Stovepipe Wells is no longer in operation; however, its past records are in Cow Creek curatorial storage. There is currently an automated station at Stovepipe Wells operated by the National Oceanic and Atmospheric Administration (NOAA). These stations are summarized in Table 15.

Table 15. Weather stations in or near Death Valley National Park.

Station Name / Owner	Station Type	Elevation	Representative Vegetation	Data Reporting	Location Lat/Long	WIMS NFDRS
Furnace Creek NPS	Manual	(-)190 ft	Desert Scrub	NOAA	East-Central	None
Scottys Castle NPS	Manual	3280 ft	Desert Scrub	In Park	Northeast	None
Stovepipe Wells NOAA	Auto-mated	Sea Level	Transitional	NOAA	Central	None
Wildrose R.S. NPS (incomplete data)	Manual	4400 ft	Pinyon	NOAA	Central-W	044805 F1A2
Hunter Mountain NPS	RAWS	6880 ft	Pinyon & Juniper and Sage	WIMS	Northwest 117:05:16W 36:07:13 N	NSDIS ID# FA45937 A
Panamint BLM-Riverside	RAWS	6880 ft	Pinyon & Juniper	WIMS	Southwest 117:28:25W 36:33:45 N	044807
Oak Creek USFS-Inyo NF	RAWS	4855 ft	Bitterbrush & Sage	WIMS	Northwest 118:15:34 36:50:33	044804 F1A1

The three remote automated weather stations (RAWS) stations and the manual station at Wildrose are cataloged and have identifiers as WIMS stations. The Hunter RAWS station was previously owned and operated by BLM-Ridgecrest (Bureau of Land Management 2006b). Panamint RAWS is currently owned by BLM but operated by the Park with ownership expected to be transferred to Death Valley in the near future. For wildland fire behavior analysis and predictions the Hunter Mountain, Panamint and Oak Creek RAWS sites are of most value as these weather stations are representative of the upper elevation vegetation types that are most likely to support significant fire events. Additional RAWS stations in lower elevation fuel types (i.e. Joshua tree woodland and blackbrush shrubland) would be valuable for monitoring fire weather conditions as well as understanding the trigger points associated with desert fire behavior.

A simple analysis of fires over 50 acres and RAWS weather collected and archived during these occurrences gives basic parameters in which Death Valley National Park has experienced significant fire behavior. Generally, large fires have occurred during June, July or August during or just after the onset of drought conditions: 1984 was a moderate drought year that continued into severe drought years of 1987 and 1988. Localized weather conditions that resulted and supported significant fire spread include temperatures above 90 F at the 6,000-foot level, minimum humidity below 25%, and wind speeds greater than 20 miles per hour.

Aviation Management

There is a variety of aircraft used in fire operations within Death Valley National Park, with one fixed wing aircraft permanently stationed within the Park.

It is the policy of Death Valley National Park 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. 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., search and rescue operation in a visitor use area).

Natural openings may be utilized as helispots. No site marking or improvements of any type will be permitted, except in conjunction with specific emergencies, after which the area will be restored.

For fixed wing aircraft, landing areas will generally be confined to designated airstrips, and those areas (i.e. paved roads, dirt roads, etc.) approved by the pilot according to the criteria identified in the Aviation Plan.

During fire incidents, temporary flight restrictions should be considered as there are several military training routes in the Park that could pose a risk to firefighting resources, both on the ground (wash from aircraft could increase fire intensity and rates of spread) as well as aviation resources supporting the fire incident.

Fire Readiness

Preparedness is work done in advance of fire occurrence to ensure effective action. These activities include recruitment, hiring, training, planning and organization, maintaining fire equipment, procuring supplies and equipment, pre-positioning resources, weather and risk analysis, pre-attack planning, and preparedness levels. Most of these activities are the responsibility of the Zone Fire Management Officer, including the annual readiness review conducted each spring before fire season. However, the Death Valley Chief Ranger, or their designee, will:

- Review annually the California Desert Districts "Staffing and Specific Action Plan" to assure that it meets the needs of the Park for management of wildland fire incidents.

- Annually prepare a Delegation of Authority for the Bureau of Land Management Ridgecrest Field Office Fire Management Officer to serve in the same capacity for the Park. Incident specific Delegations of Authority will be written as needed.
- Continue to work with the Zone Fire Management Officer to develop a cadre of qualified firefighters, trained and equipped for initial action.
- Establish or maintain interagency contacts and agreements for additional resources necessary to control or manage wildland fire in compliance with this Fire Management Plan.

Detection

There is not an effective system to detect all new wildfire starts within the Park. Most starts are reported by visitors, patrolling Park staff and the reporting from commercial, private and Park owned aircraft. There is no fixed detection system in place in the Park (lookouts). Response to reported fires are often delayed due to distance from staffed stations. It is assumed a substantial portion of wildland fires started within the Park extinguish themselves before they are detected and reported. This is due to the dominant vegetation types that typically restrict fire spread unless significant wind speeds cause a wildland fire to move from surface fuels to tree crowns.

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 Park 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 or the Zone Fire Management Officer’s office in Ridgecrest.

Initial Action

For many wildland fires, the response to wildland fire will be suppression. Suppression will be the fire management strategy for all human-caused ignitions, all ignitions that occur in a full suppression zone, and natural ignitions in fire use zones when the initial assessment (go/no go decision) indicates that managing the fire for resource benefits is not within described limits or capabilities at that time. For these or other situations, the Zone Fire Management Officer will implement an adequate level of suppression action as the appropriate management response.

As stated in the Fire Policy Review, "fires will be suppressed at minimum cost, considering firefighter and public safety, benefits, and values-to-be-protected, consistent

with resource objectives." When initial action or other suppression responses are unsuccessful in accomplishing the objectives, the Wildland Fire Decsion Support System (WFDSS)will be the tool to analyze alternatives, select a new appropriate management action, and specify necessary actions.

To better plan for initial action based on potential fire behavior, the computer program BehavePlus was used to model expected fire behavior for the four fuel models that cover most of the Park. 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 16, 17, and 18 show the expected rate of spread and flame height under a range of wind conditions as predicted by BehavePlus.

Table 16: 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	Closed canopy pinyon-juniper stand	131.5	25
8	High elevation timber stands	5.2	5

Table 17: 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	Closed canopy pinyon-juniper stand	346.8	40
8	High elevation timber stands	5.2	5

Table18: 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	Closed canopy pinyon-juniper stand	614.5	50
8	High elevation timber stands	5.2	5

Extended Attack

While over 90% of all wildfire incidents never exceed initial action, 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 the WFDSS process. The Incident Commander will re-validate the incident complexity regularly and transition to a higher complexity level when necessary as provided for in the Incident Complexity Analysis. A Delegation of Authority 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.

Fire Prevention and Public Information

The interpretive division at Death Valley National Park with assistance and support from resource management and fire management personnel, will take the lead in developing materials that provide factual, straight-forward information about both the general role of fire in the ecosystem and about specific projects being conducted in the Park. Material handed-out or presented as programs will be geared to a variety of audiences with the aid of fire management personnel. These guidelines will apply, depending on the situation:

- The Zone Fire Management Officer or their designee will assist in seasonal orientations to provide new personnel a basic knowledge to help them provide basic information about Park fire management programs to visitors.
- Handouts and programs explaining fire risk and management will be jointly developed by the interpretive and fire management staffs. A public information plan will be developed and reviewed annually.
- The Superintendent, Chief Ranger, and Park Public Information Officer will be informed by the Zone Fire Management Officer of the status of fires in or near the Park and any pertinent management actions. To effectively answer visitor questions, dispatch, fee collectors, and patrol rangers will be advised of the status of ongoing fires on a daily basis. The visitor center and campground rangers will also be kept current on fire situations.
- Appropriate signing or notices will be used to inform the public about on-going fires, area or trail closures, smoke, or other special situations. Signs or notices will be placed along roadways, at the visitor center, and at affected trailheads, campgrounds, and other areas as needed.
- Employees may be stationed at appropriate turnouts or viewpoints to explain the situation when fire or smoke is visible near these places. A temporary bulletin board may serve as an alternative.
- The ecological concepts for prescribed fire management will be incorporated into handouts, books about Park resources, and exhibits. Handouts explaining the fire

management program of the NPS and Death Valley National Park will be prepared and periodically updated. When use of wildland fire events for resource benefits occur, these handouts will be made available for distribution at entrance stations, the visitor center, and by all field personnel during their work as they make informal contacts.

- The goals and concepts of wildland fire management programs will be incorporated into the Park newspaper and when needed into interpretive programs, walks, slide and/or video programs, other Park literature, and exhibits. Particular attention will be given to inclusion in programs and walks when smoke is visible from the visitor center or other developed areas.
- The wildland fire management program will be discussed in informal contacts with Park concessionaires, special use permittees, Park neighbors, and visitors especially when smoke is visible from the visitor center or other developed areas.
- During ongoing fires, new releases will be written for local newspapers, radio, and television stations. Media information requests will be directed to the superintendent's office or a designated public information officer to ensure consistent and accurate information.
- Neighboring land management agencies, the Timbisha-Shoshone Tribe, mayors, and city and county public safety officials will be provided information about ongoing fires.
- Public involvement will be sought when major changes are made to the Fire Management Plan. The Park will notify neighbors, the Timbisha-Shoshone Tribe, in-holders, and local agencies, communities, and news media of changes and their expected effects. Every effort will be made to gain public understanding and support.
- Each winter, Firewise (a non-profit organization that promotes wildfire prevention and preparedness) materials will be mailed directly to all in-holders who have structures within the Park boundary.

Training

The Zone Fire Management Officer will coordinate the annual 8-hour fireline refresher training and work capacity test as required to maintain firefighter qualifications for Death Valley National Park's firefighters. Due to the remoteness of much of Death Valley National Park, aviation resources are likely to play a substantial role in fire detection and management operations. Thus, all permanent fire qualified personnel will strive to attend the standard Department of the Interior's Office of Aviation Safety "B-3 Aviation Safety" course and maintain currency in order to be available to fly on helicopters and fixed wing aircraft used on fire incidents. Additionally, the Zone Fire Management Officer will notify the Chief Ranger of any basic firefighter training (S-130 and S-190) or other fire training approved by the National Wildfire Coordinating Group that is being offered by any partner agencies in the California Desert District. Training and qualification files will be maintained by the Park and reviewed annually with fire qualified employees to determine additional training needs and interests.

Death Valley National Park will strive to maintain personnel qualified at the following minimum levels as needed to provide adequate staffing of small, local fire incidents and to provide an interface with the Zone Fire Management Officer and suppression resources from partner fire centers that may operate in the Park on larger incidents:

- 2 engine bosses (ENGB)
- 1 type IV incident commander (ICT4)
- 2 type V incident commanders (ICT5)
- 10 type II firefighters (FFT2)
- 4 helicopter crewmembers (HECM)
- 1 field observer (FOBS)
- 1 fire weather observer
- 2 tender operators
- 1 type III incident information officers (IOF3)
- 1 fire geographic information system technician (GIST)
- 1 fire effects monitors (FEMO)
- 4 resource advisors (READ), including 2 cultural resource specialists and 2 natural resource specialists
- 1 burned area emergency response specialist (BAES)

The list of current qualifications of Death Valley personnel can be found in Appendix G: Operational Considerations.

Safety

Firefighter and public safety is the first priority in every fire management activity. This guiding principle is official federal wildland fire management policy and official NPS policy. Safety is the responsibility of everyone assigned to a wildland or prescribed fire incident. Safety of the public and employees alike must be of prime concern during fires. Park administrators and supervisors need to stress that public and employee safety always takes precedence over property and resource loss.

The following procedures will be used to mitigate safety risks:

- The Incident Commander or Zone Fire Management Officer will report potentially hazardous situations and recommend action to mitigate that hazard to the Park Superintendent through the Chief Ranger's Office.
- The Incident Commander or Park Safety Committee will conduct a thorough review of all accidents, injuries, and near misses that occur during wildland fire actions or training. Review all accidents, injuries, and near misses as part of the annual wildland fire refresher training. Integrate the findings of safety reviews into operational plans and standards.
- The Zone Fire Management Officer and key Park staff will ensure that all Park personnel involved in wildland and prescribed fire operations will complete all medical evaluations as well as required training and refreshers.

- All active fires will be routinely monitored and evaluated for public safety considerations as conditions change. Portions of the Park may be temporarily closed due to fire hazards (intense burning activity, dense smoke, road damage, etc.) and temporary flight restrictions may be enacted.
- When a fire threatens to escape from the Park, adjacent authorities will be given as much advance notice as possible in order to achieve orderly evacuation. This includes inholdings such as Furnace Creek Ranch and Inn and Panamint Springs Resorts.
- The Division of Visitor and Resource Protection is responsible with enforcing Park closures. The Incident Commander will insure that closure and informational signs concerning ongoing fire management activities are properly posted.

On fire incidents within the Park, firefighters will be made aware of specific hazards within their assigned work area. Special safety concerns in Death Valley National Park include the potential for hazardous materials (particularly associated with plane wreckage and mine sites), unmarked mine shafts, venomous snakes, steep terrain, and extreme heat.

Job hazard analyses and other safety related information is included in Appendix G: Operational Considerations.

Resource Considerations

Because fire suppression activities require numerous incident and site specific decisions in the field, the protection of sensitive resources may best be accomplished through a generic series of management approaches that are described below. Since the overall character of many field situations are difficult to anticipate, it is important that a resource advisor be on site during fire suppression activities to provide recommendations to the incident commander on which suppression activities should be avoided in particular areas. Additional details can be found in the Resource Advisor Guide (Appendix B).

Water

As water is such a limited and important resource in the desert, extreme care must be taken to protect water resources from fire suppression activities. The following restrictions will be implemented to protect both the rare aquatic resources of the Park as well as the on-going use of water for human consumption:

- Water should not be drafted or dipped from any natural surface waters due to the potential for damage to endemic pupfish and other rare aquatic organisms. Instead, collapsible water tanks (commonly referred to as pumpkins) and water engine tenders (semi-trucks) would be used to supply water from developed sources (hydrants).
- No improvements will be made to springs or seeps and, in mountainous areas, an effort should be made to minimize disturbance to stream banks and channels.
- Fire control strategies will be sensitive to wetland values and fire lines will not "tie" into wetland margins except when relying on those areas to naturally retard the fire without constructed line.

- Foam and retardant should not be used within ½ mile of surface waters.
- Unless flow containment is in place, foam and retardant should not be used within two miles of those water collection areas maintained in the park to provide water for human consumption: Furnace Creek, Cow Creek, Panamint Springs, Emigrant Campground, Wildrose Campground, Mesquite Campground, Grapevine Ranger Station, Scottys Castle, and Lower Warm Springs.
- Camps and toilet facilities should be located more than 200 feet from surface water resources.
- Pumper trucks and motorized pumps should be kept at a distance from water sources to minimize the potential for accidental spillage of fuel in surface waters.

Tortoise

Although there are no designated critical habitats for desert tortoise within the Park, there are known populations in the Greenwater Valley. As tortoises are known to be highly susceptible to fire effects, all known occupied habitats have been zoned for suppression; however, suppression activities must be carefully managed to avoid impacts to tortoise. For more detailed discussion about desert tortoise and its habitat characteristics, see the recovery plan (U.S. Fish and Wildlife Service 1994). The following recommendations for fire suppression activities in Desert Tortoise habitats were developed from Duck et al. (1997):

- Resource advisors and monitors should be on call 24 hours. These individuals must be appropriately trained in fire and sensitive resources. If tortoise handling may be required, resource advisors should also be a qualified tortoise biologist as defined by the U.S. Fish and Wildlife Service.
- Tortoise considerations are secondary to issues of human safety. The resource advisors shall help to define goals and objectives for fire suppression efforts and will inform the Incident Command of any restrictions.
- Hand crews should be used to build and defend fire lines. Engines can be used for support from roads. Wherever practical, fire engines remain on roads and lay fire hose along hand lines. If off-road vehicle travel is necessary then a crewmember or monitor will walk in front to avoid tortoises and shelter sites.
- It is preferred to use air based fire suppression tactics rather than ground based equipment off-road to minimize the potential for crushing tortoises and burrows.
- If the use of heavy equipment becomes necessary then a resource advisor will accompany the equipment to move any tortoises out of harms way.
- Backfires may be initiated from roads or control lines where necessary. Islands of unburned habitat must not be burned out as a fire suppression measure.
- Notify Federal and State wildlife agencies of damage or injury to Desert Tortoises or tortoise habitats.
- After the fire, begin rehabilitation of fire lines, especially lines created by tracked vehicles. Obliterate vehicle tracks that leave roads to prevent those tracks from becoming trails or roads.

- After the fire, consider vegetation monitoring where appropriate using paired plots inside/outside burned areas.
- After the fire, conduct debriefing to evaluate the effectiveness of suppression activities and identify successes and failures of Desert Tortoise mitigation efforts. Revise procedures as necessary.

Additionally, the Biological Opinion issued by the U.S. Fish and Wildlife Service (U.S. Fish and Wildlife Service 2001) states that:

> "The NPS shall ensure that only qualified personnel are allowed to handle desert tortoise, conduct clearance surveys, and monitor for compliance with the protective measures and terms and conditions of the biological opinion."
>
> "If a wildfire occurred within desert tortoise habitat, the National Park Service must use the emergency provisions of section 7(a)(2) at the start of the fire fight. The National Park Service would need to assess whether any specific proposal to manage fuels may affect the desert tortoise and conduct the appropriate level of compliance with section 7(a)(2) of the Act."

Such emergency consultation is generally conducted by the resource advisor assigned to the incident. The Incident Commander and the Chief of Resource Management would be kept informed of the consultation process. Consultation would be conducted with the Ventura Field Office of the U.S. Fish and Wildlife Service at 1- 805-644-1766. Results of the consultation would be included in the incident documentation.

Riparian Birds

Fire suppression activities in or near riparian woodlands have the potential to affect the federally-listed endangered least Bell's vireo (*Vireo bellii pusillus*) and southwestern willow flycatcher (*Empidonax traillii extimus*). As such, riparian woodlands will not be subject to prescribed fire unless site specific surveys for these species are conducted and consultation with the U.S. Fish and Wildlife Service is completed for that project. Fire use will not be allowed in riparian woodlands that have the potential to support these birds. Suppression will be the management response for fires in or threatening riparian woodlands. However, such suppression activities must be carefully managed to minimize impacts on these birds. Birds are most vulnerable to disturbance or fire-related mortality during nesting season, which is mid-May to early July for the southwestern willow flycatcher and mid-March to late September for the least Bell's vireo. Both species are gone from the area from October through February, so direct mortality or impact is highly unlikely during the winter months. Habitat may be affected by fire at any time of the year. The recovery plans for these species (U.S. Fish and Wildlife Service 1998, 2002) should be reviewed for more detailed discussion of habitat characteristics.

To avoid, minimize, and mitigate impacts to these endangered birds, the following mitigation measures will be followed:

- Resource advisors and monitors should be on call 24 hours. These individuals must be appropriately trained in fire and sensitive resources. They should be familiar with the structural habitat characteristics preferred by these species and, to the extent possible, be aware of the locations of nesting sites.
- Riparian bird considerations are secondary to issues of human safety. The resource advisors shall help to define goals and objectives for fire suppression efforts and will inform the Incident Command of any restrictions. If active nests are present, efforts will focus on avoiding suppression activity and travel routes in the nest vicinity while taking action to protect those nest sites from fire.
- Hand crews should be used to build and defend fire lines. Engines can be used for support from roads. Wherever practical, fire engines remain on roads and lay fire hose along hand lines. No off-road vehicle travel is allowed in riparian woodlands.
- If necessary for fire suppression purposes, fireline will be constructed through riparian corridors at the narrowest logical point and will favor the sparsest vegetated riparian sections with the least structural diversity.
- It is preferred to use air based fire suppression tactics rather than ground based equipment off-road to minimize the potential for disturbing riparian habitat or destroying nests. No chemicals (e.g. fire retardant and class A foam) should be used in or near the riparian woodlands due to the potential for contamination of surface waters.
- Backfires may be used from roads or lines where necessary. Islands of unburned habitat must not be burned out as a fire suppression measure.
- Notify Federal and State wildlife agencies of damage or injury to southwestern willow flycatcher or least Bell's vireo birds or nests.
- After the fire, begin rehabilitation of fire lines, especially lines created by tracked vehicles. Obliterate vehicle tracks that leave roads to prevent those tracks from becoming trails or roads. If necessary, restrict visitor access to burned over riparian corridors to allow these areas to recovery without trampling. Also, use early detection and eradication to prevent invasion of non-native salt cedar in burned over native riparian corridors Consult with the U.S. Fish and Wildlife Service on post-fire rehabilitation needs and seek money for suppression rehabilitation, emergency stabilization, or long-term burned area rehabilitation as appropriate.
- After the fire, begin vegetation monitoring where appropriate. Establish paired plots inside/outside burned areas to monitor recovery of vegetation, but be careful that monitoring activities are timed to avoid disturbing birds that remain.
- After the fire, conduct debriefing to evaluate the effectiveness of suppression activities and identify successes and failures of riparian bird mitigation efforts. Revise procedures as necessary.

Additionally, the Biological Opinion issued by the U.S. Fish and Wildlife Service (U.S. Fish and Wildlife Service 2001) states that:

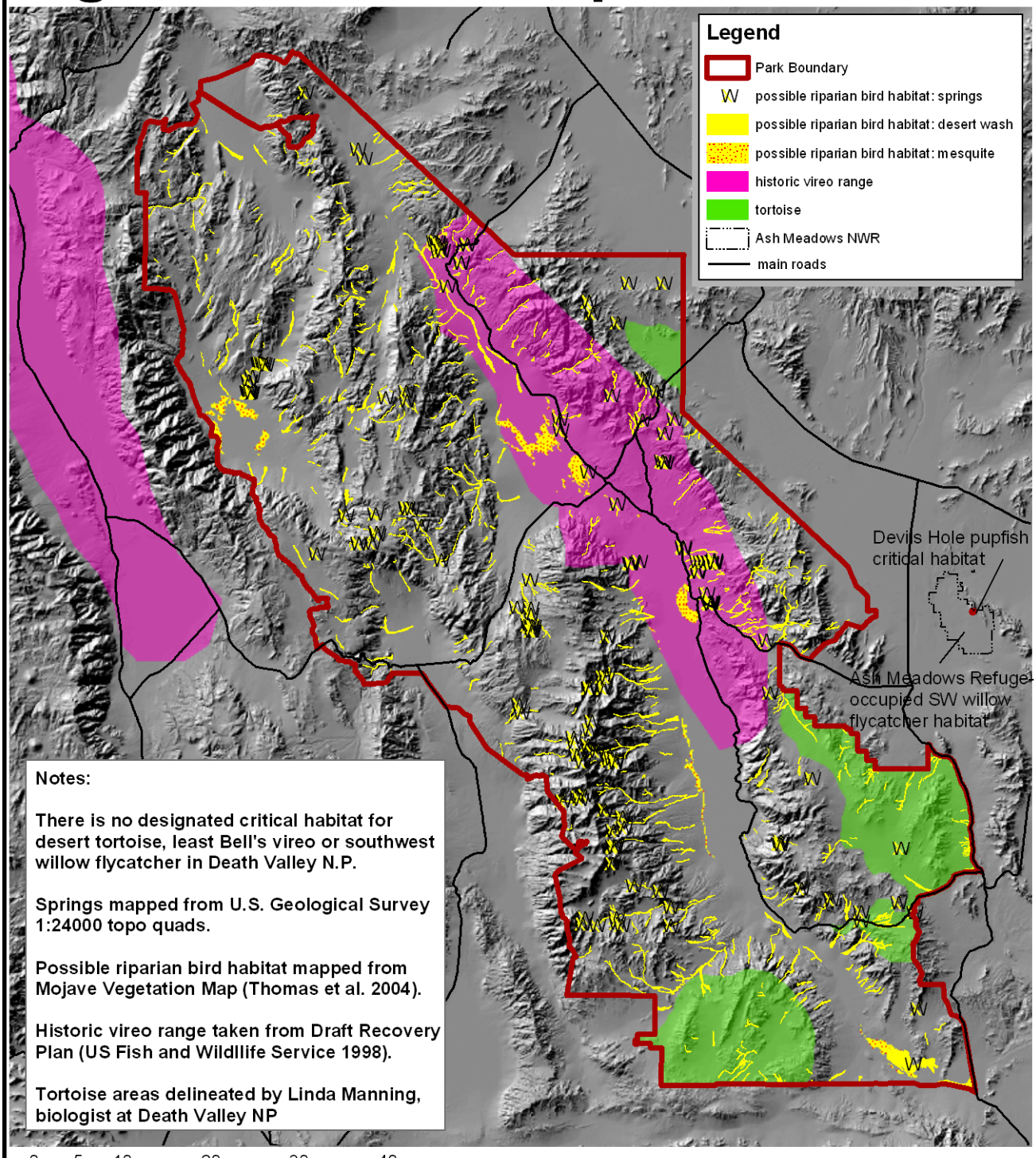
> "If emergency ground-disturbing activities are necessary in locations determined to support these species, the National Park Service could use the emergency consultation provisions of the Act (50 CFR 402.05). The National Park Service would need to assess whether any specific proposal to conduct fire management may affect the southwestern willow flycatcher or least Bell's vireo and conduct the appropriate level of compliance with section 79a)(2) of the Act."

Such emergency consultation is generally conducted by the resource advisor assigned to the incident. The Incident Commander and the Chief of Resource Management will be kept informed of the consultation process. Consultation will be conducted with the Ventura Field Office of the U.S. Fish and Wildlife Service at 1- 805-644-1766. Results of the consultation will be included in the incident documentation.

Death Valley National Park
California and Nevada
Fire Management Plan

National Park Service
U.S. Department of the Interior

Figure 12: Listed Species Habitat



Produced by S. Dingman, NPS Biologist

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Wilderness

The California Desert Protection Act of 1994 (CDPA) designated 3,090,489 acres of wilderness in Death Valley National Park. This comprises about 91% of the Park's lands. About 80% of these wilderness lands will be treated under a fire use prescription as described previously in this document. However, 617,234 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, developed areas, 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 it's 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 wilderness minimum requirement analysis, such as the one prepared for the implementation of this Plan (Appendix C). 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 would be assigned to all extended attack fires occurring in or near wilderness.
- Fire camps and incident command centers would be located outside of wilderness.
- Hand lines in wilderness would be located to make full advantage of natural barriers such as rock outcroppings, trails, and dry washes. Handlines would be no wider than necessary to stop the spread of fire.
- Within wilderness chain saws, helicopters, or pumps would only be used when essential to meet critical 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.

- To the extent possible, non-emergency use of helispots in wilderness would be avoided. If it cannot be avoided, the decision to use a helispot in wilderness would be detailed in a Wilderness Minimum Requirement Analysis as well as an environmental compliance document (i.e. the Environmental Assessment or Categorical Exclusion).
- Note that only fugitive retardant is approved for use in Death Valley National Park; fire management activities in Wilderness will avoid using red retardant.

Cultural Resources

Death Valley National Park contains a vast number of cultural resources including archeological, historical, ethnographic, traditional cultural properties, and cultural landscapes possessing varying levels of significance, integrity, interpretive value, and level of documentation. The Resources Management Division staff of Death Valley National Park has the responsibility of identifying, inventorying, documenting, and evaluating cultural resources located within the Park boundaries and providing for their preservation, interpretation, and appropriate management. Cultural resource management activities are undertaken with the knowledge that all tangible resources such as sites, objects, and structures, are finite and nonrenewable.

Park areas with the highest potential for natural starts and wildland fires include the higher elevation pinyon-juniper forests and sagebrush/blackbrush areas. It should be noted that only a small portion of the former monument land has been surveyed for archeological resources. A larger number of historical resources have been identified and documented in connection with research reports and compliance actions. The vast majority of new lands acquired from the Bureau of Land Management through the California Desert Protection Act of 1994 still require identification, documentation, and evaluation of resources.

It is known, however, that those Park areas susceptible to wildland fires contain large numbers of cultural resources, many which are significant to the prehistory and history of the Park. These include mining-related structures such as cabins, ore-processing mills and equipment, ore bins, arrastras, and tramways; historic town site ruins; prehistoric rock shelters; petroglyphs and pictographs; and a number of Timbisha Shoshone pinyon gathering campsites and sacred, religious, and traditional use areas. The extremely dry climate of Death Valley National Park has promoted the preservation of many perishable artifacts that aren't normally found in archaeological contexts, such as wikiups, pinyon hooks, and bow stave trees. Such old wooden artifacts represent very rare opportunities to better understand aboriginal peoples of Death Valley; however, their dry condition makes them extremely vulnerable to fire impacts. In addition, there are a number of cabins in these areas that are used by weekend visitors to the Park.

Ethnographic resources are also important. About fifty members of the Timbisha Shoshone Tribe--direct descendants of the Panamint Shoshone who lived in the Death Valley area for hundreds of years--still live within the Park. The tribe has special concerns related to specific Death Valley resources that are significant as sacred or religious sites or traditional subsistence areas. These sites should have high priority for fire suppression activities. In addition, Park staff will work with tribal members to

coordinate the application of fire to restore or maintain traditional collecting areas and other resources of cultural concern.

Cultural landscapes (both ethnographic and historical) are present throughout the Park. A cultural landscape is a geographic area, including both natural and cultural resources, associated with a historic event, activity or person. The National Park Service recognizes four cultural landscape categories: historic designed landscapes (deliberate artistic creations reflecting recognized styles; i.e., Spanish style architecture at Scottys Castle); historic vernacular landscapes (such as mining districts, and homesteads); historic sites (significant for their associations with important events, activities or events); and ethnographic landscapes (associated with contemporary groups and typically are used or valued in traditional ways; i.e., the mesquite groves of Mesquite Flat). In addition, these categories are not mutually exclusive. That is, a site may contain significant elements pertaining to one or more types of cultural landscapes. Death Valley National Park contains examples of each of the four landscape categories. The possibility of damage to these landscapes from wildland fire ranges from high to low potential (see Appendix B). Special consideration to these sensitive areas is required. Maintaining cultural landscapes in their present condition is important for their interpretive potential as well as their scientific data potential.

Two facts are clear concerning wildland fire management. First, a fire event may preclude any type of survey in advance of that fire due to the speed and intensity of the flames. Second, most sites will be extremely difficult to access in any reasonable amount of time due to the steep and rugged terrain common in wilderness areas. The Park needs to identify potential fire hazard areas and do immediate surveys ahead of fire with funds allocated through the fire program or other appropriate funding sources. In addition, post-fire surveys should be conducted to determine the effects of fire on various resource types, to search for new resources uncovered by the fire, and to assess further research needs related to fire management.

One of the objectives of fire management is to protect those significant cultural resources most susceptible to wildland fires. Appendix B contains a detailed list of areas with high potential for wildland fires and resources within those areas that require specific treatment or protection. Many of these areas will need to be assessed by a team composed of fire and cultural resource specialists to adequately determine potential wildfire impacts on cultural resources and appropriate mitigation and/or treatment measures.

Identified within Death Valley National Park are fifteen areas with sufficient fuel loads to sustain wildland fire. These areas include: Last Chance Range North, Last Chance Range South, Scottys Castle (including Lower Vine Ranch), Grapevine Mountains, Mesquite Flat, Furnace Creek Fan, Greenwater Valley, West Side Road, Saratoga Spring, Owlshead Mountains, Quail Mountains, Panamint Range (including Townes Pass and Nelson Range), Saline Valley, Cottonwood Mountains, and the Inyo Mountains. Significant cultural resources have been identified within many of these areas.

General cultural resource objectives for archeological sites include protecting important sources of information through proactive inventory, pre-fire treatment, and post-fire

stabilization. Table 19 provides management guidance and treatment options for generalized cultural resource categories. These are recommended actions, some of which can be done pro-actively before a fire occurs, or may be accomplished during a fire incident provided it is safe and feasible to do so.

- Archeological Resources
  - Obtain GIS coverage for sensitive areas
  - Protect sites from ground disturbing fire and fuel management activities
  - Cut snags and remove downed trees (especially from features) to eliminate the majority of intense heat sources.
  - Collect surface samples of lithic and ceramic artifacts if safe to do so prior to the arrival of the flames.
  - Flush cut and cover stumps to guard against intense sub-surface heating.
  - Design fire frequency (i.e. prescribed fires) to maintain fuel loads that will not create intense, artifact-affecting fires.
  - Design fire frequency (i.e. prescribed fires) and intensity to maintain open character of site, reducing potential for subsurface feature contamination through root burns.
  - Reduce fuels adjacent to rock art panels.
  - Document extent of surface artifacts and site conditions as part of the post fire assessment to evaluate threat of looting an prescribe mitigation treatments.

- Cultural Landscapes
  - Restore fire as a cultural tool where appropriate
  - Restore and maintain general and overarching landscape characteristics (vegetation patterning, open character, any long-range vistas and viewsheds).
  - Reduce hazardous fuel accumulations.
  - Protect contributing resources from direct impacts.

- Historic Structures
  - Reduce fuels adjacent to structures.
  - Assess (and upgrade where necessary) structural fire protection facilities and response plans at National Historic Landmarks and other National Register Structures.
  - Restore and maintain historic landscape setting.

- Traditional Cultural Resources
  - Manage utilized plants for desired characteristics through timing, intensity and frequency of burns; or protect plant stands from damaging fire effects.
  - In consultation with the Timbisha Shoshone, maintain traditional (landscape) setting characteristics such as vegetation patterning, openness, and viewsheds at ceremonial, spiritual, and historic village locations.
  - Where fire is a traditional management tool, incorporate traditional burning methods or use native people to conduct burns.

Table 19. Management and treatment options for cultural resources.

Resource Type	Management Objectives (related to fire)	Values at Risk	Risk Conditions	Treatment Options
Lithic Scatters	♦ Maintain or extract information	♦ Obsidian hydration data ♦ Blood residue ♦ Post-fire looting	♦ Heavy surface fuels ♦ Ground disturbance through fire facility construction and use ♦ Site exposure post-fire	♦ Data collection through surface collection sampling ♦ Experimentation ♦ Protection from ground disturbance ♦ Post-fire documentation ♦ Post-fire site protection ♦ Maintain fire frequency that prevents heavy fuels accumulation ♦ Residue retrieval ♦ Fuel reduction and/or fire exclusion
Ceramic Scatters	♦ Maintain or extract information	♦ Protein residue ♦ Morphology ♦ Compromised thermo luminescence dating ♦ Post-fire looting	♦ Heavy surface fuels ♦ Ground disturbance through fire facility construction and use ♦ Site exposure post-fire	♦ Data collection through surface collection sampling ♦ Experimentation ♦ Protection from ground disturbance ♦ Post-fire documentation ♦ Post-fire site protection ♦ Maintain fire frequency that prevents heavy fuels accumulation ♦ Residue retrieval ♦ Fuel reduction and/or fire exclusion
Groundstone	♦ Maintain or extract information	♦ Morphology ♦ Protein residue	♦ Heavy surface fuels ♦ Ground disturbance through fire facility construction and use	♦ Data collection through surface collection sampling ♦ Fuel reduction ♦ Residue retrieval ♦ Fire exclusion
Surface archeological features	♦ Maintain or extract info ♦ Document baseline info ♦ Maintain as landscape feature	♦ Morphology ♦ Site patterning ♦ Post-fire looting	♦ Heavy surface fuels ♦ Ground disturbance through fire facility construction and use ♦ Site exposure post-fire	♦ Data collection through surface collection sampling ♦ Fuel reduction ♦ Fire exclusion

Table 19. Management and treatment options for cultural resources.

Resource Type	Management Objectives (related to fire)	Values at Risk	Risk Conditions	Treatment Options
Subsurface archeological features	♦ Maintain or extract information	♦ Chronology (carbon) ♦ Subsistence (floral and faunal)	♦ Stumps and/or snags on site ♦ Ground disturbance through fire facility construction and use	♦ Flush-cutting and covering stumps and snags
Midden soils	♦ Maintain or extract information	♦ Subsistence ♦ Chronology	♦ Heavy surface fuels ♦ Ground disturbance through fire facility construction and use ♦ Stumps and/or snags on site	♦ Removal of downed trees ♦ Flush-cutting and covering stumps and snags ♦ Avoiding ground disturbance ♦ Post-fire site protection
Pictographs and petroglyphs	♦ Maintain or extract information ♦ Maintain as landscape feature	♦ Artistic ♦ Morphological or stylistic data ♦ Traditional/spiritual ♦ Loss of dating and organic data	♦ Fuel adjacent to panel ♦ Heavy fuel loads surrounding sites that result in flame impingement ♦ Smoke damage	♦ Reduce fuels adjacent to panels ♦ Manage site area to maintain non-hazardous fuel loads ♦ Documentation, including photography ♦ Post-fire assessment
Historic buildings	♦ Maintain or extract information ♦ Maintain as landscape feature	♦ Original historic fabric ♦ Historic setting	♦ Heavy fuels on or adjacent to building	♦ Removing hazardous fuels adjacent to structure ♦ LCS or HABS/HAER documentation ♦ Maintaining fire frequency or manual thinning that maintains historic setting ♦ External fire suppression systems for susceptible structures ♦ Internal fire suppression systems where appropriate in frontcountry areas
Historic fencelines	♦ Maintain or extract information ♦ Maintain as landscape feature	♦ Location information ♦ Contributing elements to landscape	♦ Heavy fuels adjacent to flammable fence components ♦ Snags adjacent to fenceline ♦ Fence cutting to allow access during suppression	♦ Documentation ♦ Reduce adjacent fuel loads ♦ Inform IC of alternate access points
Historic dumps	♦ Maintain or extract information ♦ Maintain as landscape feature	♦ Chronology ♦ Subsistence ♦ Functional data	♦ Stumps and/or snags on site ♦ Ground disturbance through fire facility construction and use ♦ Post-fire looting	♦ Documentation ♦ Protection from ground disturbance ♦ Post-fire site protection

IV.B. Use of Wildland Fire

Opportunities for Use of Wildland Fire

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, infrequent, small 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 Death Valley National Park, however, a number of vegetative communities reflect a transition between Mojave and Great Basin Desert types and the western margin of the Park includes high elevation coniferous forest. These communities do support fire, and their historic fire regimes and characteristic fire ecology indicate that fire plays an important role in these communities. Lightning ignitions do occur and fires can carry through native plant communities resulting in fires that are natural, albeit relatively infrequent.

The objective for use of wildland firewithin Death Valley National Park 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 wildlife.

Fire use will not be allowed in or near riparian woodlands due to the potential for impacts to least Bell’s vireo and southwestern willow flycatcher; both are federally-listed endangered bird species that are known to inhabit dense riparian woodlands in Death Valley National Park.

Fires from natural ignitions will be allowed to burn within designated areas and under specific environmental conditions and where there are minimal values at risk. Approximately 2,473,300 acres are zoned for fire use, including portions of all Fire Management Units except the Devils Hole FMU. 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 unacceptable impacts 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 appropriate complexity fire use manager (FUMA) availability. In all cases, use of wildland fire incidents will be monitored by fire personnel. The fire management strategy will transition from fire use to suppression when a) management considerations change, b) the fire threatens to exceed the maximum manageable area, c) or the fire poses a threat to other values.

Fire Use Implementation

The Wildland Fire Decision Support System process will be initiated for all wildland fires managed for resource benefit (Redbook p. 09-6, 1st paragraph). However, only the most active fires being managed for resource benefits with greater potential for growth will require completion of all parts of a WFIP. The full WFIP consists of three distinct stages (Table 20). The WFIP must be completed in compliance with the guidance found in the *Wildland Fire Use, Implementation Procedures Reference Guide* , May 2005 (March/April 2006 Revision).

It is important to note that the Long Term Fire Behavior Analyst position is a mandatory component of all teams preparing WFDSS decision support documentation. An LTAN does not have to remain continually involved with the wildland fire after completion of the WFDSS support documentation. The Fire Use Manager (FUMA), also a mandatory position for management of the WFU, will determine the necessary level of involvement of the LTAN during the implementation of the approved plan (see 310-1 Wildland and Prescribed Fire Qualification System Guide for position description and qualifications).

Regional Fire Management Officers are responsible for appraising and surveying all use of wildland fire events within their region, therefore park fire staff need to notify the Regional FMO or appointed designee of any potential us of wildland fire projects in the park. Any use of wildland fire projects with a "Complex Rating" must have their implementation plans reviewed by regional office fire staff.

Review by the Regional FMO or Acting is mandatory for any WFIP with a projected cost greater then $500,000 and a National FMO or Acting, at NIFC, for any WFIPs with a projected cost exceeding $1,000,000.

Initial Fire Assessment

- Fire name
- Fire number
- Jurisdiction(s)
- Administrative unit(s)
- Geographic Area(s)
- Management Code(s)
- Start date/time
- Discovery date/time
- Current size
- Location
- Cause
- Fuel model(s)/conditions
- Current weather
- Forecasted weather
- Current fire behavior
- Forecasted fire behavior
- Availability of resources
- Decision criteria checklist
- Recommended response action

Pre-planned Implementation and Initial Action Procedures

The Park's fire management plan will be communicated annually to all incident commanders within the Park's initial response area.

Smoke management activities are coordinated with the Great Basin Unified Air Pollution Control District or the Mojave Desert Air Quality Management District. Required actions are specified in Appendix E, 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.

One or more resource advisors will be ordered for each use of wildland fire project.

Public Information Regarding Use of Wildland Fire

Public information regarding use of wildland fire 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 use of wildland

fire incident that exceeds the first operational period. 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 Death Valley National Park and the localized nature of most fires, it is unlikely that a fire use event will generate significant media or political interest. However, 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.

Use of Wildland Fire 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 use of wildland fire project will have a permanent record developed which will be maintained in the permanent Fire Management files at Park headquarters. This record will include: 1) Wildland Fire Decision Support decision process documentation,2) digital fire maps with fire perimeter,3) monitoring reports and summaries of findings, along with a summary of all monitoring activities including a monitoring schedule as prescribed in the Death Valley National Park Fire Effects Monitoring and Research Plan (Appendix D), and4) cost accounting documents.

IV.C. Prescribed Fire

Every burn will be the subject of a burn plan as described in DO/RM #18: Wildland Fire Management. This document will describe the primary objective for the project, how other values will be protected during implementation, exactly how the burn will be carried out, and how success of the burn will be measured against monitoring objectives (Appendix D). A burn plan must be written by a qualified burn boss and approved by the Park Superintendent prior to implementation. Prior to approval of a burn plan, all applicable compliance actions must be completed and documented, including consultations with the State Historic Preservation Office, Tribes, and the U.S. Fish and Wildlife Service. Compliance with the National Environmental Policy Act must also be documented, including completion of an environmental assessment with public review if the project is not categorically excluded. Additionally, a burn permit must be obtained from the Great Basin Unified Air Pollution Control District or the Mojave Desert Air Quality Management District, depending on the location of the project.

Slash pile burns also require a burn plan, but do not have to be in the Five-Year Work Plan. All other prescribed fires should be identified in the Fire-Year Work Plan (Appendix F) and entered in the National Fire Plan Operating and Reporting System.

IV.D. Non-fire Fuel Treatments

The only fuel treatments proposed in Death Valley National Park are hazard fuel reduction immediately adjacent to Park owned structures and hazard fuel reduction in the campgrounds. Specific locations and projects are outlined in the Five-Year Work Plan (Appendix F).

Before fuel treatments are undertaken in habitat for the threatened desert tortoise, least bell's vireo, or southwestern willow flycatcher, the U.S. Fish and Wildlife Service must be consulted. Those areas of potential impact must be surveyed by a qualified biologist using a survey method prescribed by U.S. Fish and Wildlife Service and terms and conditions agreed upon by both parties must be followed. Such consultation should occur one year prior to planned implementation of the treatment.

IV.E. Burned Area 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 wildfire 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 that is infeasible, then 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. <u>Suppression Rehabilitation Plans</u>

Short-term rehabilitation plans are written by the Park's Resource Advisor or the Planning Section on the incident, 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 action should be assessed for suppression rehabilitation. Appropriate 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 suppression effects rehabilitation plan would address the following concerns:

- Hand lines will be rehabilitated by re-contouring 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 re-vegetation, and construction of waterbars as needed. Survey lines for cultural resources before rehab treatment.
- All trash and debris will be policed from camps, bases, staging areas, firelines, helispots and heliports.
- Re-vegetation of constructed fire lines may be necessary to mitigate impacts of suppression activities. If re-vegetation 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 Stabilization and/or Rehabilitation Plans

Long-term emergency stabilization and/or rehabilitation plans are usually prepared by a team of interdisciplinary rehabilitation specialists, are recommended by the Park Superintendent and approved or recommended (depending on dollar amount) by the Pacific West Regional Director or the NPS Fire Director. These plans are implemented by the Park over a period of one year for emergency stabilization treatments and three years for rehabilitation treatments. Such plans generally involve major expenditures of funds and are implemented to stabilize and 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. Federal fire funds are made available through established channels for assessment and implementation of approved actions. Allowable actions as well as planning and implementation procedures for post-fire treatments are found in the Departmental Manual on Wildland Fire Management Burned Area Emergency Stabilization and Rehabilitation (620 DM 3, current policy was released May 20, 2004). Further guidance is found in the NPS Burned Area Emergency Response Guidebook and Burned Area Rehabilitation Guidebook.

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 Death Valley National Park that should be considered during emergency stabilization and rehabilitation assessments.

- Areas occupied by listed threatened or endangered species, including aquatic habitats that could be affected by ash and sediment movement from burned areas upslope.
- Park infrastructure and private properties that are located on or adjacent to steep slopes where large areas upslope have burned.
- Abandoned industrial mining sites - of particular concern are those that include leach piles that may become destabilized and move downslope and those that include open shafts or adits that might have been compromised by the fire
- Numerous cultural resources, including both historic and prehistoric sites. Of particular concern are those sites that are exposed by the fire and are vulnerable to looting, such as lithics, ceramics, and habitation sites.
- Numerous rare plant species and communities, particularly those concentrations of rare species found in the Grapevine and Panamint Mountains.

Other issues of concern include the potential for spread of non-native plants, primarily red brome (*Bromus madritensis* ssp. *rubens*), cheatgrass (*Bromus tectorum*), Mediterranean grass (*Schismus arabicus*), and non-native mustards (*Brassica* spp. and *Sisymbrium* spp.). 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 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 2006).

V. ORGANIZATION AND BUDGET

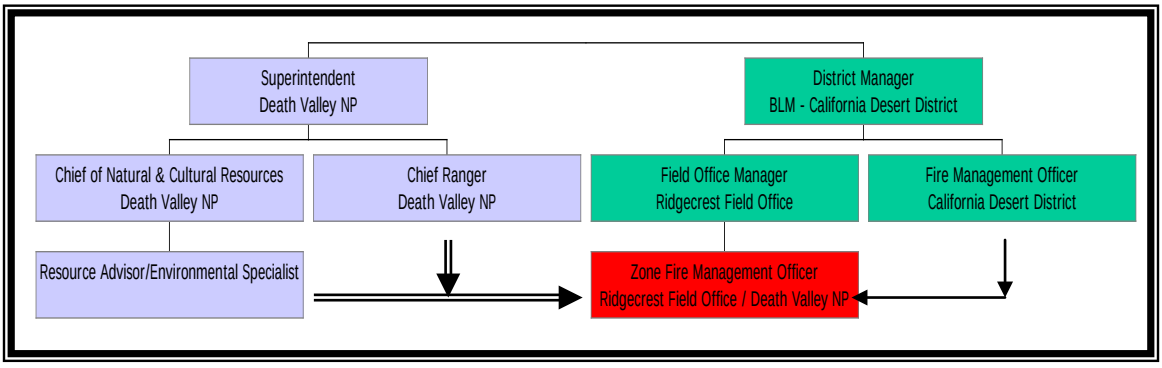
V.A. Organization

Fire management at Death Valley National Park is supported by an interagency framework. An USDI California Desert District Operations Plan defines this organization and responsibilities. In general terms:

> "The BLM District Manager and NPS Park Superintendent are responsible for their respective fire management programs. BLM Field Office Manager and NPS Chief Rangers manage the day to day fire programs in their respective zones as delineated in the management duty matrix (refer to CDD-Operations Plan). Zone Fire Management Officers work directly for the BLM Field Office Manager and NPS Chief Ranger and will be assigned to all zones."

Program guidance will be provided to the Zone Fire Management Officer by the both the California Desert FMO and/or the NPS Regional FMO. Division chiefs at Death Valley all have a responsibility to support the fire management program and incident management occurring within the Park. Coordination between division personnel, key staff and interagency cooperators is critical to the implementation and continued success of this plan. An organizational chart for fire management at Death Valley National Park is shown as Figure 13.

Figure 13. Fire organizational chart at Death Valley National Park.



The following positions have direct responsibility for the implementation of the Death Valley National Park fire management program.

Regional Director, Pacific West Region

Authority for the approval of this plan rests with the Regional Director of the Western Region, National Park Service.

Superintendent

The Superintendent of Death Valley National Park is responsible for implementation of this plan. Under normal conditions, implementation authority and responsibility is delegated to the Chief Ranger for fires within the administrative boundary of the Park. The Superintendent is responsible for periodic assessment signature to certify that continued management of use of wildland fire actions is acceptable. Under certain conditions, the Superintendent may delegate this responsibility to another organizational level.

Visitor and Resource Protection

Visitor and Resource Protection management includes the Chief Ranger and District Rangers. The Chief Ranger, with the assistance of the Fire Management Officer (FMO) is responsible for assuring that qualified personnel manage each fire. All personnel assigned will meet the NPS qualifications as outlined in Interagency Incident Management Qualifications System, and the National Park Service Wildland Qualification System. The Chief Ranger also helps (with the Chief of Resource Management) define treatment objectives. The Chief Ranger is responsible for assigning an Incident Commander (IC) during the 1st burn period. Public and employee safety objectives are the responsibility of Resource Protection and Public Use Management.

Fire Management Officer (BLM position)

The Zone Fire Management Officer (FMO), duty stationed at the Bureau of Land Management Ridgecrest Field Office, serves as the Park's FMO. The FMO makes all operational decisions in a manner that demonstrates sensitivity to the NPS mission as well as an understanding of agency policies and guidelines. To further this ends, the FMO attends NPS conferences and trainings, representing the Park at the annual NPS FMO conference. The FMO is responsible for direct coordination and management of all wildland fire activities within the administrative boundary of the Park. The FMO reports directly to the Chief Ranger and serves as liaison with the Bureau of Land Management and the Forest Service. Management activities will include training, maintenance of equipment (RAWS), wilderness exceptions, funding requests, and documentation and record keeping (1202 process, fire reports/supplemental, oversight of RAWS data). Project definitions and the assignment of incident personnel is also the responsibility of the FMO. In addition, the FMO is responsible for the assignment of the duty officer and decides on a case-by-case basis, whether a fire monitor will be required.

Resource Management

The Chief of Resource Management is responsible for assigning the Resource Advisor and delineates resource objectives for fire management. The Chief of Resource Management also takes the lead in evaluating fire effects and helps (with the Chief Ranger) define treatment objectives. The Chief will also propose and secure funding for fire ecology research projects in support of subsequent plan revision. During incidents, the Chief will coordinate resource advisor participation, and will serve as backup advisor to the Incident Commander. The Chief is responsible for initiating burned area emergency stabilization and rehabilitation treatments as needed to secure the long-term ecological health and productivity of burned lands.

Cultural Resources Specialist

The Cultural Resource Specialist will serve as a Resource Advisor to the Fire Management Officer or an Incident Commander regarding cultural resource matters.

V.B. Funding

Death Valley National Park does not currently receive any annual funding from the NPS Fire Program. The Park's fire program is primarily supported by a few thousand dollars set aside each year from the Park's operating budget. These dollars are sometimes augmented with need-specific funds (i.e. fire cache supplies, engine maintenance) made available from the Pacific West Region's Fire Program.

V.C. Interagency Coordination for FMP Implementation

For Wildland Fire Management, Death Valley National Park falls within the operational coordination area of the Federal Interagency Coordination Center (FICC) at San Bernardino, California. All interagency dispatching and requesting of resources will be completed through FICC. The Zone Fire Management Officer for Death Valley National Park is the primary contact between the Park and FICC. FICC provides services on indices, fire weather, cache support, resource coordination and mobilization as well as flight following and incident aviation support.

The Zone Fire Management Officer works with key Park staff in the annual review of documents, plans and agreements that may need revision. Some of these plans and documents include; dispatch plans, incident qualifications, and run cards.

The Zone Fire Management Officer with key Park staff, works with, coordinates and maintains contacts with Park neighbors that include:

- BLM California - Ridgecrest Field Office, Barstow Field Office, Bishop Field Office
- BLM Nevada – Tonopah Field Office, Las Vegas Field Office
- Forest Service – Inyo National Forest

- California Department of Forestry and Fire Protection – Owens Lake Unit
- County Entities within Nevada that include;
    - Nye County
    - Esmeralda County
- County Entities within California that include;
    - Inyo County
    - San Bernardino County

V. D. Fire Related Agreements and Contracts

The Zone Fire Management Officer maintains a current copy of all wildland fire agreements, which are available at the Ridgecrest Field Office. Annual updates to national agreements can be found and referenced in the National Mobilization Guide.

The most current fire-related agreements are the charters for the California Desert Fire Planning Unit and the Southern Nevada Fire Planning Unit for the Fire Program Analysis. Other interagency and mutual aid agreements pre-date the establishment of the Fire Planning Units. 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.

Death Valley National Park 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, 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.

Additional details regarding existing agreements can be found in Appendix G: Operational Considerations.

VI. MONITORING AND EVALUATION

VI.A. Operational Reviews

Annual readiness reviews of the Death Valley wildland fire engine are conducted in the spring by the Zone Fire Management Officer. 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.

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

VI.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 Death Valley National Park 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 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 post-burn; 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 post-burn monitoring. This long-term change monitoring continues until the area is again treated with fire.

At Death Valley National Park, 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 Zone Fire Management Officer. If fire or fire suppression poses a risk, strategies are developed to mitigate that risk.

At Death Valley National Park, fire observation monitoring (level 2) is required for both fire suppression actions and use of wildland fire. Fire suppression requires only reconnaissance monitoring while use of wildland fire 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-fire 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 D)

As burn plans are developed for specific prescribed fire projects outlined under this Fire Management Plan, implementation of level 3 or level 4 monitoring will be determined. In general, burns undertaken for slash pile removal or for traditional cultural practices will not require vegetation monitoring. Additional details of fire effects monitoring is discussed in the Death Valley National Park Fire Effects Monitoring and Research Plan (Appendix D).

VI.C. Annual Update of Fire Management Plan

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, generally in January or February. The purpose of this review is to assure that fire management planning documents are pertinent and up-to-date with current resource information, new policies, and improved 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 2007 documents.

VII. CONSULTATION AND COORDINATION

This Fire Management Plan has been under development for several years, with changes in personnel and fire management policies. It was developed by Death Valley National Park staff, staff from other parks, and the Ridgecrest Bureau of Land Management staff. Early drafts were shared with the Timbisha Shoshone Tribal Council and revisions were made based on their suggestions. Additionally, an early draft was given to members of the Death Valley National Park Advisory Commission on October 28, 1999.

Because implementation of this fire management plan has the potential to affect the federally threatened desert tortoise, endangered least Bell's vireo and southwestern willow flycatcher, an Endangered Species Act Section 7 consultation with the U.S. Fish and Wildlife Service will be necessary. All Federal agencies that are engaged in management activities that affect listed species are required to consult with the Service in order to determine the magnitude of potential impacts from different management actions, and devise actions that will eliminate or mitigate impacts to threatened or endangered species. Potential impacts of the proposed fire management actions were analyzed in a biological assessment prepared for the Park's General Management Plan. A biological opinion was issued by the U.S. Fish and Wildlife Service (2001) that identified non-discretionary terms and conditions that have been incorporated throughout this Fire Management Plan and its appendices. Project specific consultation will be initiated as needed for fuel treatments and prescribed fires that have the potential to impact endangered species.

The Smoke Management document (Appendix E) will be prepared in consultation with the Great Basin Unified Air Pollution Control District and the Mojave Desert Air Quality Management District.

The Fire Management Plan and its appendices will be submitted to the State Historic Preservation Offices of California and Nevada as well as to the Timbisha Shoshone Tribe for review and consultation.

A separate environmental assessment for this Fire Management Plan will be prepared in compliance with the National Environmental Policy Act and made available with the Fire Management Plan and its appendices for a 30 day public review period. Following the close of the public review period, the comments received will be analyzed, along with any other new information, and a management decision will be made and announced.

VIII. PREPARERS

This document was several years in development. It was first drafted by Dana York, former botanist at Death Valley National Park, and later revised by Sandee Dingman, biologist at Lake Mead N.R.A., under the direction of Chief Ranger Nancy Wizner. The following people were involved in the development of this Fire Management Plan. They provided assistance in identifying issues, developing alternatives or analyzing impacts. They did not necessarily review the entire or the final Fire Management Plan, nor do they necessarily recommend the proposed action or agree with all of the material presented.

Richard Anderson	Former Environmental Specialist, Death Valley N.P.
Terry Baldino	Chief of Interpretation, Death Valley N.P.
Bill Blake	Former Chief Ranger, Death Valley N.P.
Charlie Callagan	Park Ranger (Interpretation), Death Valley N.P.
Ken Castro	Former Fire Management Officer, Lassen Volcanic N.P.
Tim Canaday, Ph.D.	Former Archeologist, Death Valley N.P.
Kevin Chambers	Former Zone Fire Management Officer, Ridgecrest BLM
Tim Croissant	Former Biological Science Technician (Plants), Death Valley N.P.
Ed DeRobertis	Assistant Chief Ranger, Death Valley N.P.
David Ek	Asst. Chief of Resources Management, Death Valley N.P.
Linda Greene	Chief of Resources Management, Death Valley N.P.
Chuck Heard	Fire Management Officer, Mojave National Preserve
Linda Kerr	Former Prescribed Fire Specialist, Grand Canyon N.P.
Brian Knaus	Former Biological Sciences Technician (Plants), Death Valley N.P.
Sara Koenig	Former Biological Sciences Technician (Wildlife), Death Valley N.P.
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Jim Roche	Former Physical Sciences Technician, Death Valley N.P.
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Don Washington	Zone Fire Management Officer, Ridgecrest BLM
Vicki Wolfe	Park Ranger (Interpretation), Death Valley N.P.

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