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REDWOOD NATIONAL PARK

AUGUST 1985



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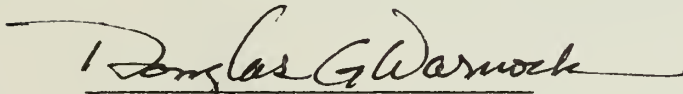
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FIRE MANAGEMENT PLAN
REDWOOD NATIONAL PARK

An Amendment to the Resources Management Plan

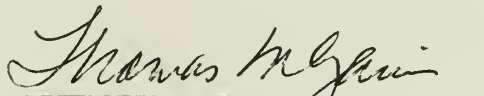
AUGUST 1985

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REDWOOD NATIONAL PARK FIRE MANAGEMENT PLAN

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I. INTRODUCTION

A. Overview

Fire is a natural environmental factor which has played a varied but important role in shaping the plant and animal communities of Redwood National Park and the three California State Parks included within the Congressionally authorized boundary. Fire's public image of a totally destructive agent has changed through the years; now fire is generally accepted as a beneficial agent which, under prescribed conditions, can be used to help achieve resources management objectives to protect and preserve natural environments.

The National Park Service, in its management policies (USDI 1978), recognizes the natural role of fire in park ecosystems and allows use of fire under prescribed conditions as a natural process in park ecosystems. Restoring fire's natural role in Redwood National Park would be a relatively simple task if the park were isolated from timber lands, cattle ranches and other public and private property. However, the threat of fire to adjacent lands significantly affects the fire management process.

This plan describes a fire management program which includes limited prescribed natural fire and prescribed burning. Many factors have been addressed to produce a plan based on ecosystem needs while not compromising protection of park resources and adjacent lands. This plan is an amendment to Redwood National Park's Resources Management Plan (USDI 1984).

Resources within Prairie Creek Redwoods, Del Norte Coast Redwoods and Jedediah Smith Redwoods State Parks are discussed; however, no fire management is proposed or recommended for the State Park lands with the exception of the existing suppression aid agreement presently in force.

B. Objectives of the Fire Management Plan

- To provide a clear and detailed statement policy with respect to wildfire and management fire within the park.
- To guide management actions in wildfire prevention and control in implementing that policy.
- To establish policies which will avoid or minimize expenses and limit natural and cultural resource damage during wildfire suppression.
- To predetermine, as clearly as possible, the conditions (prescriptions) under which fires may be allowed to burn as management fires and the consequences of nonsuppression.
- To provide policy guidelines on the experimental use of fire.
- To identify additional information needed to improve the understanding of the role of fire in park vegetation and to contribute to refinement of the fire management plan.

-To fully inform park neighbors and cooperating agencies of park fire policies.

C. National Park Service Fire Management Policy

The National Park Service has developed the following policy (USDI 1978) for fire management:

"The presence or absence of natural fires within a given ecosystem is recognized as a potent factor stimulating, retarding or eliminating various components of the ecosystem. Most natural fires are lightning-caused and are recognized as natural phenomena which must be permitted to continue to influence the ecosystem if truly natural systems are to be permitted.

"The fire management program of all parks must be designed around park objectives. In natural systems this may include the need for some areas to proceed through succession toward climax while others are set back by fire. Natural zones should represent the full spectrum of the parks' dynamic natural vegetative patterns. Sharply defined zones or blocks of vegetation limited to certain species locked in over time are not natural and only rarely justified. In historic zones fires may be controlled or used to perpetuate the historic scene.

"Management fires, including both prescribed natural fires and prescribed burns, are those fires which contribute to the attainment of the management objectives of a park through execution of predetermined prescriptions defined in detail in the Fire Management Plan, a portion of the approved Natural Resources Management Plan.

"Prescribed natural fire is the preferred means to achieve the prescriptions in natural zones. This use of natural ignition may be adopted when analysis of past fire occurrence, distribution, control, and influence, indicates that natural vegetative accumulation and composition has not been significantly altered by past management of fire control. It may also be used where the prescription provides for a transition from an altered state back to historic fuel loading.

"In ecosystems modified by prolonged exclusion to fire, prescribed burning may be used to restore fuel loading or vegetative composition to natural levels followed by a prescribed natural fire program, or to create narrow fuel breaks along boundaries of a fire management area and thereby reduce the probability of wildfires crossing into or out of that area.

"Prescribed burning may be used as a substitute for prescribed natural fire in natural zones only where the latter cannot meet park objectives. This determination will be documented in the Fire Management Plan. In natural zones, the objective for prescribed burning is to simulate, to the fullest extent, the influence of natural fire on the ecosystem. In other zones it may be used to recreate or perpetuate a historic setting or to attain other resources management objectives.

"Clearly defined limits will be established in the prescription of all management fires, beyond which limited or complete control action will be undertaken.

"Management fires in the park will be suppressed if they threaten:

- human life;*
- cultural resources or physical facilities of the park;*
- threatened or endangered species;*
- to escape from predetermined zones or from the park, except here cooperative agreements exist for certain fires to cross such boundaries; or*
- to exceed the prescription.*

"All fires not classified as management fires are 'wildfires' and will be suppressed.

"An active fire prevention program will be conducted in all parks and in conjunction with other agencies to protect human life, prevent modification of park ecosystems by human-caused wildfire, and prevent damage to cultural resources or physical facilities.

"Human-caused fires will be controlled to prevent damage and to eliminate impact to the park ecosystems.

"The fire suppression methods used in the parks should be those causing the least resource damage, commensurate with effective control.

"Cooperative agreements will be developed to facilitate reciprocal fire management activities for land within and adjacent to the parks."

D. Redwood National Park Resources Management Objectives

The following resources management objectives from the Statement for Management (USDI 1984) are relevant to fire management planning:

- Restore and maintain the natural ecosystems of the park as they would have evolved without disturbance by human technology;
- Cooperate with other government agencies and private interests in planning for the management and use of resources adjacent to the park;
- Maintain old-growth and restore cutover redwood groves [forests] to perpetuate the prime scenic resources.

Within the framework of National Park Service fire management policy and Redwood National Park's resources management objectives, the overall goals of the fire management program at Redwood National Park are to:

- Determine the natural role of fire in the vegetation of the park and man's recent impact upon it, if any;
- Restore fire's natural role to park ecosystems while limiting risk to the resources of adjacent lands;
- Determine the effects of fire upon second-growth forests and other disturbed park resources and, if appropriate, develop fire management strategies which will contribute to the restoration of these ecosystems.

The goals of the fire management program will be accomplished by:

- Continuing the experimental and applied use of prescribed burning;
- Developing guidelines for determining areas in which natural and incendiary fires are allowed to burn within prescription, provided they meet approved resources management objectives;
- Maintaining an active fire prevention program to reduce the incidence of human-caused wildfires;
- Suppressing all fires that threaten life, park developments or adjacent lands and property;
- Taking special precautions to preserve historical/cultural resources and threatened/endangered species.

II. AREA DESCRIPTION

Detailed descriptions of the park's resources are contained in the Draft Environmental Statement for the General Management Plan (USDI 1979a), along with the Resource Maps Supplement (USDI 1979b) to the environmental statement for the General Management Plan (USDI 1980a), the Watershed Rehabilitation Plan (USDI 1980b) and the Resources Management Plan (USDI 1984).

A. Regional and Local Setting

Redwood National Park is situated in extreme northwestern California (see Regional and Redwood National Park maps on the following pages), between Crescent City and Eureka in Del Norte and Humboldt counties. The 106,000 acre park includes some 35 miles of Pacific Ocean shoreline. Three major streams, the Smith and Klamath Rivers and Redwood Creek, flow through park lands. Three California State Parks are within the established boundaries - Jedediah Smith, Del Norte Coast and Prairie Creek Redwoods State Parks.

B. Topography

Redwood National Park has two distinctive physiographic environments - the coastline and the mountains of the Coast Range. The coastline is, for the most part, undeveloped by humans. It is rugged and rapidly eroding with stretches of steep, rocky cliffs broken by rolling slopes that are covered by grass and brush. The tidal zone is rocky and difficult to traverse, except where sandy beaches have developed such as Gold Bluff, Crescent and Freshwater beaches.

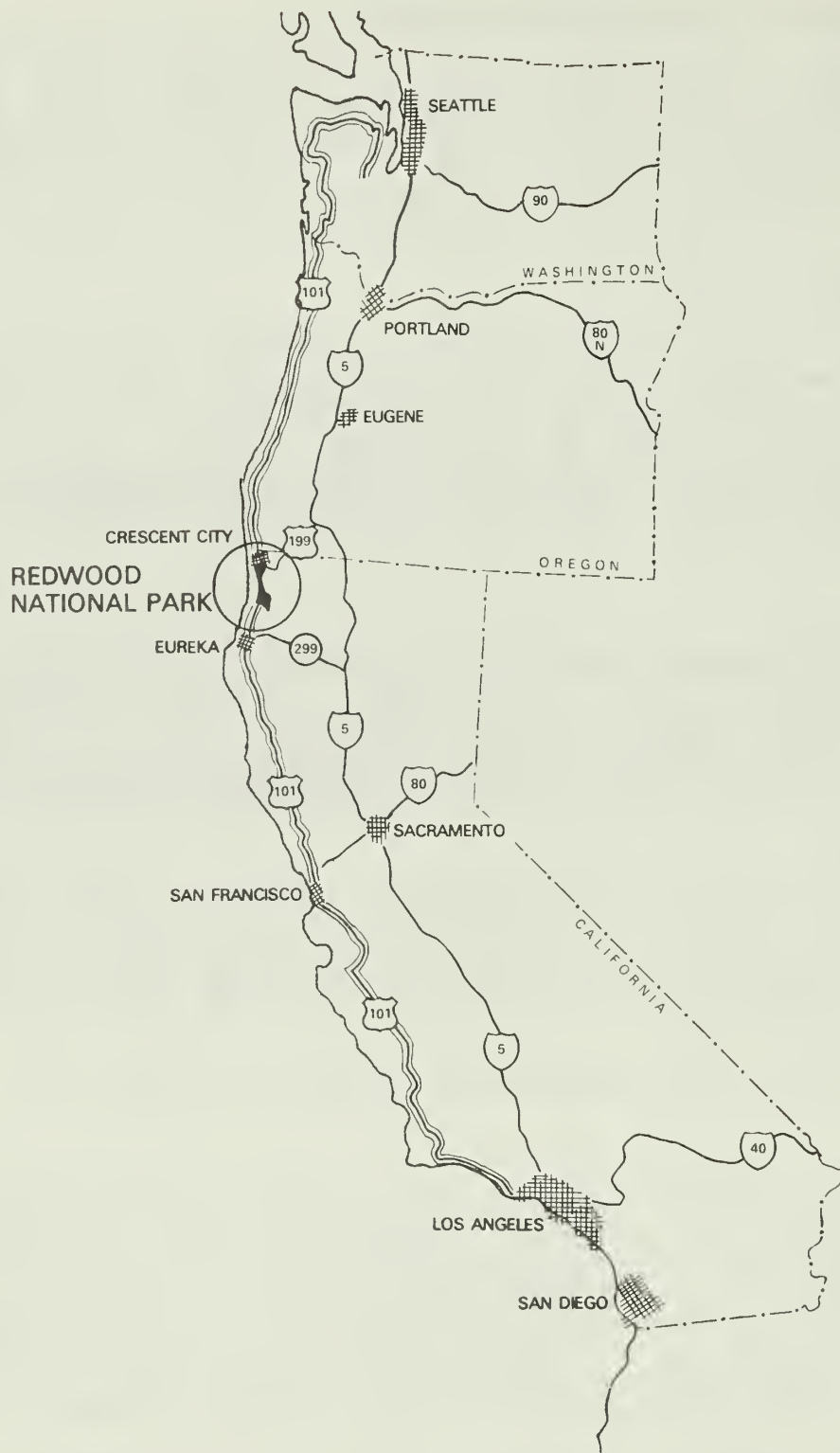
Inland from the coast lies the physiographically dominating Coast Range. Major streams and ridgelines trend northwesterly. The gently rounded summits of the mountains contrast with the steep sideslopes that have been deeply incised by streams. Elevations within the park range from sea level to 3,097 feet at Schoolhouse Peak.

More detailed descriptions of the topography are provided in Section IV G.

C. Geology

The bedrock beneath Redwood National Park is primarily of the Franciscan assemblage, a collection of sandstones, siltstones and minor amounts of conglomerates. There also are isolated exposures of chert and volcanic greenstones. These rocks are thoroughly folded, sheared and jumbled. The Franciscan is bounded on the southwest by the San Andreas fault, which is several miles off the coast, and on the east by the South Fork Mountain fault. The South Fork Mountain fault runs through the northeast corner of Redwood National Park in the Little Bald Hills area. Secondary faults are common.

The Franciscan assemblage was laid down on the ocean floor as deposits of sand and mud about 150 million to 100 million years ago. Continental drift and associated plate movements caused the Franciscan assemblage to collide with the



LOCATION
Redwood National Park



REDWOOD NATIONAL PARK

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continent, and eventually it uplifted to become the Coast Range. Continued folding and faulting complicated the Franciscan assemblage.

Just east of Crescent City, Redwood National Park contains small remnants of marine and non-marine sedimentary deposits that are approximately 11 million years old. The park also includes a small corner of the Point Saint George marine terrace.

The other major geologic formation in the park is a deposit of loosely consolidated sediments that are primarily fluvial in origin and informally known as the Gold Bluffs formation. It is exposed along Gold Bluffs Beach and in the Prairie Creek drainage basin. The Gold Bluffs formation is thought to be a river delta deposit laid down by the Klamath River more than 2 million years ago.

D. Soils

The soils in Redwood National Park are primarily derived from the Franciscan assemblage. Residual soils are confined mainly to patches on sloping ridge crests, except for those developed on the Gold Bluffs formation. There also are alluvial soils in the park that developed on floodplains, in alluvial valleys and on terraces of major streams and rivers. Variations in soils types are controlled primarily by the topography and varying rock types in the underlying Franciscan assemblage. Local variations may result from microclimatic differences influenced by slope and aspect.

E. Vegetation

The region encompassing the present parklands is primarily forested with small areas of prairie and coastal scrub. Sitka spruce dominates the forests immediately adjacent to the ocean. Inland of the spruce forests, coast redwood dominates with Douglas-fir, tan oak, hemlock and grand fir occurring as common associates. With increasing elevation and increasing distance from the ocean, redwood becomes less abundant. Beyond 10 to 15 miles inland, redwood is rare and forests are dominated by Douglas-fir, except where serpentine soils provide habitat for a specialized vegetation. A list of common and scientific plant names is given in Appendix A. Park vegetation maps are available separately.

While extensive alteration of both the forests and non-forest vegetation has occurred, their distribution is essentially the same now as described in the first written records. Since 1850 more than 50,000 acres of redwood vegetation now within the park have been clearcut or selectively harvested. Most of the timber harvesting has occurred since 1950. Additional forest land has been less modified. Limited tree cutting in some areas left a largely intact canopy. Prospecting, pasturage, burning of understory and other minor disturbances also resulted in forest changes.

Much of the Sitka spruce forest was logged prior to 1940 for box making and airplane structural members. In the Gold Bluff area other spruce stands were cut or burned during the gold mining area.

Of the parklands subjected to timber harvest, essentially all are in some phase of forest regeneration. Native tree species dominate the second-growth although some exotic trees have become established. Coastal and moist sites support alder and spruce, and the fast growing but short-lived alder are eventually replaced by spruce. Mesic sites away from the immediate coast support second-growth stands of varying age classes with redwood and Douglas-fir dominating. Hemlock and spruce are also well represented. Douglas-fir is over-represented in the youthful second-growth stands. An evaluation of second-growth redwood vegetation is underway to define the probably long-term stand development. One spruce stand near Crescent City was successfully converted to pasture after logging in the 1920's. The re-establishment of forest there is expected to be slower, probably passing through an old field - coastal brush - forest succession.

Grasslands within the park have been greatly modified through agricultural use, including grazing, and now are largely composed of exotic grasses and Eurasian weeds. They are similar in appearance to the native grasslands but differ in composition. Plant succession in the prairies may lead to development of brushlands or forest. Several instances of Douglas-fir invasion into the inland prairies and adjacent Oregon white oak woodlands since 1850 have been observed in the park and are usually related to disturbance by domestic livestock, road building and lack of fire. Other factors such as climatic change may have contributed to shifts in vegetation.

Other minor vegetation types include chaparral and Jeffrey pine on serpentine, alder stands, freshwater marsh, nearshore and dune vegetation. Specific descriptions of the vegetation are provided in Section IV G: Fire Management Unit Descriptions.

F. Rare, Threatened and Endangered Plants

Coastal bluffs, rock outcrops, streamsides, wet meadows, bogs and serpentine soils host the majority of the rare plants of Redwood National Park. In comparison heavily forested areas contain few rare plant species. The majority of the rare plants in the park occur within one harsh environment, the serpentine/periodotite rock belt stretching across northern Del Norte County. Here few nutrients are available for plant uptake because of the ultra basic (high pH) soil chemistry and its poor water holding capacity. Sparse vegetation survives in this area (Little Bald Hills) despite annual rainfall of 100 inches.

Redwood National Park's list (Table 1) of rare, threatened or endangered plants was developed by combining the following:

1. Species currently listed by the U.S. Fish and Wildlife Service as endangered or threatened (USDI 1983a).
2. Species currently under review for Federal listing as endangered or threatened (USDI 1983b).

Table 1: Rare, Threatened or Endangered Vascular Plants
In or Near Redwood National Park

Taxa	Status			Habitat
	USFWS ¹	CALIF ²	CNPS ²	
<i>Bensoniella oregana</i> (Abrams & Bulig) Morton. Oregon <i>bensoniella</i>	C	R	E	Heads of streams, edges of wet meadows. May be restricted to fog belt 2,000-5,000 feet. This species is probably not in the park, but should not be eliminated from consideration.
<i>Erigeron delicatus</i> Cronq. Del Norte fleabane	-	-	3	Rocky cliffs above rivers and streams in old-growth redwood, Douglas-fir. Known in the park.
<i>Erigeron supplex</i> Gray Supple daisy	C	-	1B	Occurs along Humboldt and Mendocino seacoasts. Has been collected south of the park.
<i>Erigonum pendulum</i> Wats. Waldo erigonum	C	-	2	Serpentine dry slopes or ridge tops, along streams or in disturbed areas, mixed evergreen forests less than 3,100 feet. Collected north of the park.
<i>Grindelia stricta</i> D.C. ssp. <i>blakei</i> (Steyserm.) Keck Humboldt Bay gum	C	-	1B	Coastal salt marsh and bluffs, coastal strand, north coastal scrub. Collected north and south of park.
<i>Lilium occidentale</i> Purdy Western lily	C	E	1B	Former range included park lands. Collected south of park in north coastal scrub, coastal prairie.
<i>Lilium vollmeri</i> Eastw. Vollmer lily	-	-	3	Wet areas, serpentine. North coastal coniferous forest.
<i>Oenothera wolfii</i> Raven, Dietrich & Stubbe. Wolf's evening-primrose	C	-	3	Coastal bluffs, gravel road-bank near coast. Known in the park.
<i>Phacelia argentea</i> Nels & Macbr. Sand dune phacelia	C	-	1B	Coastal strand, Del Norte to southwest Oregon. Historically collected within present park boundaries. Present status unknown.
<i>Viola lanceolata</i> L. ssp. <i>occidentalis</i> (Gray) Russell. Western bog violet	-	-	1B	Wet area, on and off serpentine, mixed evergreen forest. Has been collected north of the park.

1 - Status of species in 48 FR 34194, July 27, 1983 and 48 FR 53630, November 28, 1983. USFWS. Endangered and Threatened Wildlife and Plants; Review of Plant Taxa for Listing as Endangered or Threatened Species.

C = Candidate species currently under review for listing as endangered or threatened.

2 - Species designated as endangered or rare by the State of California. 1984. Department of Fish and Game. Endangered Plant Program, Sacramento, California.

3 - Species listed as rare or endangered by the California Native Plant Society: Smith, J. P. and R. York. 1984. Inventory of Rare and Endangered Vascular Plants of California. Special Publication No. 1 Third Edition. CNPS. Berkeley, CA.

1B = Plants rare and endangered in California or elsewhere.

2 = Plants rare and endangered in California, common elsewhere.

3 = Plants for which more information is still needed.

3. Species designated as endangered or rare by the State of California (California, State of 1984).
4. California Native Plant Society's (CNPS) list of plants presumed extinct in California or elsewhere (List 1a, Smith and York 1984).
5. CNPS' list of plants rare and endangered in California or elsewhere (List 1b, Smith and York 1984).
6. CNPS' list of plants rare and endangered in California - common elsewhere (List 2, Smith and York 1984).
7. CNPS' list of "Plants for Which We Need More Information" (List 3, Smith and York 1984).

A species currently under review for Federal listing as endangered or threatened (category 2 or "candidate" species) does not have legal status or protection under the Federal Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq*). It is National Park Service policy, however, to treat candidate species as if they were listed (Chapman 1981).

Some species not on Federal lists, but only on State lists, have been included on Redwood's list. Many of the species included in Table 1 have not been noted or collected within the park. Because they have been found nearby in similar habitats; however, it is possible they would also be within park boundaries. They have been included at the recommendation of local botanists familiar with the area. The list is current as of October 1984 and is subject to change from time to time as new information becomes available.

G. Wildlife

The wildlife of the park includes a broad spectrum of the common species of the Pacific states. The mammals, birds, marine mammals, marine and anadromous fish and other marine groups include migratory species while the remaining groups and species are essentially resident. Within the National and State Parks, roughly 50,000 acres of native vegetation remain more or less intact. Most of the elements of the terrestrial faunal systems, especially those associated with the forests, remain intact.

Certain species of particular economic value or hazard have been strongly modified since 1850. The grizzly bear was known to be in the area, but is now extinct. The Roosevelt elk was hunted nearly to extinction by the end of the 19th century, but remnants persisted and with protection, have extended their range back into areas formerly utilized. The larger groups are found in and around the Bald Hills area within the Redwood Creek watershed and in Prairie Creek Redwoods State Park. A list of scientific and common animal names is given in Appendix B.

The mountain lion, black bear, bobcat, blacktailed deer and other larger vertebrates may be exposed to continued hunting and/or predator control outside the park, but with adequate habitat conservation, there is

probably little concern for their persistence as integral elements of the natural system. The mountain lion, because of its wide ranging character, is afforded the least protection by available park habitat.

Several exotics, including muskrat and porcupine, have been successfully introduced or have invaded the area subsequent to suitable alteration by humans.

Freshwater aquatic systems have been greatly modified by utilization, introduction of exotics and habitat alteration. These systems will continue to be degraded where streams continue to be exposed to modification. Marine systems are described generally for the park area in Boyd and DeMartini (1977). Beyond the local extirpation of the sea otter and reduction of salmonids, little change has occurred.

No threatened or endangered fauna are known to reside in the park. Brown pelicans, peregrine falcons and bald and golden eagles are seasonal transients.

H. Climate

The climate of near coastal northwestern California and southwestern Oregon is temperate with rainy winters, rainless summers and coastal fog. Mean annual precipitation at Crescent City is 70 inches; at Klamath, 87 inches; and at Orick, 69 inches. Rainfall often exceeds 100 inches per year in interior portions of the park. Seasonal temperatures are moderated by the influence of the Pacific Ocean, becoming more extreme inland. Snow is uncommon, occurring at higher elevations within the park two or three times a year and usually melts rapidly. At Crescent City, the mean annual temperature is 52.6°F. The mean daily maximum and minimum temperatures are 60.4°F and 44.8°F respectively. The maximum recorded high temperature was 92°F and the lowest recorded temperature was low of 24°F. At Orick (Prairie Creek), the daily mean maximum is 61.1°F and the minimum is 42.8°F.

The prevailing winds are westerly. Winter storms are usually intense with heavy rainfall and high winds, mixed with intervals of generally fair weather. In summer, upwelling of cold water results from nearshore currents in combination with onshore breezes. This combination produces frequent low level coastal cloudiness of varying thickness which often resembles a dense fog. This "fog" comes and goes on a daily basis and in response to regional weather patterns. Fog and low lying clouds are present an estimated 90 to 120 days each year and limit the coastal area to about 50 percent of available sunshine each year. Near the coast, the fog lessens the effects of summer drought by directly contributing moisture via fog drip and reducing evapotranspiration.

Weather information for the park is available from the National Weather Service stations in Eureka and Crescent City. The California Department of Forestry issues fire weather information originating at Gasquet and Schoolhouse Peak. Temperature and precipitation data are collected at Prairie Creek Redwoods State Park Headquarters. Additional data (wind speed and direction, temperature and humidity) has been collected for the Little Bald Hills Area through a cooperative effort with the California-Nickel Corporation.

I. Fire Weather

The normal fire season for coastal northwestern California begins during June and persists into September, but may be expanded during drought periods by about two to three months. In 1976, for example, only 2.9 inches of precipitation fell at Eureka during the 6-month period of May through October. Although the Eureka weather station generally receives less precipitation than points farther east or north, weather data collected at Eureka over a long-term is useful in defining the fire season. The 6-month precipitation mean for a 105-year period at Eureka is 6.33 inches (May through October); however, if only a 4-month period is considered, the same record shows only 1.89 inches (June through September). Although critical fire weather may occur at any time during the fire season, large fires occur most frequently during September. Fire weather becomes especially critical during periods of low humidity, strong westerly or easterly winds and low fuel moistures. Near the coast, fuels in the larger size classes, especially in exposed habitats, are at their lowest moisture content during late summer and early autumn. Even then, coastal fog and high humidity recovery are common during the night.

Lightning caused fires are most frequently associated with the "Closed Low Aloft" weather pattern where high cold, unstable air masses, trapped in the westerlies, move inland (Sibley 1979). If moisture is abundant, thunderstorms can develop. Since this is an upper level disturbance, bases of thunderstorms are high. Rainfall may evaporate before hitting the ground and the possibility of dry lightning increases. Tall trees near openings or isolated in prairies are prime targets for lightning strikes.

J. Air Quality

The 1968 Federally-owned portions of Redwood National Park are mandatory Class I air quality areas defined under the Clean Air Act Amendments of 1977. All other parklands are currently Class II, with some State owned portions being considered for redesignation to Class I.

A Class I and Class II status requires that the air quality of the park remain cleaner than the National Ambient Air Quality Standards. An important provision of the Clean Air Act Amendments is the prevention of significant deterioration in areas where good air quality currently exists. Class I status allows very little additional deterioration of air quality. Class II status allows moderate deterioration that might accompany well planned growth.

Under the Clean Air Act Amendments, the Federal Land Manager has an affirmative responsibility to protect the Air Quality Related Values of a Class I area. Park values such as vegetation, visibility, odor, fauna, geological resources, cultural resources, soils and water quality all may depend on clean air and park management is charged with protecting these resources.

In addition, Section 118 of the amendments has had an influence on prescribed fire programs:

"Each officer, agent, or employee of the Federal Government must comply with Federal, State, interstate, and local requirements concerning control and abatement of air pollution to the same extent that any other person must when the person is subject to the same substantive or procedural requirements. The President may grant an exemption to the requirements of this section under certain circumstances and conditions."

Air quality in and around Redwood National Park is generally good. The North Coast Air Basin has been declared an "attainment" area for all criteria pollutants. Some particulate emission problems still exist from industrial wood burning and visibility is occasionally impaired by smoke from lumber mills. However, particulate emissions were reduced by 55 percent from 1970 to 1976 (from 104 to 47 tons per day) and further reductions are expected.

Air quality monitoring stations operated by the Humboldt County Air Pollution Control District exist near the park in Crescent City (5 miles west) and Arcata (30 miles south). Particulates are the primary pollutants monitored. Testing for other emissions such as nitrous oxides, carbon monoxides and sulfur oxides occurred in the early 1970's, and all results were well below the National Ambient Air Quality Standards.

K. Cultural Environment and Resources

The prehistoric, historic and contemporary Native American cultural resources of Redwood National Park cover a time span of at least 4,000 years. The original peopling of the region and subsequent events of human prehistory are not yet documented. However, during the first significant contact between Europeans and Native Americans in northwestern California (around 1830 - 1850), three ethnolinguistic groups occupied what is now Redwood National Park. The Yurok inhabited the coastal strip from Wilson Creek in the north to the modern town of Trinidad in the south, as well as the lower 45 miles of the Klamath River. Tolowa territory extended north from Wilson Creek to just north of the Oregon border and about 30 miles inland. The Chilula lived in the Redwood Creek drainage inland from Yurok territory. Their territory extended along the creek from a few miles above the mouth to a few miles above Redwood Valley and probably to the crests of the ridge systems on either side of the creek.

The historic sequence of events within what is now Redwood National Park has been described by Bearss (1969) and Barker (in Bickel 1979). Although sea exploration along the northern California coast began in the 1500's, it was not until the 1800's that significant White-Indian contact began. During this period trappers and traders visited both coastal and inland areas. With the discovery of gold in the Trinity region in 1848, there was a growth of new settlements, trade, homesteaders and ranchers. Conflict between Whites and Indians was intense; native populations were greatly decimated and the military establishment of forts and reservations followed. In the latter part of the 19th century, the commercial pursuits began and continue today: logging, fishing and agriculture. After World War II, tourism increased in importance.

The cultural resources of Redwood National Park reflect the sequence of prehistoric and historic events outlined above. Prehistoric cultural resources include: major villages along the coast and rivers and inland in the northern part of the park and in the Redwood Creek basin; temporary or seasonal camps throughout the park, probably reflecting the use of seasonal or specific resources; trail sites along ridges used as travel routes; and ceremonial or power seeking places.

A number of local Indian communities are politically active and committed to the continuation of aspects of traditional culture in and around Redwood National Park. The prehistoric and ethnographic cultural resources are of great importance to these people, not only as part of Native American history but also as places which are still in use. These resources include power seeking places, burial grounds and ceremonial sites, all found within the park. Important also are certain natural resources which are utilized by the Indians for traditional purposes, including materials for baskets, ceremonial structures and ceremonial paraphernalia. Some of these natural materials were regularly obtained through use of fire.

Today, due to changes in land ownership and policies of fire suppression, Indians rarely burn for basket materials and food stuffs. However small burn projects for bear grass, the primary basket material, have been conducted on National Forest lands inland from the park.

Historic resources representing the major stages of regional land use, social and economic history, are distributed throughout Redwood National Park. Items of early sea trade are present in some of the coastal prehistoric/historic villages. Trails, roads and stage stops associated with early transportation networks are found in the northern part of Redwood National Park and in the Redwood Creek basin. Mining settlements were established along the coast. Landscaping, structures and equipment associated with homesteading and early ranching are located within the park boundaries as are buildings and support facilities associated with the commercial industries of logging, fishing and dairies. Finally, a World War II observation post was established south of the mouth of the Klamath River, now within the park.

III. NATURAL PREHISTORIC AND HISTORICAL ROLE OF FIRE

A. Prehistoric

In prehistoric times, lightning and Indians were the ignition sources for fire in the natural environment. Research by Veirs (1980, 1982) using tree age distribution in old-growth redwood forests suggests that fires which significantly influenced stand composition and age distribution occurred at 250-500 year intervals in moist coastal sites, 100-250 years in intermediate sites and 33-50 year intervals in high elevation, summer dry interior sites within and near the park. On the whole, these fires were not all-consuming, wind driven holocausts. Rather, they were surface fires burning understory fuels with relatively little canopy involvement.

Nothing is known about prehistoric fire intervals in other vegetation types within the park.

Past Indian use of fire within the present park boundary is known or inferred from many sources (Gibbs 1853). These included escaped or intentional burning upslope of villages, understory burning of hazel copses, tanoak and white oak stands and burning of grasslands. Post-fire hazel sprouts were used in basketry. Burning made gathering of seeds and plant materials easier and stimulated vegetative growth which in turn attracted wildlife. Mixed evergreen forest, chaparral and Jeffrey pine stands, which are at the upper elevation inland margins of present parklands, were burned to favor beargrass and tanoak. Speaking of areas with ten miles of the park, Thompson (1916) states that the Indians purposely burned the prairies to keep the trees from invading. There is no evidence that the Indians inhabiting the present parklands systematically burned redwood forest vegetation. With European settlement, however, beginning about 1850, the frequency of man-caused fires increased, often as a result of use of fire in logging operations.

B. Historic

Nineteenth and early 20th century newspapers from Humboldt and Del Norte Counties document many fires which occurred in the redwoods, usually as a result of human activity; however, the locations and impacts of these fires are vague.

Some intentional vegetation burning by White packers may have occurred near the Trinidad Trail in the Redwood Creek basin. It was probably used as a defensive measure during warfare between Indians and settlers during the 1850's and 1860's. Settlers also used fire to maintain or expand grazing land on the periphery of natural grasslands during the 19th and early 20th centuries (Pozzi 1977; Foss 1978) for use by domestic livestock. Fire was frequently used before, during and after logging prior to World War II. These fires often escaped from the logging area and burned into uncut stands, some of which are now within the park. The old-growth redwood forest on the southwest margin of Jedediah Smith Redwoods State Park was heavily influenced by this type of burning. Almost all of the areas logged after World

War II were burned to remove slash and prepare the site for seeding or planting. Some of these fires escaped, the largest of which now within park boundaries was 620 acres when contained.

During the drought years of the 1930's, human ignition is known to have produced several large fires in present park forests. One of these (Merrill 1978) burned in the Bridge Creek drainage, and another, starting in Orick, burned through the Skunk Cabbage drainage to the Davison Road until extinguished by rain in October (Davison 1972). A third fire burned in the old-growth redwood of the present Jedediah Smith Redwoods State Park (Peacock 1984); however, its location and area have not yet been adequately determined.

Fires in chaparral east of the Little Bald Hills have burned into the pine-grassland, knobcone pine and chaparral vegetation there, as well as into the margins of the redwood forest downslope to the west. Based on tree fire scar examination and post fire regeneration, the last of these fires is known to have occurred in 1941.

The first organized fire protection work in the redwoods was begun in Mendocino County in 1912. By 1932 the State Division of Forestry had built up a force of 25 rangers, lookouts and fire guards in the redwood counties (Show 1932). Both Show and Fritz (1932) address the economic disadvantages of fire in the redwoods and Fritz even discusses the impact of smoke upon tourism in the redwoods.

After 1945, the fire control philosophy and increased fire control capability at State, Federal and private levels combined to reduce the impact of both man- and lightning-caused fires. Strict fire control has been the policy of both State and Federal redwood park managers since the establishment of these parks.

For the 25-year period (1960 - 1984), 199 wildfires occurred within the 106,000 acres of Redwood National Park. Forty-five percent (89 total) of the fires were escaped or abandoned campfires. Twenty-six percent (52 total) were smoking or equipment related or of unknown origin. Sixteen percent (31 total) of the fires were lightning caused. Ten percent (20 total) of the fires were logged slash or debris burns that escaped and four percent (7 total) were incendiary fires.

An additional 52 wildfires occurred within 3.5 miles of the park boundary during the same period. Ignition sources for those fires were 42 percent (22 fires) lightning caused; 29 percent (15 fires) were smoking or equipment related, or of unknown origin; 13 percent (7 fires) were slash or debris burning escapes; ten percent (5 fires) were campfire related and six percent (three fires) were incendiary ignitions.

Appendix C provides a complete wildfire occurrence summary by Fire Management Unit (see Section IV G Fire Management Unit Descriptions) and ignition sources.

Between 1980 and 1982, Redwood National Park conducted 12 prescribed burns in grassland vegetation totaling 134 acres. One burn totaling 3 acres was conducted in oak woodland vegetation (Hektner et al. 1982; Sugihara et al. 1982).

C. Fire Effects

1. Vegetation - The effects of fire upon vegetation depend on the fire behavior and the type of vegetation involved. Variations in fire intensity, temperature, flame length, duration and time of day and season will influence the relative impact of fire.

Fire may kill or damage individual plant species but many others have been perpetuated through various fire adaptations. Individuals of some species are inherently more resistant to fire and therefore survival rates differ. Ultimately the impact of fire on vegetation is expressed through changes in species composition, density and vegetation structure, all of which are dependent on fire frequency and intensity.

a. Redwood Forests - The effects of fire on old-growth redwood have been a matter of considerable conjecture. Cooper (1965), Stone and Vasey (1968) and Stone et al. (1969) treat redwood forests as fire-dependent sub-climaxes. Fisher (1903), Weaver and Clements (1929), Roy (1966), Veirs (1972, 1980) and Daubenmire (1978) describe redwood in terms of having climax status. They consider fire an integral part of the environment, but not necessary to maintain the stands. These contradictory views may be due in part to limited field data or the apparent variation in fire frequency throughout the 720 km (450 mile) north-south distribution of redwoods. Jacobs et al. (1985) found the average interval between fires near Muir Woods (Marin County) to be 27 years at a more coastal site and 22 years at a more inland site. Greenlee (1983) found a mean interval of 56 years between fires for two stumps cut in Santa Cruz County, and Fritz (1932) found an average of four fires per century in Humboldt Redwoods State Park (southern Humboldt County). Within Redwood National Park, fire frequency appears to be one per 250 to 500 years in mesic coastal areas, one per 100-250 years on intermediate sites and one per 33-50 years on the dry interior sites (Veirs 1982). Veirs determined the fire history by examining age classes of redwood and some of its tree associates, primarily Douglas-fir, western hemlock and grand fir.

Fire frequency in redwood vegetation is not easily determined. It is plainly not similar to the frequencies found in many other vegetation types (Wagener 1961). For example, in ponderosa pine as described by Dieterich (1981), many trees display many scars which yield unequivocal fire dates and short fire intervals. In redwood forests, larger individuals of redwood and Douglas-fir are almost unscarred by surface fires which kill all or most of the fire sensitive associates, especially tanoak and hemlock as well as small redwood and Douglas-fir. Fires of this type are more easily inferred on the basis of the age distributions of the sensitive species rather than scarring of the resistant trees. The problem of accurately aging redwoods due to false rings and missing rings has not been evaluated and is more difficult than fixing fire dates where Douglas-fir are also scarred.

Redwood, western hemlock, tanoak and perhaps grand fir can become established with or without fire. All become established more or less frequently in the shade beneath an overstory canopy and often beneath an understory as well. They also become established rapidly when competition is reduced by a light surface fire and when mineral soil is exposed. Each varies somewhat in seedling establishment sites in undisturbed stands.

Redwood becomes established in stands not exposed to the disturbance of fire, on logs, root wads and associated mineral soil, almost never in duff. Redwoods are extremely tolerant and persistent. A few seedlings, once established, may survive 50 to 150 years in a suppressed condition. Dying back as a result of low light levels or breaking from falling branches, they sprout from the basal burl again and again. A change to more favorable conditions may result in increased growth leading to canopy status after many years in the understory. The sprouting habit may also increase survival of understory redwood under light fire conditions. The larger trees are relatively fire resistant. Redwood is a long-lived tree which dominates its associates in terms of height growth. In the mesic and intermediate sites, redwood usually must reach 200 years of age and 60 cm (24 in) diameter to enter the canopy tree class.

Tanoak is similar to redwood and may be more shade tolerant. Tanoak grows more rapidly in diameter in the understory than any of its associates. Tanoak seedlings can become established abundantly in deep litter and under a full canopy of overstory trees. On some sites in the park, hemlock has become established after a light fire, forming a dense understory. Tanoak became established under the hemlock several decades later. Tanoak and redwood are also sufficiently tolerant to become established beneath a full canopy of young Douglas-fir in invaded prairies. Tanoak is abundantly successful as an understory tree and may become large in openings unless killed by fire. Tanoak, like redwood, also sprouts from dormant basal buds following fires which kill the initial stem. Tanoak sprouts following browsing or other forms of damage, and like redwood, persists in the understory even under low light conditions. Tanoak is most abundant on the park's intermediate to dry sites, but has a broad ecological amplitude and is both shade and drought tolerant. It reaches its greatest age in Redwood National Park on sites where frequent, light understory burning by Indians may have reduced the chance of a more typical, killing understory fire.

Western hemlock becomes established on rotten logs and fragments of woody debris on the forest floor in undisturbed stands and on mineral soil where present. Hemlock is killed by fire, even very large individuals, because of very thin bark on the stem and roots (Lotan et al. 1981). Like most conifers, hemlock does not sprout, but it becomes abundantly established following fires, especially where a substantial canopy remains. It also becomes established following other disturbance of the understory. For example, in one area when a few redwoods were selectively felled and split up on-site, leaving a shaded site with exposed mineral soil and woody debris, hemlock formed a dense understory. Hemlock is most abundant on the intermediate to moist sites and is successful as an understory tree, becoming best developed in canopy openings until killed by fire. Port-Orford-cedar is similar to hemlock; however, it appears longer lived, larger and more fire tolerant than hemlock.

Grand fir seedlings become established in the understory in light litter, especially where slopewash due to overland flow or raindrop impact exposes a large proportion of mineral soil on steeper slopes. Grand fir is less shade tolerant than redwood, tanoak and hemlock but can grow slowly in a suppressed condition under an overstory of redwood and Douglas-fir. Grand fir responds favorably to light fire, which reduces competition and is intermediate between hemlock and Douglas-fir in tolerance, size and longevity. Grand fir occurs most frequently on mesic inland sites. Sitka spruce and grand fir mingle in the redwood forest near the coast and occasionally form mixed stands in coastal sites where redwood is absent. Grand fir established following light fires are best developed in overstory gaps. Possibly less sensitive to fire than hemlock, it may be slightly more long lived. Grand fir occasionally approaches the heights of redwood and Douglas-fir.

Douglas-fir is a fire resistant species which becomes established rarely, or not at all, in the deep shade of a redwood stand. Establishment is infrequent and appears to be associated with fires. These fires must be of sufficient intensity to open up the redwood stand, perhaps through defoliation and limited canopy tree mortality. Under relatively high light conditions, Douglas-fir grows rapidly in height and diameter and persists for many years as a canopy associate of redwood. Douglas-fir rapidly becomes established on exposed mineral soils on more xeric sites and dominates the second-growth forests developing on cutover redwood sites at intermediate and higher elevations. In the park, it is the primary tree invader of natural grasslands following the cessation of grazing by domestic livestock. In these invaded prairies, redwood eventually may become established beneath Douglas-fir and, in the absence of disturbance, would become dominant because of its tolerance and longevity as a canopy tree. Tanoak also becomes established under dense, young Douglas-fir stands where it persists as an understory tree.

Moving inland from the coast Douglas-fir, density increases with increasing fire frequency. Redwood drops out, probably because of drought intolerant seedlings, and the redwood forest gives way to the mixed evergreen forest of Douglas-fir, madrone and tanoak (Sawyer and Thornburgh 1977).

High intensity, stand replacing fires are unknown for redwood forests in the northern coastal portion of its range, including the 8,000 hectares (20,000 acres) of old-growth redwood under National Park administration. It appears however, that fires need not be extremely intense to produce significant changes in the understory of an old-growth stand. In 1974, Veirs observed a creeping surface fire in old-growth redwood which appeared to be of very low intensity. It crept through the duff and litter at less than one foot per minute with flame heights of 1/2 to 2 feet. It also carried up the stems of the redwoods, smoldering and charring the bark. Within a year, all of the hemlock and tanoak had died, and the tanoak resprouted. Redwoods less than two feet in diameter were killed but resprouted. Several larger redwoods also developed basal sprouts. It was not until five to ten years later that it became evident that the larger redwoods and grand fir had been injured. Portions of bark at the bases of all grand fir and some redwoods were observed to be falling away, and new cambial tissue was beginning to grow over the scars. While the cambium was not charred, it was killed by heating.

The wood in the fire scars of the grand fir is now beginning to decay, and it appears that grand fir will show delayed mortality in response to the fire. Seedlings of redwood, Douglas-fir, western hemlock and grand fir have all become established postburn.

These observations suggest a re-thinking of past fire intensity in redwood forests. Redwood bark does burn and will carry flames well up the stem, smoldering and charring the bark. This may lead the observer to think that an intense fire had roared through the stand rather than possibly just a surface fire.

Given the long intervals between fires, it is unlikely that recent fire suppression (post-1930's) has had any significant effect on most redwood stands within Redwood National Park. However it is likely that upland, interior stands have already exceeded the normal fire return interval.

b. Oak Woodlands - Approximately 260 hectares (650 acres) of Oregon white oak woodlands are located in the Bald Hills area of the park. Although little is known about the fire history in this area, there is evidence that the Chilula Indians periodically burned these woodlands prior to the mid-1800's. Early ranchers also burned to enlarge and maintain grasslands for sheep. Eventually this practice was discontinued and full fire suppression was adopted over the past several decades (Davenport 1982; Stover 1983). Sheep and cattle grazing began in 1850 and was discontinued in 1982.

A three acre prescribed burn was conducted within this vegetation type in 1981. All oaks less than 20 feet tall were top-killed, but sprouted vigorously postburn; oaks taller than 20 feet survived with no apparent damage. Shrubs, primarily snowberry, poison oak and oceanspray, were also top-killed and sprouted vigorously. Herbaceous growth was extremely dense following the burn, and a high cover of lupines and many perennials with rhizomes or bulbs developed. Most Douglas-fir with 70 percent or greater scorch were dead ten months following the fire (Sugihara et al. 1982).

Little has been published specifically about fire and white oaks but the results of the prescribed burn appear to be consistent with literature accounts. Plumb and Gomez (1983) state that trees of all California oak species less than 15.2 cm (6 inches) d.b.h. will usually be top killed by even a low intensity fire. Seedlings and small trees less than 5.1 cm (2 inches) d.b.h. will almost always be top killed by any fire. The amount of crown damage is related directly to height above ground. Trees that attain large size may suffer little or no crown damage from a low intensity surface fire if the bottom of the crown is 6 to 9 m (20 to 30 feet) above the ground. If the trunk is girdled, which is possible even from a light fire, amount of crown damage is unimportant because the top of the tree will eventually die even though it may take several years.

Most California oaks sprout when cut or burned. However the deciduous white oaks (such as Oregon white oak) do not sprout as vigorously as the other California oaks (Griffin 1980). Jepson (1910) states that Oregon white oak stump sprouts when young, but sprout vigor declines with age. Stumps of

young white oaks are more likely to live than trees of the same size which are girdled and left standing. Oregon white oak may weakly stump sprout in a few mature trees. Jepson gave no sizes or ages at which sprouting declined.

The role of fire in Oregon white oak stand development is not well understood. Three general stand types are found within the park: Savanna, closed-canopy-multiple bole and closed-canopy-single stem. Based on observations of vigorous oak bole and root sprouting following the 1981 prescribed burn, it appears that at least the dense (4,500-12,000 stems per hectare) closed-canopy-single stem stands may be in an early postfire successional stage. Conversely, Thilenius (1968), studying similar oak woodlands in the Willamette Valley of Oregon, stated that the most probable cause for the conversion of oak savanna to oak forest is interruption of the ground fires. He proposes that after settlement, wildfires and Indian set fires were much reduced in size and effect, thus allowing dense growth of Oregon white oaks to become prevalent. Continued study is needed to evaluate this apparent contradiction.

Although fire kills individual oak trees, it is important for continuation of oak stands under natural conditions, especially in areas where the inherently taller, more competitive conifers are invading (Plumb and McDonald 1981; Sprague and Hansen 1946; McCulloch 1940; Silen 1958; Taylor and Boss 1975). Fire destroys the conifers and stimulates the oaks to sprout. Because of rapid sprout growth, the oaks capture the area and are perpetuated. Fifty percent of the park's oak woodlands have sufficient Douglas-fir already in the understory to convert the oak woodland to conifer forest if encroachment continues unchecked (Sugihara et al. manuscript in preparation). The results of the park's 1981 prescribed burn agree with Plumb and McDonald's (1981) conclusions that fire would exclude the fir.

c. **Prairies** - Grasslands occupy approximately 800 hectares (2,000 acres) along the Bald Hills ridgetop dividing the Redwood Creek and Klamath River drainages. An additional approximate 400 hectares (1,000 acres) are found along the coastline.

The most obvious effect of fire on pristine grasslands was probably to kill invading trees and shrubs (Arnold 1964). Thompson (1916) states that the Klamath Indians around Weitchpec, just ten air miles from the park, specifically burned the prairies to keep the Douglas-fir from encroaching. Since the Chilula Indians of Redwood Creek were closely related and freely interacted with the Klamath Indians, it is possible that the prairies now within the park were also burned in a similar manner.

In the Bald Hills area, Douglas-fir is encroaching upon and may eventually replace parts of the open grasslands and oak woodlands. It is estimated that today's Bald Hills prairie/oak woodland complex is two-thirds its pre-settlement (circa 1850) size (Sugihara et al. manuscript in preparation). Although invasion is a natural process (Zinke 1977), it appears to have accelerated since 1850. This is probably due to a combination of reduced fire frequency (cessation of Indian burning) and introduction of livestock which disaggregated the dense sod and allowed conifers to become more easily established.

Much has been written about the effects of fire on grasslands and the comprehensive reviews by Daubenmire (1968) and Vogl (1974, 1979) point up the great variety of grassland responses. The effects of fire will vary and relate to season, fire frequency, fire intensity, plant phenology at the time of the fire, fall and spring precipitation levels, management practices such as mowing, accumulated litter and grazing intensity. No two fires, or the conditions under which they occur, are alike.

Time of year in which burning occurs is an important factor in determining which grass species are encouraged and which are discouraged. Burning before growth begins produces high rates of seed production, germination and establishment of post burn generations. *"The environmental extremes common to many grasslands, including those created by fires, were probably selected by forces favoring perennials with vegetative habits"* (Vogl 1974). If an area is burned after the annual plants have started growth, burning is detrimental, and if repeated, can eliminate the annuals (Countryman and Cornelius 1957; Sauer 1950; Vogl 1974). In the Northwest, Wright and Klemmedson (1965) found fall burning favored cool-season perennials. If burning is done in early summer, perennial bunch grasses are killed and annuals increase. By contrast, warm-season perennial grasses in the Great Plains are favored by spring burning (Aldous 1934; Hensel 1923; Robocker and Miller 1955; Wright 1969, 1974). It was concluded that cool-season grasses started growth early and suffered heat damage because of the fires, whereas the warm-season grasses, still in dormancy, suffered little or no damage.

Burning generally increases the growth of most grassland vegetation. Vogl (1974) states that fire which removes litter allows for the development of dense herbaceous growth, and vegetative reproduction of perennial species on most postburn sites occurs more rapidly and more vigorously than growth on the unburned sites. Fire produces ash and charcoal, releases nutrients into the system and allows for prevernal soil warming. Ehrenreich and Aikman (1963) also found that herbage production on burned native prairies of Iowa was greater than in unburned areas. Plants in recently burned areas begin growing earlier in the spring and develop more profusely than plants in unburned areas. Contrastingly, Redman (1978) reported a pattern of immediate reduction in forage after fire. This was due to the documented increase in water stress of plants growing on burned sites. With a decrease in plant water potential, photosynthesis also drastically decreased.

The discrepancy of fire influence on productivity relates to the different climates of grasslands. Fire on semiarid grasslands has a detrimental effect on productivity, whereas fire is beneficial on humid grasslands with sufficient water to compensate for plant water stress.

Without experimentation, it is difficult to state exactly what the results of burning will be on the park's prairies. In grasslands having a high annual component (such as the Bald Hills prairies), species composition often varies year to year, mostly in response to climatic conditions. Small experimental burns conducted in the fall of 1980, 1981 and 1982 have had variable results. In two areas on the Bald Hills, each burned one time, many species shifts were observed; when compared with the control, statistical analysis indicated

that most could not be attributed to the fire (Hektner et al. 1982). Climatic conditions were probably the main cause for species changes.

One of the sites was burned again in 1982 and when the combined pre- and post-1980 and 1982 burn data is compared with the control, analysis indicates that perennial species, both native and non-native, increased significantly as a direct result of the burning (unpublished data). In a coastal prairie burned in 1980, the dominant species, orchard grass, was decreased and wildflowers such as hairy cat's ear and lupine increased. In portions of some burned areas, particularly the more coastal prairie, exotics such as milk thistle, fireweed and wild radish increased, later decreasing or disappearing as cover of other species again increased.

It is a basic assumption that most grasslands have coexisted with fire through time and that fires are an inevitable part of those systems. The park's prairies have been significantly altered since white settlement. Whether fire can be used as a manipulative tool to increase the native species component is yet to be determined.

d. Coastal Scrub - Coastal scrub stands occupy a narrow strip along the immediate coast, generally on the ocean bluffs between the coastal strand and the first ridgeline. There are about 240 hectares (600 acres) of this vegetation type in National Park ownership. Coyote brush, salmonberry, poison oak, lupine, oceanspray and salal dominate. Occasional wind-pruned alder and Sitka spruce are also present. The scrub is often interspersed with patches of grass dominated by orchard grass, fescue or reedgrass.

All of the dominant shrub species (listed above) are able to regenerate after fire through crown sprouts or root sprouts. Even if the plants are top-killed, sprouting generally begins soon after a fire. The brush cover is not only quickly replaced, but it comes back with renewed vigor. Invading trees, such as Sitka spruce and alder, are easily killed by fire and the scrub is maintained. In the only known fire in the park's coastal strand, native bunchgrasses were temporarily enhanced, the shrubs top-killed and blueblossom established. It is possible that some scrub stands upslope of known coastal Indian villages may be the result of intentional or accidental Indian burning.

e. Spruce Forest - Sitka spruce forests occupy approximately 490 hectares (1,200 acres) of Federally owned parklands along the immediate coast. Most of this acreage was cut or burned in association with early mining efforts, especially in the Gold Bluffs area, or for airplane parts or for boxes. The stands are generally 40-60 years old with very dense canopies and little understory cover. Most are of a uniform size and age class. Some of the stands are on areas which were grassland in 1936. It is not yet known whether these areas were natural prairies or whether they had been cleared by early settlers and planted to grass. In Washington (Secor et al. 1981) and Alaska (Cooper 1933; Decker 1966), Sitka spruce is the first conifer to colonize prairies.

Sitka spruce has one of the lowest resistance to fire of any of the major trees of the North Pacific maritime forests (Lotan et al. 1981). Thin bark, shallow

rooting and high flammability of dense canopies make spruce susceptible to fire related mortality from root charring or occasional crowning (Starker 1934).

Early successional trends following fire tend towards dense red alder/shrub stands dominated by alder, salmonberry, swordfern, salal, huckleberry and thimbleberry (Franklin and Dryness 1973). Replacement of alder is often very slow even though it is a relatively short-lived species, partially because of the dense shrubby understories typically associated with it. Successional sequences have not yet been thoroughly studied for the park, but it appears that the alder may be replaced by semipermanent brushfields (Newton et al. 1968) or by Sitka spruce released from a suppressed state (Franklin and Pechanec 1968). It appears that the success of the spruce may depend on the density of the shrubs. Although Sitka spruce has a high to very high shade tolerance (Baker 1949), it rarely survives prolonged periods in the understory of dense shrub stands (Hetherington 1964).

f. Chaparral, Knobcone Pine Stands and Jeffrey Pine/Idaho Fescue Grasslands - These types occupy approximately 120 hectares (300 acres) in the northeastern (Little Bald Hills) section of the park. The driest ridge top sites are occupied by Jeffrey pine/Idaho fescue grasslands while downslope, chaparral, dominated by manzanita, golden chinquapin, rhododendron, dwarf oaks and other evergreen broadleaved shrubs, is interspersed with stands of knobcone pine. Little is known about its fire history; the area last burned about 1940.

The role of fire in the chaparral has been examined by many authors. Hanes (1977) states:

"Fire serves as the major cause of secondary succession in California chaparral by creating the pioneer conditions necessary for seedling establishment (Craddock 1929). By virtue of its shrub density, summer dryness and volatile [sic] substances, California chaparral is one of the most fire-susceptible vegetation types in the world (Lewis 1961). Yet fire actually maintains or assures the perpetuation of many chaparral species (Vogl 1970; Vogl and Schorr 1972)."

Following fire, most of the dominant plants (manzanita, chinquapin, shrub oak and rhododendron) will immediately reappear. They resprout and/or produce seedlings. Resprouting occurs from underground meristematic structures including rhizomes, lignotubers and burls. Annual grasses and forbs will probably increase initially and then decrease as the shrub canopy again closes.

Vogl et al. (1977) state that knobcone pines are also fire dependent. The cones rarely open without fire and reproduction is absent in decadent stands where the majority of trees are senescent or dying, conditions sometimes created by fire prevention. Fire is the usual and necessary cone opener. Cones are seldom consumed and seeds rarely damaged in a fire, and the opened cones shed for a considerable time (Vogl 1973). Wet weather followed by dry days may actually cause the cone scales to open wider, shedding additional seeds on an ideal seedbed of wetted ash and

soil. The fallen seeds germinate rapidly (Wright 1966). Fire creates the pioneer conditions of bare mineral soil and full sunlight necessary for seedling establishment. It temporarily reduces the cover of dominant and resprouting shrubs and increases the cover of temporary fire-following herbs. Fire removes the established plant cover and litter accumulations and accentuates the continual erosion common to knobcone sites with their steep slopes, thin soils and friable substrates.

Knobcone pines have a short potential lifespan (Newcomb 1962; Wright 1966) usually reduced even more by recurring fires. Trees that escape fire begin dying when they are about 50 years old; only a rare tree lives 100 years.

Vogl et al. (1977) state,

"Knobcone sites are subject to frequent fires, perhaps once every 33-50 years, because of their positional relationships with other fire type communities, edaphically dry sites, and early widespread senescence leading to favorable fuel conditions. Higher fire frequencies usually do not occur, even when adjacent chaparral and yellow pine forests burn more frequently, because of the slower growth, sparser cover and lighter fuel accumulations on knobcone sites."

The knobcone pine type on the Little Bald Hills is similar, and a similar response is expected.

Fire in the Jeffrey pine/Idaho fescue stands can be expected to at least temporarily reduce Idaho fescue. It is a very leafy bunchgrass and compacted at the base where dead materials accumulate as fuel (Vallentine 1980). The budding areas are at or above the surface of the ground and thus fires smoldering in the plant crowns may be particularly damaging. Wright (1971) found that dense clumps may burn two to three hours after a fire passes and that temperatures as high as 538° C (1,000° F) may be reached 45 minutes after the fire has passed. Thus many plants often die or have only a few culms that survive, regardless of the passing fire's intensity.

In an eastern Oregon study, results of an accidental burn in sagebrush-grass were evaluated 11 months after the burn and Idaho fescue had suffered 27 percent mortality and 50 percent cover reduction (Conrad and Poulton 1966). On a California perennial grass range in the Klamath National Forest, Idaho fescue had been reduced over 75 percent when evaluated five years after severe burning (Countryman and Cornelius 1957).

Researchers have found that it takes 2 to 12 years to return to a preburn state, depending on soil moisture, season and intensity of the fire (Blaisdell 1953; Conrad and Poulton 1966; Harniss and Murry 1973; Wright et al. 1979).

Throughout its range, it is most sensitive to summer and early fall (June through September) burns. But if burned in late fall, mortality in high rainfall (80 to 100 inches/year) areas such as the park should be much lower than in a low rainfall (10-15 inches/year) area (Wright 1984; Britton 1984).

Fire will probably have little effect on the mature Jeffrey pines. They are widely scattered and the lack of ladder fuels (shrubs or branches near the ground) make a crown fire unlikely. Older trees have thick bark and are relatively resistant to fire. Vogl (1967) suggests that the bark configuration of laminated scales and the ease with which the trees shed their bark scales when struck by lightning or ignited by fire may be a fire adaptation. Firefighters relate that fires climbing the trunks of the pines are sometimes extinguished when ignited scales are shed from the heated stems.

In areas of mixed conifer forests where pine is codominant with fir, Jeffrey pine seedlings greatly increase following fire (Bock *et al.* 1976; Sweeney 1968). It is relatively shade intolerant and benefits from opening the canopy. Removal of litter also creates a more favorable seedbed.

It is doubtful that a fire in the Little Bald Hills would result in greatly increased numbers of Jeffrey pine seedlings. The stands are open and parklike with large areas having no tree canopy. The herbaceous cover is discontinuous with five to ten percent of the ground bare mineral soil. Light is not limiting and there is sufficient favorable seedbed. Jeffrey pine is a prolific seeder and there are numerous seedlings in the stand. While fire may consume many younger trees, some of the trees may be missed and new seedlings will continue to become established.

2. Fauna - The direct and indirect effects of fire on wildlife are dependent on the intensity and duration of the burn. Little is known about the populations (especially density) of most vertebrates and invertebrates in Redwood National Park, thus quantitative estimates of potential impacts would be speculative at best.

Direct impacts of fire on fauna include disturbance or mortality of individuals or groups of individuals. Larger mammalian vertebrates (deer, elk and bear, all common to the park) will generally move away from a fire. However, the availability of adjacent suitable habitat for these species is an important factor in their long-term survival. A patchy burn, which leaves adequate food and cover (about 20% unburned area), is most desirable for wildlife (Wright 1974). Binder and Vrieze (1981) suggested that after a prescribed burn at Redwood, populations of smaller or less mobile mammals (rodents, rabbits, shrews) temporarily decreased. The mammals affected either burned or suffocated which ultimately resulted in a loss of prey items for carnivores (coyotes, fox, bobcats and raptors).

Birds are less likely to be directly affected by fire, but some losses will occur in nesting sites. Riparian dwelling reptiles and amphibians are usually protected from heat and loss of cover. Losses of some snakes, salamanders, lizards and toads occur but immediate population declines are usually insignificant. Because of their diversity, riparian habitats are especially sensitive. Fire which consumes streamside vegetation or upslope cover will have adverse impacts on these rich resources as well as on aquatic life and water quality (Swanston 1980; Everet and Harr 1982).

Soil fauna are usually greatly reduced by fire. Macrofauna such as earthworms and snails are especially susceptible. Surface invertebrates are

less vulnerable due to their ability to fly, jump or otherwise move quickly into tunnels and bark crevices. Larvae, pupae and eggs, however, are susceptible to fire (Ahlgren 1974).

Indirect effects on wildlife include habitat modification and shifts in species composition. The quantity and quality of ungulate forage generally increases after prescribed burning (Lay 1957). Following a 355,000 acre wildfire in Oregon, deer and other wild animals and birds increased dramatically (Issac 1963). Not only was postburn forage more plentiful, but the deer were healthy and free of liver fluke and lungworms that had plagued the herds for years before the wildfire. Biologists discovered that the fire removed the dry-land snail population, which was the intermediate host for liver fluke and certain lungworms. Animals which utilize dense ground vegetation for food and cover may be reduced initially unless islands of vegetation remain intact or suitable habitat is available outside the burn area. Increased predation pressure is expected due to losses in prey populations and unaffected predator populations (Lawrence 1966). Animals with specific habitat requirements or territorial animals with narrow ranges may be impacted by habitat loss.

In prairie lands, Rice (1932) found many species of mites, collembolans and small arthropods decreased after prevernal burning but increased again when recovering vegetation improved the habitat.

3. Lower Organisms - Some parasites of ungulates may be decreased by fire. A decrease in dwarf mistletoe, annosus root rot, brown rot and possibly other organisms is suspected by the scientific community. An increase in fusiform rust in oak and powdery mildew on coyote brush is also predicted (Parmeter 1977). The effect of fire on mycorrhizal fungi is not yet fully understood.

Bacterial response to fire seems to be concentrated in the upper one centimeter of soil. In general, bacterial populations increase after a certain postburn time lapse. Although not drastic, the increase in soil pH experienced after a fire favors bacterial growth, especially nitrogen-fixing bacteria (Ahlgren 1974).

4. Soils - Fire effect on soils increase with increased fire intensity, especially with respect to physical and biological properties (Agee 1974). Runoff and erosion are correlated with changes in infiltration, which in turn depend on the amount of vegetation, litter and duff which is consumed. Fire can increase the levels of calcium, magnesium, potassium, sodium and phosphorus in the soil, as well as volatilize nitrogen; soil pH is generally increased. Localized losses of fire-exposed soil during the rainy season may occur, depending upon extent of overland flow, rilling, slope and proximity to stream channels.

Generally speaking, postburn soil temperatures are relatively higher on burned areas than unburned areas. This is due in part to blackened soil surfaces absorbing more solar heat. These temperature differences are greatest during the prevernal stage and seem to equilibrate by the end of the first growing season (Ehrenreich and Aikman 1963).

Surface soil moisture is depleted faster on burned lands than on unburned lands. Higher evaporation rates at the soil surface in conjunction with increased plant extraction of moisture from lower soil horizons are factors which dictate the extent of soil moisture loss postburn.

Effects of fire on nutrient release are more variable. These effects are proportional to the amount of organic material present and are most affected in the top two centimeters of soil (Nimir and Payne 1978). There is generally no direct loss of soil nutrients except for the volatilization of nitrogen and sulfur. The nitrogen losses are often recovered through precipitation and the increased activity of nitrogen-fixing plants, particularly legumes, soil algae, bacteria and certain fungi (Vogl 1974). The activity of these organisms on burned sites often results in more available nitrogen than on comparable unburned areas (Daubenmire 1968).

5. Water Quality - Fire intensity, size and the proximity of fire to stream channels will determine to what extent water quality is affected. Fires of sufficient intensity to consume vegetative cover may result in surface erosion if winter rains begin before vegetation is reestablished. The primary impacts on streams, increased nutrient loading and sedimentation, will result from large fires in watercourses. Fires on ridgetop areas should have little impact on water quality.

6. Air Quality - Adverse effects of burning on air quality are generally limited to local visibility reduction (Sandberg et al. 1979). Smoke, especially the particulate component, is the most significant problem. Fires produce a range of particulates depending on fire intensity and fuel loading. Smaller particles (under 500 microns) can damage respiratory systems and affect climate, visibility and vegetation. Suspended particles in wood smoke range from .001 microns to 1 micron and include tars, soot and ash.

Firing techniques can mitigate air quality effects. High intensity backfires produce 35% less particulate matter and smaller sized particles than headfires (Agee 1977). By conducting burns when mixing heights are favorable (1500 meters) and wind direction is away from smoke sensitive areas, the effects of smoke are minimized.

7. Scenic Values - Burning may change the appearance of vegetation through scorch, char or mortality. These changes may be variously perceived by visitors, depending upon their frame of reference. Adverse visitor attitudes may be altered through proper interpretation by National Park Service employees.

In prairies the visible effects of fires are transient. A golden stand of grasses may be consumed and replaced by gray ash and charred litter. New grasses sprout quickly after first rains and after a few weeks of new growth, the evidence of the earlier fire is largely gone.

When young trees, usually Douglas-fir, are scorched by prairie fires, the foliage of these trees or portions of the foliage may turn orange-brown. Some portions may be charred and mortality may be high. Affected trees will

persist and increase the negative visual impact until understory grasses green up. Damaged trees will be evident until needle drop is complete at which time tree damage and mortality become less apparent.

In old-growth redwood, surface fire in dry litter can generate sufficient intensity to consume all duff and fine fuels and to kill all understory trees. Larger redwood and Douglas-fir survive; hemlock of all sizes die as do tanoak and young redwood. The latter two species however, sprout from the base. The bark of both redwood and fir will burn when dry, and charred bark may extend up the stem for several tens of feet, presenting an exaggerated appearance of the fire intensity (Veirs 1981). Visual effects of such a fire would include extensive ash, charcoal and dead understory trees and shrubs which may be perceived by the general public as unsightly.

Ten years after an understory fire, ample evidence of the fire may remain with respect to charcoal, reduced shrub cover and clumps of sprouts at the base of fire killed understory redwood and tanoak. Fire related tree mortality may produce a large increase in down, dead fuel. The charred bark of large redwood and Douglas-fir can remain for 100 years or more (Veirs 1981). Indeed charred old stems are frequently encountered in old-growth redwood forests.

To date there is no evidence that crown fire has been a historically significant phenomenon at Redwood National Park. No descriptions of fire in second-growth redwood stands are available. The time span of visual fire effects range from a few months in the park's grasslands to one or more decades in old-growth redwood. Coastal scrub fire effects are no longer obvious after two or three seasons.

8. Threatened or Endangered Species - Brown pelicans, peregrine falcons, bald and golden eagles are seasonal transients in the park. None are known to nest in the area. However, since fire could injure or kill nesting birds, if nests are found during pre-burn planning, the proposed burn will be cancelled.

The effects of fire on the threatened and endangered plants are yet to be determined. Consultation with the U.S. Fish and Wildlife Service, Endangered Species Office indicated limited data is available (Williams 1985). No prescribed fires are proposed in the areas in which they are found. Even so, the two species known to be in the park would probably not be affected by prescribed burning. Wolf's evening primrose and Del Norte daisy are perennial herbs which die back in late summer. All prescribed burns would occur in the fall, and the above ground vegetative parts would already be dead. Fire would not affect the below ground rhizomes or root stocks.

9. Cultural Resources - The effects of fire on cultural resources vary with the nature of the cultural resource or type of cultural artifact and the intensity of the fire. Little systematic, thorough data on the subject exists.

Park historic cultural resources, for the most part, are constructed of wood. They would, obviously, be destroyed by fire of any intensity. Resources

associated with these structures, such as fences, orchards, dumps containing objects of glass or metal or agricultural equipment could also be directly and adversely affected by fire.

Prehistoric cultural resources of the park are affected by fire in a variety of ways. Surficial lithic artifacts include objects of chert, obsidian and sandstone. Diagnostic features of these objects could be changed or destroyed by fire. Obsidian hydration rims, diagnostic for dating, are altered by heat. Faunal material such as bone or shell and vegetal materials such as pollen are affected by fire. Heat could also affect characteristics of the soil such as pH or chemical constituents and modify cultural material such as midden. The above effects on prehistoric resources are adverse and direct, but as expected low combustion temperatures of short duration produce more minimal effects on these artifacts than do high combustion temperatures of longer duration (Kelly and Mayberry 1979; Bennett and Kunzman 1981).

Fire affects prehistoric cultural resources in additional ways. Soils may be contaminated by fire retardants or may be changed by the addition of charcoal. The destruction of vegetation on an archaeological site may result in future erosion and may also result in increased visibility and therefore susceptibility to vandalism. Finally, heavy equipment itself has the potential to damage archaeological sites during fire suppression activities.

Not all fire effects are adverse. Removal of vegetation may have the beneficial effect of facilitating the definition of the surface boundaries of the resource. Previously unrecorded cultural resources in areas of dense ground cover may be revealed by fire.

Generally, prescribed fires at Redwood will have minimal adverse impacts on the cultural resources of the park. The beneficial effect of prescribed fire, that is, facilitation of site recording, would outweigh the adverse effects. Wildfires however, and associated suppression activities, do have the potential for adversely affecting both prehistoric and historic park resources.

IV. FIRE MANAGEMENT STRATEGIES

A. Introduction

The objective of the fire management program is to develop an integrated program where management fires are used to perpetuate fire dependent natural systems and wildfires are suppressed in a manner that results in minimum damage to resources. Extensive private timberlands lie adjacent to the park boundary and the fire management program must be developed in cooperation with private landowners. Fire management actions must be designed to avoid economic losses to adjacent landowners. Therefore, Redwood National Park will adopt a program that provides for a compromise between free ranging natural fires and the full suppression policies of park neighbors.

Unlike the parks of the Sierras, where natural fires are allowed to burn up through park forests to unvegetated slopes at higher elevations, the vegetation at Redwood is continuous with adjacent private lands. Thus, long-term management of fire at Redwood National Park will undoubtedly require broad-scale use of prescribed fire to mimic the effects of natural fires. This, in turn, requires a comprehensive understanding of the natural succession of vegetation in the park and the role of fire as an important element in this natural process.

This five-year plan proposes a combination of prescribed burning, limited prescribed natural fire, fire suppression and fire history and fire effects research which will examine data and evidence of past fires.

The park has been divided into 19 fire management units, identified primarily on the basis of land ownership (State versus Federal), natural topographic boundaries, vehicle accessibility and vegetation types. (See Fire Management Units map.) Existing California Department of Forestry (CDF) response zone boundaries were also considered.

In each of these units, a generalized fire history will be determined or inferred based upon historic records and the history of fire as determined from the evidence provided by the vegetation itself. Based upon that history, a combination of prescribed burning, prescribed natural fire and suppression will be used to mimic the effects of natural fire influences. Where necessary, for specific areas or vegetation types, experimental prescribed burning may be conducted to clarify the natural effects of fire on the vegetation.

Aside from adjacent land ownership, fire history and vegetation, the fire management strategies are also shaped by cultural and other resources. National Park Service Fire Management Guidelines (USDI 1983c) states:

"The park fire management program also needs to take into consideration threatened and endangered species, religious rights of Native Americans, and unique cultural implications. In some cases, prescribed fire may be necessary for the survival of threatened or endangered species. Those parks that contain religious sites of Native Americans will adapt their fire management program so as to respect

such sites. Cultural resources may be damaged by fire. Suppression action in some cases may be even more damaging if firelines are inappropriately located or heavy equipment is used. Superintendents of parks with these resources should see that the historian and archeologist work closely with their fire staff in the design of their fire management plans. Post-fire salvage of uncovered artifacts is also desirable to prevent their loss and must be a part of the rehabilitation of the burned area."

Accordingly, cultural resources and threatened and endangered species are dealt with in this plan under special concerns for each fire management unit. Specific management strategies for each unit are discussed in Sections IV F and G.

B. Prescribed Burning

Prescribed fire is a management fire introduced into vegetation under prescribed conditions to achieve specified objectives. An experimental prescribed burning program began in 1980, primarily in grasslands. The goals of the experimental program were to:

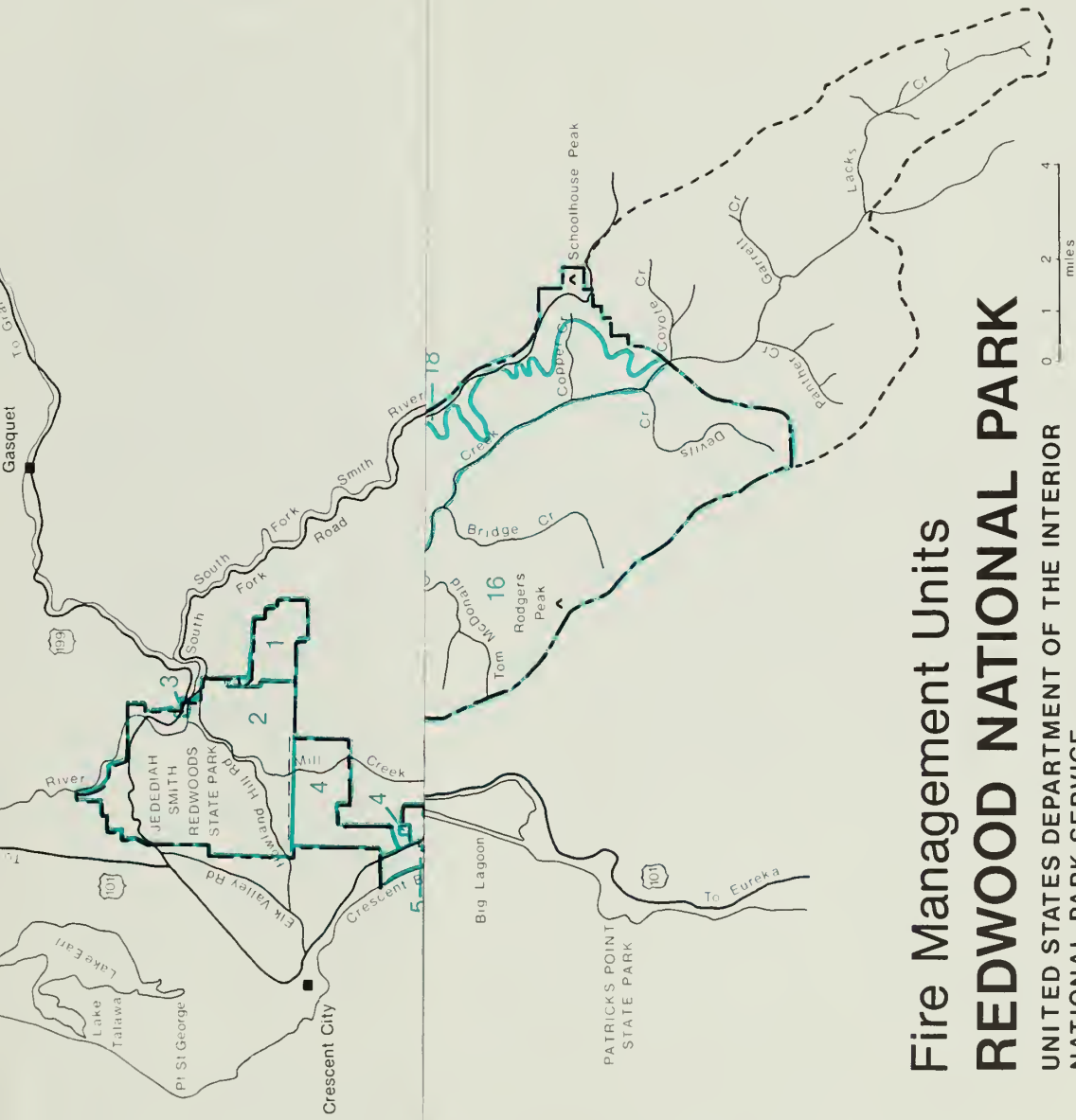
1. Document the effects of fire upon species composition;
2. Identify potential management problems and benefits resulting from the use of prescribed burning;
3. Refine techniques and prescriptions for use of fire in vegetation management.

To date, 12 experimental burns totaling 134 acres have been conducted in grassland vegetation. One burn totaling 3 acres was conducted in oak woodland vegetation. Pre- and post-burn vegetation sampling was conducted on all sites to document vegetation composition. Fire weather and fire behavior was monitored during each burn. Preliminary results of those burns are reported in Hektner et al. (1982) and Sugihara et al. (1982).

During the next five years, additional prescribed burns will be conducted in the prairies, oak woodlands, coastal scrub and old-growth forests. Prescribed burns within Enderts Beach/Bluff Road (Fire Management Unit [FMU] 5) will be used to determine fire's effect on exotic plants as well as fire's contributing effect in the restoration of natural plant communities.

Footsteps Rock (FMU 7), a well isolated and diverse unit, will be the site for prescribed burning of grassland and coastal shrub. The objective here will be to study fire's effect on species composition, to determine if the status of native species can be enhanced where exotic plants make up a significant component of the grassland and to control invading trees and shrubs on the prairie margins.

Effects of understory burning on differential mortality in old-growth stands will be investigated within FMU 17, Redwood Creek-East Side. Prescribed



Fire Management Units REDWOOD NATIONAL PARK

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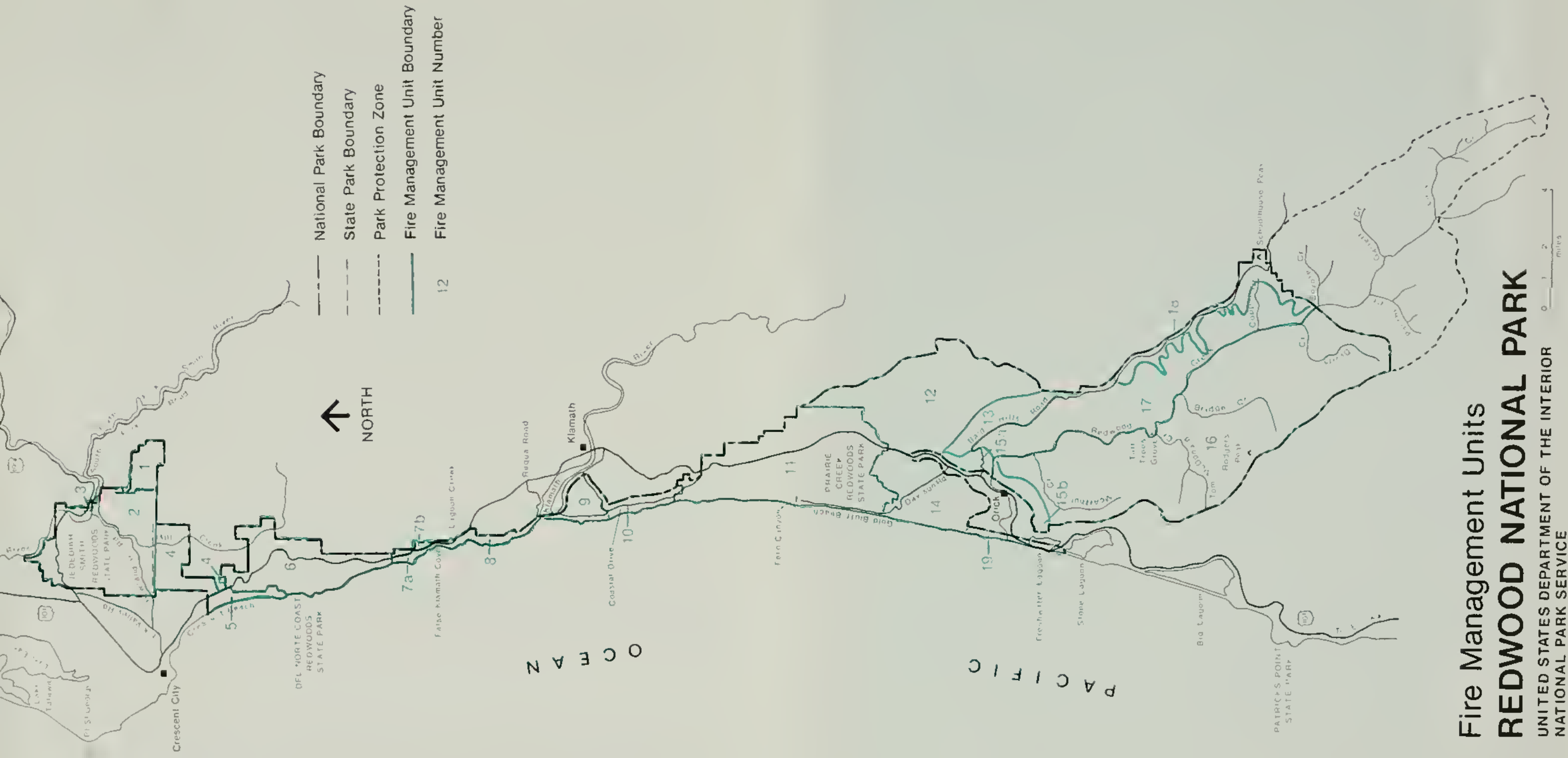
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Fire Management Units

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burns conducted in the Bald Hills unit (FMU 18) will develop the prescription necessary to reduce Douglas-fir invasion while maintaining the existing oak woodlands ecosystem. Prescribed burning in the Bald Hills grasslands will continue to provide information on changes in species composition in accordance with different burning prescriptions.

Other prescribed burns will eventually be conducted to define the role of fire in vegetation types such as second-growth redwood forests, chaparral and Jeffrey and knobcone pine. (See also Section IV F, Fire Management Unit Strategy Summary and Section IV G, Fire Management Unit Descriptions).

Initial prescribed burns will be limited to the minimum acreage necessary to develop or refine the fire management program. It is expected that a total of approximately 500 acres will be burned during the next five years. Estimated acreage for individual burns will range from 1-20 ha (2.5-50 ac) in grasslands and oak woodlands, 2-4 ha (5-10 ac) shrub communities and up to 5 ha (12.5 ac) in mature forest systems. In some cases, fires will exceed these limits in order to provide more reliable data. Fire behavior, mosaic burning and heterogenous vegetation may require larger burnplots. Size may also be increased to take advantage of natural barriers which will decrease the impact of firelines, reduce costs and mimic a natural fire. Justifications for increasing the size of the burn will be included in the prescribed burn plan. No individual burn will exceed 12.5 ha (50 ac). Limited prescribed burning for vegetation management purposes (such as campground and trail maintenance or vista clearing) will be conducted in the park's prairies. Each burn will not exceed 4 ha. All prescribed fires together will not exceed 60 ha (150 ac) annually. Results of postburn vegetation response will be used to provide direction for the re-introduction of fire into various plant communities. Related research (described in Appendix D, Research Needs) will be conducted to determine the historical frequency and areal extent of natural fires. As increased information becomes available, this plan will be amended to accommodate larger scale prescribed burning for management purposes.

A prescribed burn plan (see Appendix E) will be prepared for each proposed burn. The plan describes the physical and biological characteristics of the site. It defines the treatment objectives in terms of resource values. All constraints that bear upon how prescribed fire can be applied in the area are identified. The fire prescription specifies the type of fire behavior desired, the environmental conditions under which the fire is likely to behave and the desired burning techniques. On-the-ground tasks that must be performed before, during and after the fire are identified and assigned to appropriate personnel. The needed equipment and supplies are listed and the cost of the project is determined.

Pre-burn, in-house review will be conducted in accordance with the established Redwood National Park project clearance format. The prescribed fire plans are sent to the Superintendent and Assistant Superintendent for initial review. If given conditional approval, the plans are routed to all divisions for comment. The authors of the plan incorporate suggested changes, if any, and resubmit the plan for the Superintendent's final approval. Approved plans are then sent to the Western Regional Office as submissions to the regionwide burn plan library.

A prescribed fire evaluation report will be prepared postburn and will address the accomplishment of objectives, actual fire behavior, environmental conditions under which the fire burned and costs. The report will also include recommendations that may improve future burns or planning.

Results of the burns (effects on plants and/or wildlife) are used to further refine prescriptions and update the plan. The results will also be disseminated in technical reports, conference proceedings and journals in accordance with Section 101(A)(6) of Public Law 95-250.

C. Prescribed Natural Fire

Prescribed natural fire is a form of management fire resulting from natural ignition (such as lightning or volcanic activity) which is permitted to burn within prescribed limits. When and if the fire exceeds the prescription conditions, it automatically reverts to wildfire status and is suppressed in part, or completely.

In this plan two virgin redwood forest areas have been selected for prescribed natural fire: Flint Ridge area (FMU 9) and Little Lost Man Creek Research Natural Area (FMU 13), totaling 3,780 acres. Prescription limits for each unit are included in Appendix F.

Other units were considered for the implementation of prescribed natural fire, but were not designated at this time because of the perceived high risk to the resources of adjacent lands. Favorable public response to this plan and further consultation with cooperative agencies may result in additional units being designated in future plan revisions.

Flint Ridge and Little Lost Man Creek units are ecologically and geographically well suited for an initial effort to reintroduce natural fire to the park. Upon report of lightning ignition or ignition of unknown origin, initial attack personnel would be dispatched to the scene and Research/Resources Management personnel notified to immediately respond. Initial fire attack personnel would make an onsite determination of the ignition source. Human caused fires would be suppressed. Suppression would also be initiated if conditions are determined to be outside the established prescription specified in this plan.

If conditions are within the established prescription and standby crews are available to closely monitor the fire, it will be allowed to burn. If conditions change, exceeding the established prescription, the fire will be suppressed. In some cases, it may be necessary to suppress or contain only a given flank of the fire in order to bring it back into prescription.

D. Fire Prevention

The objective of the fire prevention program is to eliminate preventable man-caused fires. This is accomplished through reducing fire risks, public

education, personal contact, area closures and regulated use. Prevention of fires is high priority for all park personnel.

Means employed in fire prevention are as follows:

1. The use of signs, posters and notices on bulletin boards as a means of public education.
2. Fire prevention talks at campfires to further educate the public on fire prevention.
3. Issuance of warnings to the public, particularly during periods of high fire danger, through contacts by rangers, naturalists and fire control aids.
4. Periodic inspection and clean-up of debris in and about buildings.
5. Campfires are allowed without a permit in designated campgrounds, picnic areas and on beaches. Camping permits are required for overnight camping and fires along Redwood Creek.
6. State permits are required for debris burning outside approved incinerators at retained occupancies. Permits can be obtained from the California Department of Forestry at Crescent City or Trinidad.
7. Prevention patrols along roads and trails will be made by rangers and fire control aids when high fire danger weather conditions occur.

E. Wildfire Suppression

1. Presuppression - Presuppression is defined as work done in advance of fire occurrence to ensure effective suppression action. This activity includes recruiting, training, planning, maintaining a fire cache, procuring equipment and supplies and implementing the Redwood National Park Wildfire Step-Up-Plan (Appendix G).

a. Detection - Methods of detection used at Redwood National Park will include: fixed lookouts, air detection, patrols and other detection methods. Two CDF fire lookouts are in or near the park at Schoolhouse Peak and Red Mountain. These stations are manned on a 7-day-week schedule from July 1 (or earlier, if conditions warrant) to the close of the fire season. All smokes in the park are reported to the CDF Dispatcher in Fortuna who relays the information by telephone to park headquarters.

Aerial fixed-wing reconnaissance by the cooperative air patrol (timber companies and Redwood National Park) is used to supplement the ground detection system. Observers are CDF employees, familiar with the features of the park, who have had fire control experience. Communication is through the Fortuna CDF Dispatcher.

Additional road and foot patrols over and above regular patrols will be made by NPS personnel during and after lightning storms or during any high fire danger period.

Park employees, park visitors and residents may also detect fires in their incipient stage. When a fire report is received from one of these sources, all efforts must be made to secure complete information and relay it to park headquarters. If at all possible, the informant should wait at the reporting location so that he can be contacted for additional information.

b. Reporting - All initial reports of fires will be immediately reported by radio or telephone to park headquarters. Fires reported through the emergency number will also be reported to park headquarters.

c. Communications - CDF and U.S. Forest Service (USFS) frequencies are monitored at park headquarters and initial coordination between agencies will normally occur.

d. Fire Equipment - Equipment that has been purchased with Fire Control funds or assigned for that use will be used for fire protection purposes only, except in emergencies. Fire equipment will be maintained in serviceable condition and in constant readiness. All tools will be marked with red paint and kept separate from other utility tools. The District Rangers are responsible for fire equipment and vehicles assigned to their respective areas.

e. Supplies - District Rangers are responsible for maintaining perishable supplies such as rations and batteries in sufficient quantity at the field fire caches.

f. Contract Equipment Agreements - These are maintained by the park Property and Procurement Assistant. Additional contractor lists are maintained by CDF and USFS.

g. Aircraft - Helicopters are available from other agencies through cooperative agreements. Park dispatch maintains the current list. A cooperative industry fire patrol flies the park area and surrounding private lands daily following lightning storms and during high hazard periods. Airtankers are on call each fire season in Medford, Oregon and Rhonerville, California. Dispatch is via USFS or CDF, respectively. Smokejumpers may be obtained through the USFS from Redding, California.

h. Training - This function is carried out by District Rangers and the Protection Specialist. Training will be given by permanent rangers, seasonal rangers and fire control aids. Key fire personnel will attend outside fire schools presented by other agencies whenever possible. Efforts will be made to send trainees to "shadow" various positions in the fire organization on large fires outside the park. Fire suppression schools will be conducted for all personnel subject to fire suppression duty.

i. Extreme Fire Danger on Red Flag Days - During periods of extreme fire danger, personnel may be assigned to fire standby, work extended hours or be recalled from days off. This will be coordinated by the Protection Specialist who will advise the Chief Ranger when these conditions exist.

Also during these periods, some areas of the park may be closed to fires. These may include Crescent Beach, Enderts Beach, DeMartin Prairie, Flint

Ridge and Redwood Creek. Special closure signs will be posted by ranger personnel for the duration of the fire closure.

j. Daily Fire Weather - Beginning in late June and extending through the fire season (October), park dispatch obtains the afternoon weather and predicted fire danger based on Schoolhouse Peak observations, for the following day from the National Weather Service. This is then broadcast to all stations via the park radio. In 1985 the park began using the AFFIRMS system to obtain weather and predictions directly.

2. Fire Suppression - Fire suppression includes all work pertaining to confining and extinguishing a fire.

a. Reporting and Dispatching - Detection of fire will be first reported to the park dispatcher. The dispatcher will confirm the location and immediately inform the District Ranger. The District Ranger will coordinate initial attack crews and inform the dispatcher of actions taken. At this time, the District Ranger may request additional support.

b. Suppression - No fire will be abandoned until the fire is totally extinguished. Twenty-four hours after the fire is declared controlled, a final check will be made before declaring the fire out. Subsequent checks may be warranted in the event that high fire danger conditions persist.

c. Incident Commander (I.C.) Designation - The District Ranger automatically assumes suppression unless he elects to delegate these responsibilities to an individual whom he feels is capable of assuming the job as I.C. On Class III or larger fires, the I.C. will be designated by the Chief Ranger or Superintendent. On Mutual Aid Fires outside the park, the first responding individual on the initial attack will take appropriate action until relieved by an agency representative of the lands involved.

Incident Commanders must be aware of the possibility that park visitors may be ahead or upslope from a fire. The backcountry permit system may assist in determining the presence of overnight campers but not day users. If the rate of spread constitutes a threat, a helicopter mounted public address system will be used.

Temporary closure of a park or a portion of it should be exercised when large or erratically behaving fires are present. Where a fire threatens escape from the park, adjacent authorities should be advised in order to coordinate alternate departure routes. The Superintendent or Chief Ranger should be notified if park developments are threatened. Park developments and cultural resources must receive special attention. They are indicated on the fire management unit map (available separately).

3. Suppression of Fire in Old-Growth Redwood Trees - Old-growth redwood trees which are on fire will be felled only if they pose a threat to fire line stability and then only with approval of the Superintendent. Prior to this, all other methods of suppression should be attempted. In every case, an evaluation for the natural suppression of individual fires will be made.

Techniques for suppressing fires in standing trees are limited. Redwood National Park will develop methods to put out such fires.

F. Fire Management Strategy Summary

Fire management strategies differ for each of the 19 fire management units (Table 2). Three units are managed by California Department of Parks and Recreation and therefore are exempt from the purview of this plan. These areas are mentioned only for informational purposes. For ten of the units, total suppression is specified. In the remaining six units, the use of prescribed fire or natural prescribed fire is proposed. Section IV G gives a description of each of the units and their management strategies. Table 3 describes a five year program for implementing Redwood's planned prescribed fires.

Table 3: Schedule of Proposed Prescribed Fires

<u>Year</u>	<u>Fire Management Units</u>	<u>Vegetation Types</u>	<u>Estimated Acreage</u>	<u>Estimated Costs</u>
1*	7,17,18	prairies, redwood understory, oak woodland	100	\$ 4,000
2	9,17,18	redwood understory, prairies, oak woodland	100	4,500
3	5,7,17,18	redwood understory, prairies, oak woodland	125	4,500
4	5,9,18	prairies, coastal scrub	75	4,000
5	7,18	prairies, coastal scrub, oak woodland	100	4,000

* Year 1 will begin with the approval of this plan.

G. Fire Management Unit Descriptions:

1. Fire Management Unit #1: Little Bald Hills - This unit is found in T.16N. R.1E. (Humboldt Meridian) Section 22 and portions of Sections 16, 21, 23, 26 and 27. The Little Bald Hills Fire Management Unit includes approximately 1300 acres east of Jedediah Smith Redwoods State Park on steep slopes and broad ridges ranging in elevation from 500 to 2,100 feet. The vegetation is strongly influenced by soil conditions and periodic fires. Jeffrey pine/Idaho

Table 2: Fire Management Unit Strategy Summary

Unit Number	Name and Brief Description	Fire Management Strategy	Rationale for Strategy
1	Little Bald Hills: 1,300 acres of prairie and chaparral east of Jedediah Smith Redwoods State Park.	Suppress all wildfires. No bulldozer use on grassland areas.	Insufficient time and money to conduct prescribed burns within 5-year plan framework.
2	Jedediah Smith Redwoods State Park.	No actions proposed by NPS.	Fire management is under direction of California Department of Forestry.
3	Hiouchi: 40 acres, rural home and park development along U.S. Highway 199.	Suppress all fires.	Developed area - prescribed burning will be conducted elsewhere during the 5-year plan framework to refine prescriptions applicable to this unit.
4	Mill Creek/Rellim Ridge: 1,750 acres of old-growth, second-growth and cutover forest.	Suppress all fires.	Prescribed burning will be conducted elsewhere during the 5-year plan framework to refine prescriptions applicable to this unit. More experience with fire in young second-growth is necessary.
5	Enderts Beach/Bluff Road: 1,000 acres of coastal terrace and slopes including 200 acres of grassland.	Suppress all wildfires. Continue prescribed burns to control exotics and restore native plant communities.	Area is highly disturbed and heavily invaded by exotics.
6	Del Norte Coast Redwoods State Park.	No actions proposed by NPS.	Fire management is under direction of California Department of Forestry.
7	Footsteps Rock: 500 acres of coastal grassland, scrub and Sitka spruce forest. About one-half of unit is in Del Norte Coast Redwoods State Park.	Conduct prescribed burning on RNP grassland and coastal shrub. Suppress all wildfires on RNP lands. No actions proposed by NPS for State lands.	To study fire effect on species composition (particularly natives) and succession on prairie/coastal scrub vegetation types. Fire management in the State park portion is under the direction of California Department of Forestry.
8	False Klamath Cove to Requa: 900 acres of steep coastal slopes.	Suppress all fires.	Prescribed burning will be conducted elsewhere during the 5-year plan framework to refine prescriptions applicable to this unit. Unit has extremely limited access and many residences are nearby.
9	Flint Ridge: 1,300 acres of coastal grassland, scrub, old-growth and second-growth forest.	Conduct prescribed burning in prairies. Implement a prescribed natural fire program in redwood forest.	Area is topographically isolated, reducing hazard to non-park lands from prescribed natural fire. Prescribed burning will be conducted in the prairies to evaluate fire effects on species composition.

Table 2: Fire Management Unit Strategy Summary

Unit Number	Name and Brief Description	Fire Management Strategy	Rationale for Strategy
10	Coastal Drive: 1,000 acres of coastal grassland, scrub and second-growth forest north of Prairie Creek Redwoods State Park.	Suppress all fires.	Prescribed burning will be conducted elsewhere during the 5-year plan framework to refine prescriptions applicable to this unit.
11	Prairie Creek Redwoods State Park.	No actions proposed by NPS.	Fire management is under direction of California Department of Forestry.
12	May Creek/Lost Man Creek: 11,000 acres of old- and second-growth forest.	Suppress all fires.	Prescribed burning will be conducted elsewhere during the 5-year plan framework to refine prescriptions applicable to this unit. More experience with fires in second-growth is necessary.
13	Little Lost Man Creek Research Natural Area: 2,480 acres of old- and second-growth forest.	Suppress all man-caused fires. Restrict bulldozer use. Develop and implement a 5-year prescribed natural fire program.	This is a research natural area (RNA) in which no motorized vehicles are allowed. Natural (lightning) fires will be monitored and allowed to burn unless adjacent private lands are threatened.
14	Davison Road/Skunk Cabbage Creek: 5,750 acres of coastal Douglas-fir/redwood, old- and second-growth forest.	Suppress all fires.	Prescribed burning will be conducted elsewhere during the 5-year plan framework to refine prescriptions applicable to the unit. Old-growth stands are too small and interspersed with young second-growth to allow prescribed natural fires.
15A/15B	Orick Slopes Facing West: 3,450 acres of old- and second-growth forest.	Suppress all fires.	Prescribed burning will be conducted elsewhere during the 5-year plan framework to refine prescriptions applicable to this unit.
16	Redwood Creek West Side: 29,000 acres of old- and second-growth forest.	Suppress all fires.	Prescribed burning will be conducted elsewhere during the 5-year plan framework to refine prescriptions applicable to this unit.
17	Redwood Creek East Side: Old- and second-growth forest.	Conduct prescribed burning in old-growth redwood understory. Suppress all wildfire.	To determine the effects of fire of known intensity on redwood forest understory and relate this to observations of other areas.

Table 2: Fire Management Unit Strategy Summary

Unit Number	Name and Brief Description	Fire Management Strategy	Rationale for Strategy
18	Bald Hills: 2,640 acres of prairies and oak woodlands.	Continue with prescribed burn program to restore natural plant communities. Suppress all wildfires.	To provide information on the effects of fire upon species composition in the prairies and oak woodlands and to refine burning prescriptions.
19	Mouth of Redwood Creek: Unvegetated beach and coastal strand vegetation with driftwood.	Suppress all fires.	This is a heavy visitor use area and there is no fire dependent vegetation in the unit.

fescue grassland, knobcone pine, chaparral and Douglas-fir forests dominate the unit. Some cutover redwood forest occurs toward the western edge of the unit. The area is approximately 10 miles inland from the sea and climatic variations are pronounced.

It is bounded by Miller-Rellim property on the south, private land and Six Rivers National Forest on the north and east and Jedediah Smith Redwoods State Park on the west.

a. Vegetation Types - Three major vegetation types dominate the unit. Jeffrey pine/Idaho fescue grasslands are found on the ridgetops on serpentine soils; the stands are open with scattered Jeffrey pine, knobcone pine, madrone, Port-Orford-Cedar and occasional Douglas-fir. Coffeeberry and manzanita, the predominant shrubs, are widely scattered throughout. The understory grassland is particularly rich in native species, dominated by Idaho fescue. Small, scattered knobcone pine stands are found along the ridge toward the southeastern extremity of the unit.

A nearly impenetrable chaparral community composed of manzanita, coffeeberry, tanoak, huckleberry and rhododendron is found downslope and to the east on Miocene sediments.

The third major vegetation type, dominated by second-growth redwood and Douglas-fir forest, lies on the lower slopes of the western portion of the unit. It was logged in approximately 1955. Redwood, Douglas-fir, Port Orford cedar and tanoak dominate the overstory. Rhododendron, huckleberry and salal dominate the understory. A few small stands of old-growth redwood and Douglas-fir extend into the unit along drainages.

b. Fire History and Fuels - Within the Jeffrey pine/Idaho fescue grasslands (National Fire Danger Rating System Fuel [NFDRS] Model C), dry grasses will carry a rapidly spreading, low intensity fire. (Descriptions of the fuel models are given in Appendix H.) Adjacent dense stands of chaparral and senescent knobcone pine (Fuel Model B) have the potential for carrying an intense, fast moving fire. Portions of the area last burned about 1940.

The vegetation is obviously influenced by periodic burning and the use of prescribed fire may be essential to maintain the local vegetation composition and structure.

Because of vegetation and fuel types, elevation and inland climatic conditions, the potential for high intensity fire is great. Man-caused or natural ignitions on the U.S. Forest Service lands to the east and downslope could produce a high intensity fire, running rapidly to parklands on the ridgetop. Prescribed burning from the ridgetop east and downslope in cooperation with the U.S. Forest Service could be used to maintain near-natural vegetation patterns while reducing extreme risk.

c. Management Strategies - Limitations of funding and available manpower preclude initiation of a prescribed burning program in the next five years. All fires will be suppressed. A fire history and more detailed vegetation map will be prepared in advance of prescribed burning.

d. Special Concerns - This unit has the largest number of rare and/or threatened vascular plants known in the park (see Table 1).

The unit has not been completely surveyed for cultural resources. Partial reconnaissance has resulted in the recording of a historic trail and the remains of a historic ranch. Through park review procedures, the historic resources will be protected during a prescribed fire.

No bulldozers or other tracked equipment shall be used for fireline construction in the grassland areas on Little Bald Hills. The existing road may serve as a fireline.

e. Pre-Attack Information - Access is from the Little Bald Hills Road and Miller-Rellim property via Cougar Ridge. Limited water is available from a developed spring in Section 23.

2. Fire Management Unit #2: Jedediah Smith Redwoods State Park - This unit is located in T.17N. R.1W. portion of Section 36; T.17N. R.1E. Portion of Section 31; T.16N. R.1W. Sections 1, 12, 13 and 18 and portions of Sections 14 and 23; T.16N. R.1E. Sections 6, 7, 8, 17, 18, 19 and 20 and portions of Sections 5, 9, 16 and 21. Jedediah Smith Redwoods State Park is located east of Crescent City and includes 9,490 acres within national park boundaries (additional State park lands exist outside the Congressionally authorized boundary).

This unit is composed primarily of upland habitats with several excellent examples of alluvial terraces adjacent to the Smith River. The park is situated upon slopes above Elk Valley and extends easterly toward the Smith River. Mill Creek is the largest tributary to enter the Smith River within the park. Eastern park boundaries border serpentinized substrates characteristic of the Siskiyou Mountains inland. Elevations range from 100 to 1,000 feet. The bulk of the park lies between 5 and 9 miles inland from the sea.

a. Management Strategies - Jedediah Smith Redwoods State Park is wholly operated by the California Department of Parks and Recreation. All fire management responsibilities are vested within the California Department of Forestry. No fire management is proposed or recommended with the exception of the existing mutual aid agreement (Appendix I). The following description is included so that all lands within national park boundaries are considered.

b. Vegetation Types - Old-growth redwood and a small amount of advanced second-growth redwood forest dominate the park. On alluvial terraces along the Smith River (such as at Stout Grove), redwood sorrel and sword fern dominate the understory. Moving upslope, Douglas-fir, huckleberry and salal become increasingly important. Hemlock is an important component of the low elevation forests while Douglas-fir, tanoak and madrone increase at higher elevations. Relatively young stands of western hemlock form a distinct lower tree layer and are believed to have originated following fire or other disturbances, including limited tree cutting for puncheons and shingles.

c. Fire History and Fuels - A large area burned during the autumn of 1936 within old-growth forest northwest of the Howland Hill Road near the Nickerson Ranch site. Since this state park unit extends from moist, low elevation to warmer, dryer inland sites, a higher fire frequency is expected since fires originating at inland points may have spread westerly.

Large volumes of downed, woody fuels occur beneath a dense understory of shrubs throughout many park areas, providing sufficient fuel for a major understory fire (NFDRS Fuel Model G).

3. Fire Management Unit #3; Hiouchi - This unit is located in T.16N. R.1E. portion of Section 9. The Hiouchi Unit is primarily a rural home and park development totaling approximately 40 acres along U.S. Highway 199. It is bordered by Jedediah Smith Redwoods State Park on the west and south and U.S. Forest Service and private lands on the north and east. This development partially occurs on a serpentine-derived soil formerly supporting a Jeffrey pine-grassland vegetation type. It lays on an old river terrace at about 150-200 feet in elevation, north of the Smith River.

a. Vegetation - The vegetation of the area was originally Jeffrey pine-grassland with some redwood-Douglas-fir. The area has been modified by agriculture and residential development, including plantings of ornamental shrubs, fruit trees and other exotics. As developments are abandoned and structures razed, associated exotics are being removed and management is carried out to yield a more natural vegetation.

b. Fire History and Fuels - No fire history has been obtained for this unit. NFDRS Fuel Models "A" and "L" are the primary models in the grasslands surrounding the development.

c. Management Strategies - All fires in this unit, which is a rural home and park development area, will continue to be suppressed.

d. Special Concerns - The Hiouchi Unit contains 19 structures. Except for park administration buildings, all are retained occupancies which will be phased out by 1994. No threatened or endangered plants are known to occur in the Hiouchi Unit. This unit has been subjected to a complete archaeological reconnaissance and no surface evidence of cultural resources was noted.

e. Pre-Attack Information - Redwood National Park shares structural suppression responsibility with the Smith River Fire District. U.S. Highway 199 and numerous driveways provide access to the unit. Water is available at most structures.

4. Fire Management Unit #4: Mill Creek/Rellim Ridge - This unit is located in T.16N. R.1W. portions of Sections 25, 36; T.16N. R.1E. Section 30 and portions of Sections 29, 31, 32; T.15N. R.1W. portions of Section 1. The Mill Creek/Rellim Ridge Unit totals approximately 1,750 acres south of Jedediah Smith Redwoods State Park. Mill Creek bisects the eastern half of the unit; elevations range from 200 to 1,000 feet. A small, detached unit is located east of the Miller-Rellim Demonstration Forest. It is bounded by Jedediah Smith

Redwoods State Park on the north, Del Norte Coast Redwoods State Park on the south and private lands to the east and west.

a. Vegetation Types - Old-growth and advanced second-growth redwood forest dominates the eastern half of the unit. Most of the second-growth logged in the 1920's and 1930's is located on the lower slopes adjacent to Mill Creek and its tributaries. Redwood sorrel, swordfern, huckleberry, salmon-berry and salal dominate the understory of the old-growth.

The vegetation of the western portion of the unit (Rellim Ridge) was originally dominated by redwood east of the ridgetop and Sitka spruce to the west. The spruce was removed during the first half of this century and much of the slope converted to pasture. The redwood was logged early in the 1900's or during the 1950's. Today, the cutover area is dominated by second-growth redwood and brush. Some young stands of spruce are becoming established. The pasture was partially planted in the 1960's to Douglas-fir and redwood. The balance is being slowly invaded by coastal scrub, alder and spruce.

b. Fire History and Fuels - One light understory fire is known for the old-growth forests on the lower slope east of Mill Creek. It burned in 1880. On the same site, the last fire to significantly alter the stand occurred about 600 years ago (Veirs 1982). Some historic fires may have occurred on the upper slopes of this unit west of Mill Creek as a result of Hobbs-Wall logging activity in Section 25 during the period 1910-1920. Some of these fires escaped into the old-growth redwood forest to the north as well, within the present Jedediah Smith Redwoods State Park (Section 24), resulting in extensive fire damage to overstory trees.

NFDRS Fuel Model "G" best typifies the old-growth stands with a heavy accumulation of litter and downed woody material. Second-growth forests and the small pasture on Rellim Ridge are grouped under Fuel Model "J".

c. Management Strategies - All fires will be suppressed. Small stands of old-growth timber surrounded by young second-growth stands pose difficult fire management problems. This unit is adjacent to extensive private timber lands. It is recommended that introduction of prescribed fire in this unit be deferred until experience is gained with fire in young second-growth stands.

d. Special Concerns - No threatened or endangered plants are known to occur in the unit. The unit contains a horse trail, a USGS stream gauging station, the Howland Hill Outdoor School and power lines serving the Miller-Rellim complex. This unit has been partially surveyed for cultural resources. Remnants of the historic Hobbs-Wall logging operation, including remains of camps, railroad grades and trestles, are located within the unit. This historic resource should be completely recorded and evaluated so that it will not be adversely impacted by fire management activities.

e. Pre-Attack Information - The major access to the unit is via the Hamilton Road (on Miller-Rellim property) and the Rellim Ridge Road. Walking access is available via the horse trail off Rellim Ridge.

5. Fire Management Unit #5: Enderts Beach/Bluff Road - This unit is located in T.15N. R.1W. portions of Sections 2, 11, 13 and 14. The Enderts Beach/Bluff Road Unit includes approximately 1,000 acres of coastal terrace and slopes overlooking the ocean, just south of Crescent City. Elevations range from sea level to 850 feet.

It is bounded by the Pacific Ocean to the west, Del Norte Coast Redwoods State Park to the south and east and private property to the north. Access is from Highway 101, Enderts Beach Road and the Coastal Trail.

a. Vegetation Types - Approximately 200 acres of the unit are occupied by coastal grasslands. Portions are abandoned pasture and agricultural land. Non-native grasses and forbs dominate, including orchard, velvet and sweet vernal grasses, alta fescue, ox-eye daisy, hairy cat's ear and plantain. Scattered patches of alder and coyote brush occur throughout, becoming dominant with salal, salmonberry and oceanspray along steep, exposed coastal bluffs. A small freshwater marsh (approximately 10 acres) dominated by sedges and cattails, occurs near the north end of the unit. Along the beach, scattered individuals of dunegrass, sand verbena, sea rocket and silver beachweed are common.

Upslope and inland from the coastal grasslands and scrub, second-growth Sitka spruce and redwood forests dominate. The stands now include a substantial component of alder. The area above the prairies was logged in the early 1900's. The redwood south of Nickel Creek was logged in the 1960's.

b. Fire History and Fuels - It is thought that prehistoric populations burned the prairies/grasslands within this unit. The historic fire record for this area is largely unknown. Mr. Ben Pozzi (a local resident) states that the forested hillslopes above the prairie burned about 1916.

NFDRS Fuel Models "A" and "L" are the primary models in the prairies with flashy, continuous surface fuels in the 1-hour time lag category carrying the fire. Second-growth forests and coastal scrub are grouped under Fuel Model "J."

c. Management Strategies - A small-scale, experimental prescribed burn program was begun in the coastal grassland area along Enderts Beach Road in 1980. Objectives of the burning are to test the potential for use of fire in species manipulation aimed towards increasing native species, controlling the exotics and to control the invasion of prairies by shrubs and trees. To date, approximately 125 acres have been burned. Continued burning is proposed.

d. Special Concerns - The unit contains two park residences, a private residence (retained occupancy ended in 1984), two day-use areas, a walk-in campground, power lines serving the Klamath area and a portion of the Coastal Trail. The grasslands of this unit have been subjected to complete archaeological reconnaissance. Two prehistoric village sites, listed on the National Register of Historic Places, are located within the area. For protection of these resources, fire-fighting equipment should avoid the vicinity of the mouth of both Cushing and Nickel Creeks. Wolf's evening primrose,

currently under review for Federal listing as threatened and endangered, is found on ocean bluffs in this unit.

The location of the campground, at the base of the Nickel Creek drainage, combined with steep slopes and in-shore, up-canyon winds creates high potential fire escape conditions.

e. Pre-Attack Information - Water is available at the two park residences along Enderts Beach Road, Crescent Beach Picnic Area, Nickel and Cushing Creeks and the wetlands south of the day-use picnic area. Access is from Highway 101, Enderts Beach Road and the Coastal Trail.

6. Fire Management Unit #6: Del Norte Coast Redwoods State Park - This unit is located in T.15N. R.1W. Sections 24, 25, 36 and portions of Sections 1, 12 and 13; T.15N. R.1E. Sections 18 and 19 and portions of Sections 7, 8, 17, 30 and 31; T.14N. R.1W. Section 1, and T.14N. R.1E. Section 6. Del Norte Coast Redwoods State Park is located along the coast between Crescent City and the Klamath River and includes 6,375 acres within national park boundaries. Elevations range from sea level to 1,350 feet. National Park lands border the north and south; private timberlands owned by the Miller-Rellim Company are to the east; to the west is the Pacific Ocean.

a. Management Strategies - Del Norte Coast Redwoods State Park is wholly operated by the California Department of Parks and Recreation. All fire management responsibilities are vested within the California Department of Forestry. No fire management is proposed or recommended with the exception of the existing suppression aid agreement (Appendix I). The following description is included so that all lands within national park boundaries are considered.

b. Vegetation Types - Old-growth and second-growth redwood forest dominate the park. Redwood, Douglas-fir, hemlock, tan oak and madrone are the most important canopy species, while huckleberry, salal, sword fern and salmonberry make up the understory. Alder is an important additional component of the second-growth stands. Most of the logging occurred in the early 1930's. One 160-acre area was logged in the 1960's. Near the ocean, coastal scrub and Sitka spruce forests dominate. The dense coastal scrub, including coyote brush, salal, swordfern, oceanspray and salmonberry, gives way to spruce in the more protected areas.

c. Fire History and Fuels - The historic fire record for this area is unknown. The old-growth stands are represented by the NFDRS Fuel Model "G" - dense conifer stands with a heavy accumulation of litter and downed woody material. Second-growth forests and coastal scrub are grouped under Fuel Model "J".

7. Fire Management Units #7 A and B: Footsteps Rock - This unit is located in T.14N. R.1E. portions of Sections 7, 18 and 19. The Footsteps Rock Unit includes approximately 500 acres in a narrow strip between the main body of Del Norte Coast Redwoods State Park, False Klamath Cove, the Pacific Ocean and private timberlands owned by Simpson Timber Company. Elevations range from sea level to 600 feet. Approximately one-half of the unit (7A) is a part

of Del Norte Coast Redwoods State Park. The remaining half, all above Highway 101 (7B), is national park land.

a. Vegetation Types - Three major vegetation types dominate the unit: coastal grassland, coastal scrub and Sitka spruce forest. The coastal grasslands have been greatly modified by sheep and cattle grazing which began with white settlement in 1877 (McBeth 1950). Non-native grasses dominate, including orchard, sweet vernal and bent grasses. Large areas are made almost impenetrable by extensive masses of California blackberry.

Coastal scrub is found primarily on the steep slopes nearest the ocean; coyote brush, salal, blackberry and salmonberry dominate. Occasional wind-pruned alder and Sitka spruce are also present.

The third major vegetation type dominated by Sitka spruce forest lies on the upper slopes. Sitka spruce, Douglas-fir and alder dominate the overstory while salal and salmonberry dominate the understory.

b. Fire History and Fuels - The historic fire occurrence for this unit is unknown. NFDRS Fuel Models "A" and "L" are the primary models in the grasslands. The coastal scrub and Sitka spruce stands are grouped under Fuel Model "J."

c. Management Strategies - No fire management is proposed or recommended for State park lands. For the national park lands, prescribed burning is proposed in areas of coastal prairies, particularly DeMartin Prairie. Objectives for burning are to test the potential for use of fire in species manipulation aimed towards increasing natives and to control the invasion of prairies by shrubs and trees. All wildfires will continue to be suppressed. This unit is downslope from adjacent private timberlands.

d. Special Concerns - Unit 7B contains a portion of the Coastal Trail, a walk-in campground, one National Park Service building and eight lease-back residences. Numerous buried water lines serve the residences and the campground. Pacific Power and Light (PPL) powerlines serving Klamath dissect the unit. No threatened or endangered plants or animals are known within the unit. The unit has been partially surveyed for cultural resources. Field checks of ethnographic villages have resulted in the recording of the remnants of prehistoric sites to the north and south of Wilson Creek. A historic structure, the DeMartin House, is within the unit south of Wilson Creek. This house should be protected from fire damage. The prehistoric sites could be impacted by fire suppression vehicles.

e. Pre-Attack Information - Highway 101 and Rudisell Road provide the main access. Powerline roads also provide four-wheel drive access. All of the unit is within one-half mile of the highway. Additional foot access is available via the Coastal Trail. Water is available from the Lagoon Creek pond and at the residences and campground.

8. Fire Management Unit #8: False Klamath Cove to Requa - This unit is located in T.14N. R.1E. portions of Sections 19, 20, 29, 30, 31 and 32;

T.13N. R.1E. portion of Section 5. The False Klamath Cove to Requa Unit lies between False Klamath Cove and the mouth of the Klamath River. The Pacific Ocean lies to the west and private lands to the east. Steep slopes with west to southwest aspects characterize this 900 acre unit. Elevations range from sea level to 800 feet.

a. Vegetation Types - Habitats within this unit are exposed to sea winds and are dominated by coastal scrub interspersed with red alder/Sitka spruce woodland and coastal grassland. Perennial grasses and forbs dominate the prairies. Brome, orchard, velvet, bent and sweet vernal grasses; wild cucumber, sword fern, lupine, iris and bracken fern are the most common forbs. Coyote brush is scattered throughout, forming dense patches of coastal scrub in the more steep exposed areas. Advanced Sitka spruce forest dominates areas upslope and inland. The area was logged in the early 1920's.

b. Fire History and Fuels - Although the historic fire occurrence for this unit is unknown, it is probable that Indians burned the grassland portions. NFDRS Fuel Model "L" is the primary model in the grasslands. The coastal scrub and Sitka spruce stands are grouped under Fuel Model "J".

c. Management Strategies - No prescribed burning is presently scheduled. Fire prescriptions for the vegetation types of this unit will be developed in other units for later application to this area. Because of extremely limited access and nearby residential developments, all fires will be suppressed.

d. Special Concerns - The Lagoon Creek day-use area, Redwood National Park's maintenance facility, a portion of the Coastal Trail and Pacific Power and Light powerlines are found in this unit. Along Highway 101, the Trees of Mystery and motel complex are immediately adjacent to the park boundary. No threatened or endangered plants or animals are known to occur within the False Klamath to Requa Unit. Although this unit has not been completely surveyed for cultural resources, a prehistoric Indian village is listed on the National Register of Historic Places. Fire suppression equipment should avoid the Lagoon Creek vicinity so as to protect this cultural resource.

e. Pre-Attack Information - Water is readily available at Lagoon Creek, the Klamath River and the Requa Maintenance Facility. A California Conservation Corps (CCC) fire crew is stationed at the Requa facility. Road access is little more than one-half mile from any point in the unit. Highway 101 and the Patrick Murphy Memorial Drive leading to the Requa facility provide the major access. The Coastal Trail, overlooking the ocean, runs the length of the unit.

9. Fire Management Unit #9: Flint Ridge - This unit is located in T.13N R.1E. portions of Sections 8, 9, 10, 15, 16 and 17. The Flint Ridge Unit lies just south of the Klamath River. It is a 1,300 acre forested ridge running from sea level to 900 feet in elevation. The unit is a triangle, roughly bounded by the Coastal Drive, Alder Camp Road and the Klamath Beach Road, with private lands to the north and east, the Klamath River to the north and the Pacific Ocean to the west.

a. Vegetation Types - The western coastal slope of the unit above and below the Coastal Drive is dominated by grassland and coastal scrub vegetation with alder and occasional stands of Sitka spruce. About 360 acres of this type exist today and was probably all grassland before the arrival of Europeans.

Upslope and inland from the coastal grassland, forests dominated by redwood with Douglas-fir, Sitka spruce and hemlock occupy about 950 acres, including about 450 acres which were clearcut during the 1940's and 1950's. The old-growth redwood forests appear to have been burned in recent times and has a dense understory of salal and huckleberry. The second-growth stands include a substantial component of alder.

b. Fire History and Fuels - The fire history for this area is unknown. Nearby stands further inland show evidence of a substantial fire which occurred about 250 years ago. It is probable that some burning in this unit may have occurred as a result of intentional or accidental fires set by the Indian residents at the mouth of the Klamath River. Some historic Indian burning for basket materials is known for portions of the Flint Ridge area.

One arson fire, started in debris piles, burned in this unit above Richardson pond during summer 1980. About 3 acres burned in alder-dominated second-growth before the fire was controlled. NFDRS Fuel Model "G" is the primary model for the old-growth stands and Fuel Model "J" best represents the second-growth stands.

c. Management Strategies - The forested portion of this unit is proposed to be a prescribed natural fire zone as discussed on page 38. The unit is well isolated, surrounded by roads or water. Prescribed burning is proposed in the prairie to evaluate fire effects on species composition.

d. Special Concerns - The ridge itself and the roads around the unit constitute the most effective barriers to fire. Periods of dry, northwest winds could push fires upslope from the coastal prairie, roadways or private lands on the north and west sides of the unit. Fire hazards are strongly reduced in the unit during foggy intervals in the dry summer and fall periods. This unit has not been surveyed for cultural resources. However, isolated prehistoric artifacts were encountered by trail construction crews. No threatened or endangered plants or animals are known to occur in the Flint Ridge Unit. A portion of the Coastal Trail (the Flint Ridge Trail) and a walk-in campground are located in this unit. Pacific Power and Light Company power lines parallel the road on the north edge of the unit.

e. Pre-Attack Information - Water is readily available at Richardson pond or the Klamath River. Road access is little more than one-half mile from any point in the unit. Additional foot access is available via the Coastal Trail.

10. Fire Management Unit #10: Coastal Drive - This unit is located in T.13N. R.1E. portions of Sections 16, 17, 20, 21, 28, 29 and 33. This unit comprises an area of approximately 1,000 acres extending from the Alder Camp Road on the north to the north end of Prairie Creek Redwoods State Park on the south. The unit extends approximately one-half mile upslope from the Pacific Ocean to the ridge crest. Elevations range from sea level to 750 feet. Landslides and earthflows are frequent and are influenced in part by wave action at the toe of the slope.

a. Vegetation Types - Approximately one-half of the unit is dominated by second-growth Sitka spruce and a small amount of second-growth redwood forest, located mainly above the Coastal Drive. The remaining area is predominantly coastal grasslands and coastal scrub. In recent decades, portions of the prairies have been invaded by coastal scrub or alder and Sitka spruce, possibly as a result of less frequent burning of the grasslands or as a result of the removal of cattle, sheep and goats after 1968.

b. Fire History and Fuels - The historic fire occurrence for this unit is unknown. The degree to which the coastal grassland, scrub and forest succession are controlled by fire is unknown, but it is believed that the Indians did burn the coastal vegetation for various reasons. NFDRS Fuel Model "J" best typifies the fuels of the second-growth stands. The coastal grasslands and small areas of coastal scrub have been grouped under Fuel Model "L".

c. Management Strategies - Limited prescribed burning may be proposed in the coastal grassland and scrub vegetation types after burning prescriptions have been developed in other units.

d. Special Concerns - The Coastal Drive, Alder Conservation Camp and Pacific Power and Light power lines are found within this unit. No threatened or endangered plants or animals are known to occur within this unit. The unit has not been intensively surveyed for cultural resources. An historic structure, a World War II radar station listed on the National Register of Historic Places, is within the area. This historic resource should be protected from fire damage.

e. Pre-Attack Information - Access is via the Coastal Drive, which bisects the unit north to south, and the two roads leading to the Alder Conservation Camp. Water is available at Alder Camp.

11. Fire Management Unit #11: Prairie Creek Redwoods State Park - This unit is located in T.12N. R.1E. Sections 4, 9, 10, 15, 16, 21, 22, 23, 25, 26, 27, 33, 34, 35 and 36 and portions of Sections 3, 11, 14, 24, 28; T.13N. R.1E. portions of Sections 33 and 34. T.11N. R.1E. Section 2 and portions of Sections 1, 3, 4, 8, 9, 10, 11 and 12. Prairie Creek Redwoods State Park is located 7 miles north of Orick, California and includes 13,509 acres within national park boundaries. Elevations range from sea level to 1,500 feet. National park lands border the north and south; Simpson Timber Company lands and the U.S. Highway 101 Bypass border the east and the Pacific Ocean borders the west.

a. Management Strategies - Prairie Creek Redwoods State Park is wholly operated by the California Department of Parks and Recreation. All fire management responsibilities are vested within the California Department of Forestry. No fire management is proposed or recommended with the exception of the existing suppression aid agreement. The following description is included so that all lands within national park boundaries are considered. Eighty acres of Redwood National Park are found within the State park [NW¼ Section 10 T.12N R.1E.]. Fire management of this area will be consistent with State park policies.

b. Vegetation Types - Old-growth redwood forest comprises the major vegetation type of the area. Associated species include hemlock, Douglas-fir, occasional grand-fir, western red cedar and, rarely, Port-Orford-Cedar. Tanoak and madrone are important upland, dry site components. Understory species include redwood sorrel, swordfern, salal, huckleberry and salmonberry. Sitka spruce becomes more important near the coast where it is more tolerant of salt spray. Areas near the coast were cutover or burned before 1900 during periods of gold mining activities. Portions of Major Creek and Skunk Cabbage Creek were logged for spruce during the 1930's. Approximately 600 acres of redwood in the Home Creek drainage were logged in the early 1960's, prior to donation to the State. Ninety acres of redwood in the Boyes Creek drainage were logged in the 1970's and donated to the State. Broadleaf species dominate riparian habitats along Prairie Creek and include red alder, bigleaf maple and California laurel. Vine maple and salmonberry are common lesser shrubs. Other riparian understory species include salal, huckleberry, cascara, hazel and rhododendron.

Vegetation along Gold Bluff Beach is dominated by dense clumps of European beachgrass with scattered individuals of native dunegrass, wild strawberry and sand verbenas.

Small coastal grasslands occur as mosaics within the forest. The largest, Boyes Prairie, comprises approximately 170 acres and is dominated by sweet vernal, velvet and bent grasses. Sedges occupy large areas of poor drainage. Another small prairie, less than 2 acres, is found above Fern Canyon, with a similar species composition.

c. Fire History and Fuels - Little is known about the fire history of the area. The autumn of 1936 is known to have had many fires in coastal vegetation. The Skunk Cabbage Creek and Espa Lagoon areas are known to have burned at that time. NFDRS Fuel Model "G" is the primary model for the old-growth stands while Fuel Model "J" best represents the second-growth stands.

12. Fire Management Unit #12: May Creek/Lost Man Creek - This unit is located in T.12N. R.2E. portions of Sections 30 and 31; T.11N. R.1E. Section 13 and portions of Sections 1, 11, 12, 14, 23, 24 and 25; T.11N. R.2E. Sections 7, 18, 19, 20, 29 and 30 and portions of Sections 5, 6, 8, 17, 21, 38, 31, 32 and 33; T.10N. R.2E. portions of Sections 5, 6, 7 and 8. This unit composes approximately 11,000 acres of forest lands in Lost Man and May Creek drainages and the headwaters of Boyes Creek, all tributary to Prairie Creek. Elevations range from about 200 feet near Prairie Creek on gentle terrain to more than 2,000 feet on the steep ridges forming the eastern limit of the unit.

a. Vegetation Types - Approximately 2,500 acres of old-growth redwood vegetation remain in the lower Lost Man Creek basin. These forests are characterized by high redwood cover values with swordfern dominating the understory. They are relatively moist. The remaining 9,000-9,500 acres are young to advanced second-growth stands 15-35 years old. After logging Douglas-fir and Sitka spruce were aerially seeded. Alder is abundant near

watercourses. Some Monterey pine and Lombardy poplar were planted in the unit. At higher elevations toward the eastern portion of the unit, tanoak and madrone increase in the Douglas-fir/redwood.

b. Fire History and Fuels - No fire history information has been assembled for the unit. NFDRS Fuel Model "G" is the primary Model for the old-growth stands while Fuel Model "J" best represents the second-growth stands.

c. Management Strategies - All fires will be suppressed because of the patchwork nature of the old-growth and young, second-growth forest and lack of experience with fire in second-growth stands.

d. Special Concerns - A park radio relay station is located on the boundary of this unit at the headwaters of Lost Man Creek. May Creek/Lost Man Creek Unit is adjacent to the Little Lost Man Creek Research Natural Area (Unit #14) which has special fire management limitations. See Unit #14 description for details. No threatened or endangered plants are known to exist within this unit. It has not been surveyed for cultural resources. The U.S. Highway 101 Bypass is being constructed through this unit.

e. Pre-Attack Information - Water is available from May and Lost Man Creeks and several unnamed creeks. Access is from U.S. Highway 101, the May Creek Road and the Geneva/Holter Ridge Road.

13. Fire Management Unit #13: Little Lost Man Creek Research Natural Area - This unit is located in T.11N. R.1E. portions of Sections 23, 24, 25, 26 and 36; T.11N. R.2E. portions of Section 31; T.10N. R.1E. portions of Section 1; T.10N. R.2E. portions of Sections 6 and 7. This unit encompasses the 2,480 acre watershed of Little Lost Man Creek. The entire watershed has been designated a Research Natural Area. Old-growth redwood forest dominates the unit with approximately 300 acres of advanced second-growth. Elevations range from 50 to 2,250 feet.

a. Vegetation Types - The vegetation of the unit is largely old-growth redwood. At lower elevations hemlock and sword fern are abundant. Douglas-fir, tanoak and madrone become increasingly important on upper, drier slopes. Some of the Douglas-fir stands on the upper slopes of this unit were prairies as recently as the mid-1800's and 1910.

Approximately 300 acres of redwood forest was logged during the 1950's and 1960's in three areas: the east-facing slope upstream from the Geneva Road, the "Whiskey 40" area which straddles the Bald Hills Road and the extreme headwaters along Holter Ridge Road.

b. Fire History and Fuels - No fire history has been determined for the unit; however, the unit includes a range of redwood environments from cool, moist low elevation to seasonally hot, dry high elevation sites. On this basis a range of natural fire influences would be expected. Native Americans are known to have burned in tanoak stands and hazel copses on prairie margins. NFDRS Fuel Model "G" is the primary model for the old-growth stands, and Fuel Model "J" best represents the second-growth stands.

c. Management Strategies - The park's management strategies for this unit are based upon National Park Service policies for Research Natural Areas. General policies about designation and management of Research Natural Areas are found in *Preserving Our Natural Heritage* (Nature Conservancy 1975). Specific guidelines for fire management are found in two National Park Service documents: Chapter Nine of the *Natural Sciences Research Handbook* (USDI 1968) and an internal memorandum, "Standards and Policy Guidelines for National Park Service Natural Areas" (Everhart 1975).

"The Park Service Handbook is no longer in general use; however, Chapter Nine of the Handbook dealing with Research Natural Areas remains the most complete document dealing with all aspects of the Park Services Research Natural Area Program." (Preserving Our Natural Heritage, p. 265)

Chapter Nine makes only one specific reference to fire and that is under the management section, which states,

"The definition of, and the criteria for, Research Natural Areas requires management and protection that will not allow any activity which may directly or indirectly modify natural types, features or ecological processes"(their underlining).

Management Guideline Number 6 states, *"no fire control of any natural (lightning) fires should be permitted."* Additional references to fire management are given in "Standards and Policy Guidelines for National Park Service Research Natural Areas":

"Natural events, such as insect infestations, fire, and climatological phenomena, should in most cases be allowed to take their course, but there may be instances where protection or treatment is necessary. Insect or disease control may be necessary where the infestation seriously threatens adjacent areas. There may be instances, especially where past practices have altered the environmental context, when protection or control may be necessary. For example, a small remnant stand may be all that remains of a once widespread type. Such resistant stands will now require protection from such influences. Wild fires within Research Natural Areas will not normally be controlled unless the fire threatens adjacent areas, or if the fire was man caused. There should be no clean up, fire hazard reduction, or revegetation that is not consistent or compatible with the ecological associations for which the Area was designated." (Section 4.2.3)

"Maintenance of otherwise transient stages in the vegetative succession may be desired in some Areas which will require vegetation management. For Research Natural Areas that are sufficiently large, a portion should be left without vegetation management. Only proven techniques should be utilized and experimentation should be conducted at other sites. Vegetation management may be achieved through such measures as prescribed fire to simulate wildfire, reintroduction of extirpated native wild animals, use of firearms or reintroduction of predators to control excessive game populations." (Section 4.3.1.1)

"Restoration of area to those ecological conditions (not necessarily physical conditions) which existed prior to introduced disturbances may require manipulation. For example, after a long period of fire protection, it may be desirable to reduce litter accumulations by carefully controlled combustion so that a naturally fire-adapted vegetation formation can better survive wildfire." (Section 4.3.1.2)

Based upon these guidelines, the Little Lost Man Creek Research Natural Area Unit is proposed to be a prescribed natural fire zone as discussed on page 38.

Man-caused ignitions will be suppressed. Lightning ignitions will not be suppressed unless the fire threatens adjacent private lands. Special care must be taken when establishing fire camps, staging areas and helispots. Areas outside the Research Natural Area should be used if possible. Use of bulldozers or other tracked equipment will be restricted to the areas outside the unit. A response plan has been developed and is outlined in Appendix F.

d. Special Concerns - The unit has not been completely surveyed for cultural resources. Past archaeological field checks have not resulted in the recording of cultural resources. No threatened or endangered plants are known to occur in the Little Lost Man Creek Unit.

e. Pre-Attack Information - Vehicular access to the unit is available from the Bald Hills, Holter Ridge and Geneva Roads. A former logging road off the Holter Ridge Road follows the Lost Man/Little Lost Man divide for two miles. Water is available from Little Lost Man and Lost Man Creeks.

14. Fire Management Unit #14: Davison Road/Skunk Cabbage Creek - This unit is located in T.11N. R.1E. Sections 10, 15, 16 and 21, and portions of Sections 3, 4, 9, 11, 14, 17, 20, 22, 27, 28, 29 and 33. The unit contains about 5,750 acres of forest land west of Highway 101 between Orick and Prairie Creek Redwoods State Park on gentle to moderately steep slopes in the Skunk Cabbage and Streelow Creek basins, tributaries of Prairie Creek, and Major Creek, a small watershed flowing directly into the Pacific Ocean.

a. Vegetation Types - The vegetation of the unit is predominately redwood with Douglas-fir. Near the coast, Sitka spruce increases to pure stands. Much of the spruce was logged during the 1920's and 1930's. Some was burned during periods of mining activity in the last half of the 19th century. Approximately 1,000 acres was logged to seed tree standards during the 1950's. The residual trees have been damaged by exposure and possibly by fire. During the 1960's, clearcutting removed all but about 750 acres of the remaining redwood old-growth. Advanced second-growth Sitka spruce is found in the headwaters of Skunk Cabbage Creek and north along the coast, with alder abundant on moist or unstable slopes. Advanced redwood and Douglas-fir second-growth occurs on the older upland sites while alder stands occur on the moist lower slopes and stream bottoms. On the clearcut areas, timberland owners aerially seeded Sitka spruce in an effort to limit browse effects by elk on the second-growth stands.

b. Fire History and Fuels - Man-caused fires burned north through Skunk Cabbage Creek during 1936. Burning, accidental or intentional, of the coastal

Sitka spruce stands occurred during periods of gold mining activity. Fritz (1973) reported whitewoods in the Skunk Cabbage basin about 300 years of age, suggesting that the most recent fire of consequence (prior to 1936) occurred in the early 1600's.

Other fire history remains to be documented by studies of fire scars and tree age distributions. NFDRS Fuel Model "G" is the primary model for the old-growth stands while Fuel Model "J" best represents the second-growth stands.

c. Management Strategies - No prescribed burning is proposed. All fires will be suppressed in these young second-growth stands until experience with fire in this type is gained.

d. Special Concerns - The Davison Road/Skunk Cabbage Creek Unit contains the Wolf Creek outdoor school, Wolf Creek Composting/Fire Cache Facility, a seasonal residence, portions of the Coastal Trail and the Davison Road leading to Gold Bluff Beach/Fern Canyon. No threatened or endangered plants are known to occur in the unit. Approximately 40 percent of this unit has been subjected to archaeological reconnaissance. Limited surface evidence of cultural resources was noted.

e. Pre-Attack Information - Major access is via Highway 101, Davison Road and the Wolf Creek road. Numerous abandoned roads and the Coastal Trail provide limited access. Water is available from Prairie, Streelow, Skunk Cabbage and Johnson Creeks, the Outdoor School, Compost/Fire Cache Facility and the seasonal residence.

15. Fire Management Units #15 A and B: Orick Slopes Facing West - This unit is located in T.11N. R.1E. portions of Sections 23, 26, 27, 34 and 35; T.10N. R.1E. portions of Sections 3, 4, 8, 9 and 34. This unit is subdivided into Unit #15A and #15B. Unit #15A (approximately 1,250 acres) lies north of Redwood Creek, bounded by the Orick valley (private land) on the west and parklands on the east. It includes cutover land on both sides of the Bald Hills Road below Lady Bird Johnson Grove, above Berry Glen and the old-growth redwood stand between. Elevations range from 50 to 1,350 feet.

Unit 15B (approximately 1,200 acres) includes the west-facing slopes overlooking the Orick-Redwood Creek valley. The unit extends from Redwood Creek on the north along the forested slope to the eastern crest and south to the Hilton County Road (lower Westside Access Road). Elevations range from 50 to 1,250 feet.

a. Vegetation Types - In 15A, approximately 450 acres of old-growth redwood forest are located on the west slopes between the Lady Bird Johnson day-use area, Berry Glen and the Arcata Redwood Company "A" Mill. To the north, in the Berry Glen watershed, the vegetation is young second-growth redwood forest reestablished following logging during the 1960's. To the south of the old-growth, the vegetation consists of second-growth redwood with a large alder component. This area was logged during the 1940's. A few acres of riparian vegetation, largely alder, willow and coastal scrub species, occupies the floodplain in the vicinity of the Redwood Creek Trail access road.

Approximately 50 percent of Unit 15B is old-growth redwood and 30 percent is advanced second-growth redwood with a large component of alder. The balance includes some recent cutover redwood near the ridgetop and some Sitka spruce along the toe of the slope. Some of the Sitka spruce occupies areas which were logged or burned 50 or more years ago.

b. Fire History and Fuels - No fire history is known for Units #15A and #15B. However, it is known that early settlers used fire on the lower slopes around Orick to enhance forage for domestic livestock (Riley 1971).

NFDRS Fuel Model "G" best fits the old-growth redwood fuels. The young spruce, second-growth and riparian vegetation types are grouped under Fuel Model "J".

Because of the western aspect and proximity to the ocean, relative moisture levels in both portions of the unit are high and fire danger low.

c. Management Strategies - All fires in this unit will continue to be suppressed. No prescribed burning is proposed during the next five years due to the high visibility from the town of Orick and the proximity of residences.

d. Special Concerns - Unit 15A has one retained occupancy. The park's South Operation Center (formerly the Antonioli Ranch) and the Horse Trail are located in Unit 15B. No threatened or endangered plants are known to occur within this unit. Only project specific archaeological surveys have been conducted. No surface evidence of cultural resources was noted.

e. Pre-Attack Information - Access to Unit 15A is from Highway 101, the Bald Hills Road, the Geneva Road, the Redwood Creek Trailhead Access Road and the frontage road between the Arcata Redwood Company "A" Mill and the Geneva Road. The Hilton Road, Dryden Road and the West Side Access Road provide access to Unit 15B. Foot access is available on the horse trail. Water is available from Redwood Creek and several tributaries and the South Operations Center.

16. Fire Management Unit #16: Redwood Creek - West Side - This unit is located in T.11N. R.1E. Portions of Sections 34 and 35; T.10N. R.1E. Sections 10, 14, 15, 22, 23, 26, 27, 34 and 35 and portions of Sections 2, 3, 9, 11, 12, 13, 16, 21, 24, 25, 28, 33 and 36; T.9N. R.1E. Sections 2, 3, 10, 11, 12, 13, 14 and 24 and portions of Sections 1, 4, 9, 15, 16, 22, 23, 25 and 36; T.9N. R.2E. Sections 7, 17, 18, 19, 20, 21, 28, 29, 30, 32, 33 and portions of Sections 6, 8, 16, 27, 31 and 34; T.8N. R.2E. Sections 4 and 5 and portions of Sections 3, 6, 8, 9, 16 and 17. The Redwood Creek - West Side Unit (approximately 29,000 acres) includes all parklands west of Redwood Creek upstream of the ridgetop dividing the McArthur Creek drainage from the Orick Valley. Elevations range from 50 feet at Redwood Creek to 2,800 feet at Rodgers Peak. It is bounded by Redwood Creek and parklands on the north and east and private timberlands owned by Louisiana-Pacific and Simpson Timber Companies on the west and south.

a. Vegetation Type - Old-growth and second-growth redwood forests dominate the unit. Approximately 81 percent of the unit has been clearcut, mostly since the 1960's. Sword fern, huckleberry, salal and salmonberry dominate the understory of old-growth stands. Douglas-fir, hemlock, tanoak and madrone are the most common understory trees. Second-growth forests are typically dominated by dense young stands of Douglas-fir, often the result of aerial re-seeding after logging, or dense stands of alder. When present, the understory is usually dominated by coyote brush, huckleberry, salal or blueblossom.

b. Fire History and Fuels - Although ethnographic sources indicate that Indians burned the tanoak portions of this unit, the fire history is largely unknown. One extensive fire burned in the Bridge Creek basin in 1936. Higher elevations within the unit display greater evidence of natural fire than do lower elevation sites. The open fire-scarred vegetation along the ridge between Redwood and Bridge Creeks is a good example.

NFDRS Fuel Model "G" best represents the old-growth redwood forest, with large volumes of downed, woody fuels beneath a dense understory of shrubs. The second-growth stands are characterized by Fuel Model "J".

c. Management Strategies - All fires will continue to be suppressed within this unit due to the difficulty of access and continuity with adjacent private timberlands. As experience and understanding of fire processes within these vegetation types is gained, recommendations for prescribed fire will be prepared.

d. Special Concerns - The unit contains the horse trail and the Redwood Creek Trail. Watershed rehabilitation is ongoing. Park staff and heavy equipment contractors frequently camp near the rehabilitation sites. No threatened or endangered plants are known to occur within this unit. The majority of surveyable lands of this unit have been archaeologically field checked. Five prehistoric archaeological sites are recorded in the area, located on the major trending ridge and on an adjoining ridge. All of the cultural resources have been impacted by logging; further adverse impacts from fire suppression equipment is considered to be unlikely.

e. Pre-Attack Information - Water is available from Redwood Creek and numerous tributaries. Major road access is via the West Side Access, M-Line and Y-Line Roads. Limited access will be available on other roads until they are removed. Foot access is via the Horse and Redwood Creek Trails.

17. Fire Management Unit #17: Redwood Creek - East Side - This unit is located in T.11N. R.1E. Portions of Sections 35 and 36; T.10N. R.1E. Section 1, and portions of Sections 2, 11, 12, 13, 24, 25 and 36; T.10N. R.2E. Sections 19, 30, 31 and 32 and portions of Sections 7, 18, 29 and 33; T.9N. R.1E. portion of Section 1; T.9N. R.2E. portions of Sections 4, 5, 6, 8, 9, 10, 15, 16, 22, 23, 24, 25, 26, 34 and 35. The Redwood Creek - East Side Unit lies on the lower forested slopes between Redwood Creek and the Bald Hills ridge. The upper portion of the Bald Hills ridge, which divides the Redwood Creek and Klamath River drainages, contains prairies and oak

woodlands and is designated Fire Management Unit 18. Elevations range from 50 feet to 2,500 feet.

The unit is bounded by Redwood Creek and parklands on the west, private lands on the south and private and parklands to the east and north.

a. Vegetation Types - Like Unit 16, old-growth and second-growth redwood forests dominate the unit. Approximately 50 percent of the unit has been clearcut, mostly since the 1950's. Sword fern, huckleberry, salal and salmonberry dominate the understory of old-growth stands. Douglas-fir, hemlock, tanoak and madrone are the most common understory trees. Second-growth stands are typically dominated by dense young Douglas-fir. Alder is less common on this side of the drainage than on the west side. In contrast to the west side unit, much larger areas are dominated by blueblossom, probably the result of hotter, post-logging slash burns on the drier southwest facing slopes. Coyote brush and huckleberry are other important understory species.

b. Fire History and Fuels - NFDRS Fuel Model "G" best represents the old-growth redwood forest, with large volumes of downed woody fuels beneath a dense understory of shrubs. The second-growth stands are characterized by Fuel Model "J".

c. Management Strategies - All unplanned ignitions will be suppressed within this unit. Some small scale prescribed burns in old-growth redwood understory are proposed to develop prescriptions for burning.

d. Special Concerns - This unit contains the Tall Trees Grove and the Tall Trees and Emerald Ridge Trails. A shuttle bus carries visitors to the Tall Trees Trailhead several times each day during the summer. Watershed rehabilitation is ongoing. Park staff and contractors frequently camp in areas near rehabilitation sites.

The majority of surveyable lands in this unit have been archaeologically field checked. Five cultural resources were recorded in the prairies and prairie margins of the unit. These areas should, if possible, be avoided during fire suppression activities.

e. Pre-Attack Information - Major access is available via the Bald Hills, C-Line and K & K Roads. Additional access is available on smaller spur roads until they are removed. Water is available from numerous tributaries to Redwood Creek. Foot access is available via the Tall Trees, Emerald Ridge and Redwood Creek Trails.

18. Fire Management Unit #18: Bald Hills - This unit is located in T.10N. R.2E. portions of Sections 28, 29, 32 and 33; T.9N. R.2E. portions of Sections 3, 4, 5, 9, 10, 14, 15, 23, 24, 25, 26 and 35; T.9N. R.3E. portion of Section 19. The Bald Hills Fire Management Unit includes approximately 2,000 acres of prairie and 640 acres of Oregon white oak woodland found along the eastern ridgecrest of the Bald Hills above Redwood Creek. The unit is bounded by private timber and range lands to the south and east. Elevations

range from 300 feet at the bottom of Counts Hill Prairie to 3,100 feet at Schoolhouse Peak.

a. Vegetation Types - The Bald Hills prairies are composed of a mosaic of annual and perennial, native (N) and introduced (I) grasses and forbs. Dominant grass species include soft chess (I), dogtail (I) and California oat-grass (N). Yarrow (N), English daisy (I), sheep sorrel (I), bracken fern (N) and western buttercup (N) are the most common forbs.

Originally the grassland probably was composed of mostly perennial grasses. Four major factors have contributed to drastic changes in the composition: the introduction of highly competitive exotic species, an increase in domestic livestock and grazing pressures, the elimination of frequent fires and cultivation. Wild oats species were the first annuals to become abundant, and they were followed by introduced species of brome, fescue, wild rye, cranesbill, star thistle, hairy cat's ear and bur clover (Heady et al. 1977).

Oregon white oak stands border the Bald Hills prairies and extend up stream channels, becoming continuous woodlands near Schoolhouse Peak. Narrow strips of oak border the prairies as close as seven miles from the Pacific Ocean.

Three general stand types are found: (1) oak savanna-open stands dominated by a few large, widely scattered individuals; (2) closed canopy with numerous, medium size clustered individuals, and (3) closed canopy with dense, small single stem individuals. The understories of the savanna and clustered, closed canopy stands are characterized by high herbaceous cover, dominated by grasses. A few tall shrubs, oceanspray and serviceberry are scattered throughout. Low shrubs, yerba buena and snowberry dominate the understory of the dense, single stem stands. Herbaceous cover, especially that of grasses, is low. Douglas-fir is present in low amounts throughout the woodlands. Localized concentrations may be favored by recent human activities, including logging, livestock grazing and fire suppression (Sugihara et al. 1982).

Occasional Douglas-fir along roadsides and second-growth stands dominated by Douglas-fir occur around the margins of the unit and within stream channels reaching into the upper slopes.

b. Fire History and Fuels - Ethnographic and historic records indicate that Indians burned these prairies in the fall. Some ranchers continued this process. The largest know recent wildfire burned approximately 400 acres of prairie and oak woodland in 1955. This was a portion of a large fire (estimated 22,000 acres) called the Healy or Weitchpec Fire which was caused by an escaped "controlled burn."

Fuel Models "A" and "L" are the primary models in both the prairies and oak woodlands with flashy, continuous surface fuels in the 1-hour time lag category carrying the fire.

Occasional ladder fuels exist in the oak woodland with sapling Douglas-fir and lichen and moss-covered oak trunks. Little down and dead woody fuels occur in the profile.

In 1980, dry weight biomass in the prairies was estimated to be 4,000–6,000 pounds per acre (1,814–2,722 kilograms per hectare). Oak woodland understory biomass was estimated at 8,000–10,000 pounds per acre (3,628–4,535 kilograms per hectare). Since 1980, livestock grazing has been discontinued.

In 1980, a small-scale, experimental prescribed burn program was initiated to test the potential for use of fire in species manipulation aimed toward increasing native grassland species. Two prairie units on the Bald Hills, each 2.5 acres, were burned in September 1980, and a 3-acre area was burned in an oak woodland/grassland in September 1981. One of the 1980 areas was reburned in September 1982 and an additional 39 acre grassland area was burned. Preburn inventories included plant species composition and percent cover, biomass, soil pH and fuel moisture. These permanent sample plots were resampled following at least one post-burn growing season.

c. Management Strategies - Further burning is proposed to refine prescriptions for grassland and oak woodland fires.

d. Special Concerns - No threatened or endangered plants or animals are known to occur with the Bald Hills Unit. One park residence is located along the Bald Hills Road. A CDF fire station and lookout are also located within the unit.

All of the Bald Hills Unit has been subjected to archaeological reconnaissance. Thirty-nine cultural resources have been recorded, including prehistoric villages, camps and trails; historic homesteads and associated structures; and contemporary Native American religious sites. Nineteen prehistoric sites are listed on the National Register of Historic Places as the Bald Hills Archaeological District.

Due to the archaeological sensitivity and fragile nature of the Bald Hills Unit, fire suppression activities are limited in this area. No bulldozer constructed fire lines are permitted. Bulldozers should avoid crossing prairies if possible. If such heavy equipment does need to cross grasslands, it shall be done only in the dry season and with the blade raised.

e. Pre-Attack Information - The primary access is via the Bald Hills, K & K, Lyons Ranch and Robbers Gulch Roads. Water is available at the park residence and at the CDF Elk Camp Fire Station. The fire station and a CDF lookout at Schoolhouse Peak are seasonally manned.

19. Fire Management Unit #19: Mouth of Redwood Creek - This unit is located in T.10N. R.1E. portions of Sections 5 and 8; T.11N. R.1E. portions of Sections 29 and 32. The Mouth of Redwood Creek Unit is a narrow ocean front strip running from the southern park boundary to the western base of Orick Hill. It includes Freshwater Spit, the Redwood Information Center, the

estuarine areas at the mouth of Redwood Creek and ocean bluffs just north of the mouth. Elevations range from sea level to 400 feet.

It is bounded by Humboldt Lagoons State Park on the south, national park on the north, private lands on the east and the Pacific Ocean on the west.

a. Vegetation Types - Most of the unit is coastal strand and unvegetated beach. Along the strand, above mean high tide, vegetative cover is greatest in areas where driftwood protects the site from ground disturbance. Wild strawberry, beach pea, sea rocket, bentgrass and beach morning-glory, all native species, dominate. To the south, along Freshwater Spit, vegetative cover is greatly reduced due to heavy visitor use with European beachgrass becoming increasingly important.

North of Redwood Creek and south of Freshwater Spit, the ocean bluffs are dominated by coastal scrub with coyote brush, salmonberry and salal most common. Small patches of coastal prairie are scattered throughout.

East and northeast of the Information Center, a small area of wetlands is being restored. Sedges and cattails dominate the wettest areas with alder and Sitka spruce found on the drier margins.

b. Fire History and Fuels - The historical fire record for the unit is unknown. One fire occurred in the coastal scrub vegetation south of Freshwater Spit in 1974. Since the creation of the park in 1968, driftwood fires abandoned by visitors have been suppressed. Scattered driftwood represents the primary fuel of the unit. The small amount of coastal scrub is grouped with the adjacent second-growth spruce forests of Fire Management Unit 15 under NFDRS Fuel Model "J."

c. Management Strategies - All fires in this unit, a heavy visitor use area, will continue to be suppressed.

d. Special Concerns - This unit is a high-use area with overnight camping along Freshwater Spit, the Redwood Information Center and surf fishing along the length of the unit. One lease-back residence is located on the north side of Redwood Creek at the end of Hufford Road. No threatened or endangered plants or animals are known to occur within the unit. Two prehistoric archaeological sites are located within this unit. It is unlikely that these cultural resources would be damaged during the course of fire suppression activities.

e. Pre-Attack Information - Access is provided by U.S. Highway 101, Hufford Road and the Redwood Creek levee roads. Water is available from Redwood Creek and the Information Center.

V. FIRE MANAGEMENT OPERATIONS

A. Organization

1. Superintendent - As administrative head of Redwood National Park, he/she is responsible to the Regional Director and the Director of the National Park Service for all work and activities, including fire management. He/She has designated full authority to the Chief, Protection Division for all direct fire control activities and holds him/her responsible for accomplishments and results.
2. Assistant Superintendent - Is responsible for overall direction of the Resources Management and Technical Services Divisions and the Cooperative Park Studies Unit. All fire related activities initiated by one of these groups will be approved by the Assistant Superintendent. In the Superintendent's absence, serves as Acting Superintendent, providing overall direction and management of all park operations, including fire management.
3. Chief, Protection - As head of the Division, he/she is responsible to the Superintendent for all fire prevention and suppression activities. The Chief of Protection supervises and advises the ranger force in all fire control activities, including calling for assistance as needed from the other divisions and agencies. He/She supervises the execution of prescribed fires in cooperation with Resources Management Division personnel.
4. District Rangers - He/She is delegated to plan, organize, coordinate, train, inspect and submit all reports on all phases of fire suppression within their districts. He/She shall personally respond to all fires. He/She acts as the Incident Commander for all fires that originate in the District.
5. Permanent and Seasonal Rangers - These people will function as assigned on fires according to their capabilities.
6. Fire Control Aids - The FCA's are under the direct supervision of the District Ranger. Their duties consist of many phases of fire control and they may be assigned to patrol, as smokechasers and to small suppression crews. They are also responsible for equipment maintenance, pre-suppression and prevention activities.
7. Prescribed Fire Manager - He/She is typically in the Resources Management Division and is concerned with fire effects, pre- and post-burn monitoring and overall prescribed burn management. He/She prepares the burning prescriptions and plans. (See Appendix I. for qualification requirements for Prescribed Fire Manager, Prescribed Burn Boss and Crew Member.)
8. Prescribed Burn Boss - He/She is responsible for burn plan implementation. This position is typically held by someone in the Protection Division who is also responsible for fire suppression. The Prescribed Burn Boss may also prepare burning prescriptions and plans.
9. Crew Member - Anyone within the park with proper training who provides support to prescribed burning programs.

10. Chief, Resources Management - As head of the Division, he/she supervises the Prescribed Fire Manager who is in turn responsible for initiation and monitoring of all prescribed fires. He/She coordinates execution of prescribed fires and monitoring of prescribed natural fires with the Chief of Protection.

11. Plant, Management Ecologists, Research Scientist - As Prescribed Fire Manager, he/she shall be responsible for initiating and preparing prescribed burning plans for experimental and management purposes. Burns will be monitored and the effects on vegetation evaluated. Results of prescribed burns will be used to revise this plan.

12. Biological Technicians - As crew members under the supervision of the Prescribed Fire Manager, they assist in the monitoring of fire weather and fire behavior during prescribed burns. They conduct pre- and post-burn vegetation analyses and are available for assignment to both prescribed burns and emergency suppression duty.

13. All Divisions - Each division head will see that all facilities at his/her command, including personnel, equipment and supplies, are available for fire control. All employees will maintain a constant alert for fires as they perform their regular duties. Trained and qualified employees will be called for fire suppression duty as the need arises and will be assigned according to their capabilities. They will not normally be called for initial attack unless protection forces are depleted. They should be trained in initial attack procedures and be prepared to make such attacks should the need arise.

13. Safety Officer - The Safety Officer is responsible for participating in all phases of fire management and has direct authority from the Superintendent to ensure that safety is a priority concern, unsafe acts and safety hazards are eliminated and proper safety training is implemented.

14. Cooperating Agencies -

a. California Department of Forestry (CDF) - A State-wide agreement (see Appendix J) dated June 1, 1982 is in effect which provides for:

- Initial suppression action on adjoining State and private lands protected by CDF.

- Reimbursement and payment procedures.

- Exchange of fire control maps and plans.

b. United States Forest Service - An interagency agreement for wildland fire exists between National Park Service, U.S. Forest Service, Bureau of Indian Affairs, Bureau of Land Management and U.S. Fish and Wildlife Service (see Appendix J). The agreement provides for:

- Initial attack without request on lands bordering the park and adjacent national forests.

- Aid on other lands within the park or adjacent forests on initial attack with requests through each agency's respective dispatchers.
- Other aid through requests from or to the North Zone Dispatcher at Redding, California.

-A provision for no cross-billings between agencies.

c. The National Weather Service - The National Park Service shares in the multiagency agreement for provision of various meteorological services (see Appendix J). Spot forecasts for specific areas may be obtained directly from the Eureka Fire Weather Forecaster. Upon request, the same office will dispatch a meteorologist and a mobile unit directly to the scene of a large fire to provide the best possible weather information for predicting fire behavior.

d. Local Volunteer Fire Departments - Memorandums of Agreement for mutual assistance on structural fires are in effect with the Klamath and Orick Volunteer Fire Departments (see Appendix J).

e. Private Companies - These include Miller-Rellim, Simpson Timber and Arcata Redwood Companies and Louisiana-Pacific Corporation. Assistance from them is available through Jim James, Coordinator, Mutual Fire Protection Group. No formal agreement exists other than a set of guiding rules for private cooperators. Redwood National Park attends the annual spring review meeting.

f. Equipment Contractors - These are available under rental agreements, maintained by the property and protection offices.

B. Financial Management

The Protection Division and Resources Management Divisions share the fiscal responsibilities for the Fire Management Program.

Activity	Division Responsible
Fire Prevention and Presuppression	Protection
Emergency Presuppression	Protection
Emergency Forest Fire Suppression	Protection
Rehabilitation of Burned Areas	Resources Management
Prescribed Fire	Protection and Resources Management

The Protection Division executes prescribed fires in cooperation with Resources Management Division personnel. They provide the burn boss, necessary personnel, fire trucks and accessory equipment. Provide hand tools, safety and individual equipment for Protection personnel involved.

The Resources Management Division provides the Prescribed Fire Manager, selects burn sites, develops prescriptions, establishes monitoring plots, performs photo documentation before and after, performs follow-up monitoring and prepares reports. They provide tools, safety and individual equipment for Resources Management Division personnel assisting in prescribed fire execution. Protection Division's tools, hoses, etc. (excluding individual equipment) that are damaged during a prescribed burn will be replaced. Necessary overtime for Resources Management and Protection personnel will be covered.

VI. SAFETY

Personnel safety while on wildland or management burns is the most important responsibility of fire managers and will be given priority over all other considerations. The safety of visitors and neighbors affected by the fire activity are equally important. Pre-incident training and equipment upkeep is an essential part of meeting this requirement. State-of-the-art equipment, techniques and procedures will be used as funding permits and when adaptability and feasibility is determined.

Only personnel currently certified under qualification standards established in NPS-18, Chapter Nine and Western Region Prescribe Fire Job Qualification standards (Appendix I) will be permitted to participate in fire management activities. Training will be commensurate with standards.

Only qualified personnel equipped and utilizing required fire safety clothing and equipment will be engage in fire management activities. Safety equipment will include fire retardent shirts, trousers, jackets and other approved wearing apparel, goggles, face shields, leather or leather-palmed gloves, hard hats and sturdy lace-up boots of at least six-inch height with lug soles. Synthetic materials which melt at normal fire condition temperatures will not be authorized. Fire shelters will be issued and carried as standard equipment on all fires when determined necessary by the fire/burn boss. Fire shelters will not be considered extra equipment justifying excessively hazardous assignment or activities. Specialized safety equipment such as chainsaw chaps, hearing protectors, air operations equipment or other devices identified as essential to the safe performance of fire assignments will be immediately available for use. Pre-burn and pre-attack safety briefings, including review of terrain, fire characteristics and weather predictions, will be accomplished. Escape routes are procedures for medical and rescue activities will be established and discussed with all participants before committal.

The primary responsibility for personnel safety lies with the fire/burn boss and cannot be delegated to lower level managers or line positions.

Temporary closure of portions of the park will be effected where danger exists to visitors. Appropriate signing and enforcement will be provided.

VII. PUBLIC INFORMATION

A. Review of Draft Plan

The draft fire management plan was made available for review by other agencies, adjacent landowners and interested persons. One letter was received from the California Department of Forestry which expressed concerns about the prescribed natural fire areas and prescriptions, fire suppression policies, and fire detection and management logistics. The National Park Service has incorporated a number of the suggestions into the final plan. See Appendix L for the CDF letter and the NPS response.

B. Fire Management Notification

This is one of the most important parts of the fire management program. It will be coordinated by the Incident Commander with input from the Staff Assistant, Chief Ranger and the Chief of Resources Management. The Staff Assistant, Chief Ranger and Chief of Interpretation will be kept informed daily by the Incident Commander of the fire situation in the Park.

The management fire program will be explained to the public as follows:

- Concepts of the prescribed natural fire and prescribed burning programs will be incorporated into the Park Visitor Guide.
- Informational handouts detailing the fire management program will be prepared and periodically updated. During periods when management fires are burning, handouts will be distributed to all visitors entering the park and areas of fire activity.
- The fire management program will be incorporated into interpretive walks, talks and other programs; particular attention will be given to this activity when fires are conspicuous from roadsides.
- During prescribed burning periods, news briefs will be released by the Staff Assistant to newspapers, radio and television stations as appropriate.
- The Regional Ecologist will be notified by phone prior to all prescribed burns so that he can address any questions coming in to the Regional office.
- Public information outlets for neighboring Forest Service and California Department of Forestry offices will be provided with all fire management information.
- The fire management program will be discussed in informal talks with all Park Divisions, concessionaires and surrounding communities.
- All visitors to zones where management fires are burning will be informed at the trailhead.
- Some areas may be closed if the fire situation dictates.
- Protection and Interpretation personnel will keep backcountry users informed of any fire situation.

VIII. COMPLIANCE

The National Park Service has reviewed the Environmental Assessment prepared for the Resources Management Plan (February 1982) and believes it adequately describes the impacts of this fire management plan. Furthermore, comments received during public review of the draft fire management plan, did not indicate that additional environmental documentation was necessary.

Prior to the initiation of any prescribed burn, the project area will be surveyed for threatened or endangered species or cultural resources. The results of such surveys will be documented in the prescribed burn plan and the Park Project Clearance Form and any necessary mitigating measures will be implemented prior to burning.

Wildfire suppression and Management Fire decisions will be made in consideration of threatened and endangered species and cultural resources. Sufficient information will be made available to fire management personnel so that suppression/management activities avoid these resources.

Neither prescribed natural fires nor prescribed fires require a burning permit from the North Coast Unified Air Quality Management District, and are they not regulated by the publicly announced "burn and no-burn days" (Clark 1983). However, to minimize the impact of fire on air quality, prescribed burns shall be initiated only on "permissive burn" days.

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APPENDIX A

LIST OF COMMON AND SCIENTIFIC PLANT NAMES
MENTIONED IN TEXT

LIST OF COMMON AND SCIENTIFIC PLANT NAMES MENTIONED IN TEXT

COMMON NAME	SCIENTIFIC NAME*
alder (red)	<i>Alnus oregona</i>
'Alta' fescue**	<i>Festuca arundinacea</i> 'Alta'
beach morning-glory	<i>Calystegia soldanella</i>
beach pea	<i>Lathyrus</i>
beargrass	<i>Xerophyllum tenax</i>
bentgrass*	<i>Agrostis</i> spp.
big leaf maple	<i>Acer macrophyllum</i>
blueblossom	<i>Ceanothus</i> spp.
bracken fern	<i>Pteridium aquilinum</i> var. <i>pubescens</i>
brome	<i>Bromus</i> spp.
bur clover***	<i>Medicago</i> spp.
California blackberry	<i>Rubus vitifolius</i>
California laurel	<i>Umbellularia californica</i>
California oatgrass	<i>Danthonia californica</i>
cascara	<i>Rhamnus purshiana</i>
cattail	<i>Typha</i> spp.
ceanothus	<i>Ceanothus</i> spp.
coffeeberry	<i>Rhamnus californica</i>
coyote brush	<i>Baccharis pilularis</i> var. <i>consanguinea</i>
cranes bill***	<i>Geranium</i> spp.
Del Norte fleabane	<i>Erigeron delicatus</i>
dogtail**	<i>Cynosurus echinatus</i>
Douglas-fir	<i>Pseudotsuga menziesii</i>
dwarf mistletoe	<i>Phoradendron</i> spp.
dwarf oak	<i>Quercus</i> spp.
dunegrass	<i>Elymus mollis</i>
English daisy**	<i>Bellis perennis</i>
European beachgrass**	<i>Ammophila aernaria</i>
fescue***	<i>Festuca</i> spp.
fireweed**	<i>Erechtities arguta</i> and <i>E.</i> <i>prenanthoides</i>
golden chinquapin	<i>Castanopsis chrysophylla</i> var. <i>minor</i>

COMMON NAME	SCIENTIFIC NAME
grand fir	<i>Abies grandis</i>
hairy cat's ear**	<i>Hypochoeris radicata</i>
hazel	<i>Corylus cornuta</i> var. <i>californica</i>
huckleberry	<i>Vaccinium ovatum</i> and <i>V. parviflorum</i>
Humboldt Bay gum	<i>Grindelia stricta</i> ssp. <i>blakei</i>
Idaho fescue	<i>Festuca idahoensis</i>
iris	<i>Iris</i> spp.
Jeffrey pine	<i>Pinus jeffreyi</i>
knobcone pine	<i>Pinus attenuata</i>
Lombardy poplar**	<i>Populus nigra</i> var. <i>italica</i>
lupine	<i>Lupinus</i> spp.
madrone	<i>Arbutus menziesii</i>
manzanita	<i>Arctostaphylos</i> spp.
milk thistle**	<i>Silybum marianum</i>
Monterey pine**	<i>Pinus radiata</i>
oceanspray	<i>Holodiscus discolor</i>
orchard grass**	<i>Dactylis glomerata</i>
Oregon bensoniella	<i>Bensoniella oregana</i>
Oregon white oak	<i>Quercus garryana</i>
ox-eye daisy	<i>Chrysanthemum leucanthemum</i>
plantain**	<i>Plantago</i> spp.
poison oak	<i>Toxicodendron diversilobum</i>
ponderosa pine	<i>Pinus ponderosa</i>
Port-Orford-cedar	<i>Chamaecyparis lawsoniana</i>
redwood	<i>Sequoia sempervirens</i>
redwood sorrel	<i>Oxalis oregana</i>
reedgrass	<i>Calamagrostis nutkaensis</i>
rhododendron	<i>Rhododendron</i> spp.
salal	<i>Gaultheria shallon</i>
salmonberry	<i>Rubus spectabilis</i>
sand dune phacelia	<i>Phacelia argentea</i>
sand verbena	<i>Abronia latifolia</i>
sea rocket	<i>Cakile maritima</i>

COMMON NAME	SCIENTIFIC NAME*
sedges	<i>Alnus oregona</i>
serviceberry	<i>Festuca arundinacea</i> 'Alta'
sheep sorrel**	<i>Calystegia soldanella</i>
shrub oak	<i>Lathyrus</i>
silver beachweed	<i>Xerophyllum tenax</i>
	<i>Agrostis</i> spp.
Sitka spruce	<i>Acer macrophyllum</i>
snowberry	<i>Ceanothus</i> spp.
soft chess**	<i>Pteridium aquilinum</i> var. <i>pubescens</i>
star thistle**	<i>Bromus</i> spp.
supple daisy	<i>Medicago</i> spp.
sweet vernal grass**	<i>Rubus vitifolius</i>
sword fern	<i>Umbellularia californica</i>
tan oak	<i>Danthonia californica</i>
thimbleberry	<i>Rhamnus purshiana</i>
velvet grass**	<i>Typha</i> spp.
vine maple	<i>Ceanothus</i> spp.
Vollmer lily	<i>Rhamnus californica</i>
Waldo eriogonum	<i>Baccharis pilularis</i> var. <i>consanguinea</i>
western buttercup	<i>Geranium</i> spp.
western bog violet	<i>Erigeron delicatus</i>
western hemlock	<i>Cynosurus echinatus</i>
western lily	<i>Pseudotsuga menziesii</i>
wild cucumber	<i>Phoradendron</i> spp.
wild oats**	<i>Quercus</i> spp.
wild radish**	<i>Elymus mollis</i>
wild rye**	<i>Bellis perennis</i>
wild strawberry	<i>Ammophila aernaria</i>
willow	<i>Festuca</i> spp.
Wolf's evening primrose	<i>Erechtities arguta</i> and <i>E.</i>
yarrow	<i>prenanthoides</i>
yellow pine	<i>Castanopsis chrysophylla</i> var. <i>minor</i>
yerba buena	

* Nomenclature follows Munz and Keck (1973).

** Considered exotic within the park.

*** Both native and exotic species within this group.

APPENDIX B

LIST OF COMMON AND SCIENTIFIC ANIMAL AND BIRD NAMES
MENTIONED IN TEXT

LIST OF COMMON AND SCIENTIFIC ANIMAL AND BIRD NAMES
MENTIONED IN TEXT

COMMON NAME	SCIENTIFIC NAME
bald eagle	<i>Haliaeetus leucocephalus</i>
black bear	<i>Ursus americanus</i>
black-tailed deer	<i>Odocoileus hemionus</i>
bobcat	<i>Lynx rufus</i>
brown pelican	<i>Pelecanus occidentalis</i>
coyote	<i>Canis latrans</i>
golden eagle	<i>Aquila chrysaetos</i>
grey fox	<i>Urocyon cinereoargenteus</i>
grizzly bear	<i>Ursus arctos</i>
mountain lion	<i>Felis concolor</i>
muskrat	<i>Ondatra zibethica</i>
peregrine falcon	<i>Falco peregrinus</i>
porcupine	<i>Erethizon dorsatum</i>
Roosevelt elk	<i>Cervus elaphus</i>
sea otter	<i>Enhydra lutris</i>
shrew	<i>Sorex spp.</i>

APPENDIX C

FIRE OCCURRENCE IN REDWOOD NATIONAL PARK

1960-1984

FIRE OCCURRENCE IN REDWOOD NATIONAL PARK 1960-1984

YEAR	NAME OF FIRE	LOCATION	SOURCE	#	DATE	SIZE	IGNITION SOURCE	FIRE MANAGEMENT UNIT	MAP #
1966	NONE	NONE	NONE	NONE	NONE	NONE	NONE	Lit Bald Hills	#01
1966	Beaches & Parks	16N-1E-20	CDF #	192-D	8/27/66	I	Lightning	Jedediah Smith	#02-2
1977	Lightning Series	16N-1E-18	CDF #	270	8/7/77	---	Lightning	Jedediah Smith	#02-5
1978	Hiouchi Hill	16N-1W-1	CDF #	332	11/2/78	II	Campfire	Jedediah Smith	#02-6
NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	Hiouchi	#03
1977	Reilim Ridge	16N-1E-30	RNP #	7001	2-21-77	---	Lightning	Mill CK, Reilim	#04-01
1961	Ellis	15N-1W-14	CDF #	170-D	9/12/63	I	O-Smoking	Enderts Beach	#05-01
1972	Crescent Beach	15N-1W-2	RNP #	72-15	6/16/72	---	Campfire	Enderts Beach	#05-03
1974	C. Beach Picnic Area	15N-1W-2	RNP #	72-54	8/17/74	---	O-Grassfire	Enderts Beach	#05-04
1973	South Beach	15N-1W-2	RNP #	73-69	6/10/73	---	Campfire	Enderts Beach	#05-05
1973	C. Beach Picnic Area	15N-1W-2	RNP #	73-123	8/11/73	---	Campfire	Enderts Beach	#05-06
1974	Crescent Beach	15N-1W-2	RNP #	---	10/17/74	---	Campfire	Enderts Beach	#05-07
1974	Crescent Beach	15N-1W-2	RNP #	---	10/27/74	---	Campfire	Enderts Beach	#05-08
1974	NPS Assist #2	15N-1W-2	CDF #	365	10/10/74	---	O-Undet.	Enderts Beach	#05-09
1974	Crescent Beach	15N-1W-2	RNP #	---	9/12/74	---	Campfire	Enderts Beach	#05-10
1975	NPS Assist	15N-1W-2	RNP #	59	6/7/75	---	O-Undet.	Enderts Beach	#05-11
1975	1/2 mi. S. C. Bch	15N-1W-2	RNP #	---	7/13/75	---	Campfire	Enderts Beach	#05-12
1977	Crescent Beach #1	15N-1W-2	RNP #	---	2/20/77	---	Campfire	Enderts Beach	#05-13
1978	C. Bch Parking Lot	15N-1W-2	RNP #	---	8/3/78	---	Campfire	Enderts Beach	#05-14
1979	NR, CB#2, W-2	15N-1W-2	RNP #	---	8/9/79	---	Campfire	Enderts Beach	#05-15
1979	CB #3, Bud's, W-3	15N-1W-2	RNP #	---	9/16/79	---	Campfire	Enderts Beach	#05-16
1979	NPS Assist	15N-1W-2	CDF #	140	7/20/79	---	Campfire	Enderts Beach	#05-17
1980	Bluff Rd	15N-1W-2	RNP #	---	8/20/80	---	O-Undet.	Enderts Beach	#05-18
1980	Crescent Beach #1	15N-1W-2	RNP #	---	7/17/80	---	Campfire	Enderts Beach	#05-19
1963	Nickel Creek	15N-1W-11	CDF #	136-D	8/24/63	I	O-Smoking	Enderts Beach	#05-20
1981	Crescent Beach #1	15N-1W-2	RNP #	6062	6/27/81	---	O-Undet.	Enderts Beach	#05-20
1982	Enderts#1	15N-1W-14	RNP #	2082	6/19/82	---	Campfire	Enderts Beach	#05-21
1982	Boones Farm	15N-1W-11	RNP #	2129	7/4/82	---	Campfire	Enderts Beach	#05-22
1982	Cushing #1	15N-1W-11	RNP #	2103	7/4/82	---	Campfire	Enderts Beach	#05-23
1982	Enderts Bch	15N-1W-14	RNP #	---	7/4/82	---	Campfire	Enderts Beach	#05-24
1964	Beaches & Parks #5	14N-1E-6	CDF #	310-D	10/19/64	II	O-Equipment	Del Norte Coast	#06-01
1966	Simpson Timber Co	14N-1E-30	CDF #	31-D	5/18/66	I	O-Smoking	Del Norte Coast	#06-02
1967	Wilson Creek	14N-1E-6	CDF #	111-D	9/12/67	---	O-Smoking	Del Norte Coast	#06-03
1974	Last Chance	14N-1E-6	RNP #	---	9/12/74	---	O-Equipment	Del Norte Coast	#06-04
1974	Last Chance	14N-1E-6	CDF #	286	9/12/74	---	Incendiary	Del Norte Coast	#06-05
1974	Damination	15N-1W-36	CDF #	206	8/5/74	II	Lightning	Del Norte Coast	#06-06
1977	Inner Spring	15N-1E-19	CDF #	109	6/7/77	---	Debris Burn	Del Norte Coast	#06-08
1979	Mill Creek	15N-1W-13	CDF #	247	8/27/79	II	O-Equipment	Del Norte Coast	#06-11
1981	Half Mile	15N-1E-30	CDF #	3	1/8/81	---	Debris Burn	Del Norte Coast	#06-12
1981	Half Mile #2	15N-1E-30	CDF #	16	1/18/81	---	Debris Burn	Del Norte Coast	#06-13
1983	False Klamath Cove	14N-1E-18	RNP #	---	9/25/83	---	Campfire	Footsteps Rk/7a	#07-1
1977	Sniff	14N-1E-8	CDF #	287	8/7/77	I	Lightning	Footsteps Rk/7b	#07b-2
1974	Hidden Beach	14N-1E-20	RNP #	---	6/11/74	---	Campfire	Requa	#08-02
1977	Dad	13N-1E-5	CDF #	24625	2/19/77	II	Campfire	Requa	#08-05
1977	Dad's Camp	13N-1E-5	CDF #	125	6/27/77	II	Campfire	Requa	#08-06
1979	Klam Beach	13N-1E-5	RNP #	---	10/ 5/79	---	Campfire	Requa	#08-07
1982	Lagoon	14N-1E-19	RNP #	2177	8/20/82	---	Campfire	Requa	#08-09
1974	Dada Camp Beach	14N-1E-20	SIBLEY	---	---	---	Campfire	Requa	#08-30
1974	Dada Camp Beach	13N-1E-8	RNP #	---	8/29/74	I	Incendiary	Flint Ridge	#09-03

NOTE: --- = Unavailable, I=0-.25A, II=.26-9A, III=10-99A, IV=100-299A, V=300-999A, O=Other

FIRE OCCURRENCE IN REDWOOD NATIONAL PARK 1960-1984

YEAR	NAME OF FIRE	LOCATION	SOURCE	#	DATE	SIZE	IGNITION SOURCE	FIRE MANAGEMENT UNIT	MAP #
1974	Dads Camp Spit	13N-1E-8	RNP #	72-55	8/18/74	I	Campfire	Flint Ridge	#09-04
1974	Dads Camp Beach	13N-1E-8	RNP #	2623	7/2/74	I	Campfire	Flint Ridge	#09-06
1974		13N-1E-8	SIBLEY				O-Undet.	Flint Ridge	#09-07
1977	Dads Camp Bch	13N-1E-8	RNP #		2/10/77		Campfire	Flint Ridge	#09-08
1977	Dad #2	13N-1E-8	CDF #	34	2/18/77	II	Campfire	Flint Ridge	#09-10
1979	Crevelli's Barn	13N-1E-8	RNP #		1/3/79		O-Structure	Flint Ridge	#09-11
1979	Dad Camp/NPS Assist	13N-1E-17	CDF #		1/6/79		O-Undet.	Flint Ridge	#09-13
1979	Dad Camp/NPS Ass. #2	13N-1E-17	CDF #		1/30/79		O-Undet.	Flint Ridge	#09-14
1979		13N-1E-17	SIBLEY				Incendiary	Flint Ridge	#09-15
1980	NPS assist	13N-1E-10	CDF #	230	8/22/80		O-Undet.	Flint Ridge	#09-16
1980	Klam Bch Rd Chub's	13N-1E-8	RNP #	131	6/12/80		O-Grassfire	Flint Ridge	#09-17
1974	Cruther's Trailhead	13N-1E-33	RNP #	4004	8/4/74		Campfire	Coastal Drive	#10-01
1979	Klamath Bch Rd	13N-1E-28	RNP #		3/25/79		Incendiary	Coastal Drive	#10-02
1976	Light series #55	11N-1E-1	CDF #	179	7/16/76	II	Lightning	Prairie Creek	#11-02
1961	Arcata Redwood Co.	11N-1E-11	CDF #	13	6/4/61	I	O-Smoking	Prairie Creek	#11-03
1963	McGarvey Creek	12N-1E-3	CDF #	60-D	7/12/63	V	O-Smoking	Prairie Creek	#11-04
1963	Wunderlick	12N-1E-3	CDF #	39	6/25/63	I	Debris Burn	Prairie Creek	#11-05
1963	Beaches & Parks #3	12N-1E-28	CDF #		9/1/63	I	Campfire	Prairie Creek	#11-06
1970	#23	11N-1E-4	CDF #		5/26/70	I	Campfire	Prairie Creek	#11-07
1973	#34	11N-1E-11	CDF #		7/21/73	I	O-Smoking	Prairie Creek	#11-08
1975	Botch #47	11N-1E-2	CDF #	192	8/5/75	I	Debris Burn	Prairie Creek	#11-09
1975		12N-1E-28	SIBLEY				Campfire	Prairie Creek	#11-10
1976	Light series #53	11N-1E-1	CDF #	177	7/16/76	II	Lightning	Prairie Creek	#11-11
1978	Gold Bluff	12N-1E-33	CDF #	266	9/2/78	II	O-Equipment	Prairie Creek	#11-12
1981	Prairie Creek	11N-1E-2	CDF #	300	10/19/81		Campfire	Prairie Creek	#11-13
1984	Prairie Creek	11N-1E-2	RNP #	4223	9/20/84		O-Undet.	Prairie Creek	#11-14
1984	MP 133.48	12N-1E-10	FNP #	4209	9/13/84		O-Undet.	Prairie Creek	#11-15
1961	Simpson #3	11N-2E-21	CDF #	157	10/5/61	II	O-Smoking	May Ck/Lost Man	#12-01
1963	Arcata Redwood Co.	11N-2E-6	CDF #	221	10/14/63	III	Debris Burn	May Ck/Lost Man	#12-02
1967	Arcata Redwood	11N-2E-13	CDF #	134	10/15/67	II	Debris Burn	May Ck/Lost Man	#12-04
1969	Arco #2	11N-2E-19	CDF #	97	7/24/69	I	Lightning	May Ck/Lost Man	#12-05
1969	Arco #3	11N-2E-19	CDF #	98	7/24/69	I	Lightning	May Ck/Lost Man	#12-06
1969	Arco #1	11N-2E-18	CDF #	96	7/24/69	I	Lightning	May Ck/Lost Man	#12-07
1975		11N-1E-24	SIBLEY				O-Undet.	May Ck/Lost Man	#12-10
1976	Light series #54	11N-1E-1	CDF #	178	7/16/76	II	Lightning	May Ck/Lost Man	#12-11
1960	Harkin	11N-1E-26	CDF #	133	11/4/60	II	Debris Burn	Lit. Lost Man Ck.	#13-01
1972	LBJ Parking Lot	11N-1E-26	RNP #		6/8/72		Incendiary	Lit. Lost Man Ck.	#13-02
1976	Post #5	11N-1E-26	RNP #	6002	2/13/76		O-Man-caused	Lit. Lost Man Ck.	#13-03
1976	LBJ Light fire	11N-1E-36	RNP #	6001	7/17/76		Lightning	Lit. Lost Man Ck.	#13-04
1960	Arcata Redwood #2	11N-1E-9	CDF #	345	11/4/60	III	Debris Burn	Skunk Cabbage Ck.	#14-01
1960	Arcata Redwood	11N-1E-10	CDF #	110	10/6/60	II	Debris Burn	Skunk Cabbage Ck.	#14-02
1966	Arcata Redwood	11N-1E-15	CDF #	235	9/27/66	I	O-Smoking	Skunk Cabbage Ck.	#14-03
1967	Utility	11N-1E-14	CDF #	69	8/11/67	I	O-Equipment	Skunk Cabbage Ck.	#14-04
1969	#9	11N-1E-21	CDF #		7/24/69	I	Lightning	Skunk Cabbage Ck.	#14-05
1969	#21	11N-1E-14	CDF #		9/16/69	I	O-Undet.	Skunk Cabbage Ck.	#14-06
1970	#25	11N-1E-22	CDF #		7/10/70	I	Debris Burn	Skunk Cabbage Ck.	#14-07
1973	#34	11N-1E-11	CDF #		7/21/73	I	O-Smoking	Skunk Cabbage Ck.	#14-08
1975	Gold Bluff Bch	11N-1E-20	RNP #	75-1	5/1/75		Campfire	Skunk Cabbage Ck.	#14-09
1976	Arco #57	11N-1E-28	CDF #	205	7/22/75	I	O-Equipment	Skunk Cabbage Ck.	#14-10
1976	#58	11N-1E-23	CDF #		11/6/76	I	O-Smoking	Skunk Cabbage Ck.	#14-11

NOTE = Unavailable, I=0-25A, II=26-9A, III=10-99A, IV=100-299A, V=300-999A, O=Other

FIRE OCCURRENCE IN REDWOOD NATIONAL PARK 1960-1984

YEAR	NAME OF FIRE	LOCATION	SOURCE	#	DATE	SIZE	IGNITION SOURCE	FIRE MANAGEMENT UNIT	MAP #
1979	Hobo	11N-12-11	CDF #	2/3	8/15/79	I	Campfire	Skunk Cabbage Ck.	#14-13
1980	W. Bank Pr. Cr.	11N-1E-11	RNP #	---	8/28/80	---	Incendiary	Skunk Cabbage Ck.	#14-14
1980	Roadside	11N-1E-11	SIBLEY	---	---	---	Incendiary	Skunk Cabbage Ck.	#14-15
1983	Driftwood #1	11N-1E-14	RNP #	3002	1/3/83	---	O-Equipment	Skunk Cabbage Ck.	#14-16
1984	LBJ fire/Bald Hills	11N-1E-29	RNP #	4118	8/21/84	---	Campfire	Skunk Cabbage Ck.	#14-17
1974	---	11N-1E-35	RNP #	4001	11/11/74	---	O-Smoking	Orick Slopes West-A #15a-1	#15a-1
1974	---	11N-1E-26	SIBLEY	---	---	---	O-Undet.	Orick Slopes West-A #15a-2	#15a-2
1975	RNP assist #48	11N-1E-35	CDF #	250	9/3/75	II	O-Undet.	Orick Slopes West-A #15a-3	#15a-3
1975	RNP assist #44	11N-1E-35	CDF #	47	6/1/75	---	O-Undet.	Orick Slopes West-A #15a-5	#15a-5
1976	---	11N-1E-26	SIBLEY	---	---	---	O-Undet.	Orick Slopes West-A #15a-6	#15a-6
1976	#40	11N-1E-26	SIBLEY	---	---	---	Lightning	Orick Slopes West-A #15a-7	#15a-7
1974	Arco	10N-1E-9	CDF #	---	8/12/74	I	Debris Burn	Orick Slopes West-B #15b-1	#15b-1
1979	Arco	11N-1E-34	CDF #	41	5/24/79	---	Debris Burn	Orick Slopes West-B #15b-3	#15b-3
1969	#12 GP #1	9N-1E-14	CDF #	101	7/24/69	II	Lightning	Redw Ck-West	#16-01
1969	#20	9N-2E-8	CDF #	---	7/24/69	I	Lightning	Redw Ck-West	#16-02
1969	Copper	9N-2E-21	CDF #	95	7/24/69	II	Lightning	Redw Ck-West	#16-03
1969	GP #2	9N-1E-3	CDF #	102	7/24/69	I	Lightning	Redw Ck-West	#16-05
1969	GP #4	9N-1E-1	CDF #	104	7/24/69	I	Lightning	Redw Ck-West	#16-06
1969	#18	9N-2E-7	CDF #	104	7/24/69	I	Lightning	Redw Ck-West	#16-07
1969	#16	9N-2E-22	CDF #	113	7/24/69	I	Lightning	Redw Ck-West	#16-08
1970	#28	9N-1E-25	CDF #	---	9/30/70	---	O-Smoking	Redw Ck-West	#16-09
1970	#29	10N-1E-21	CDF #	385	10/30/70	V	Debris Burn	Redw Ck-West	#16-10
1974	L.P. Escape	9N-2E-22	CDF #	385	11/8/74	II	Debris Burn	Redw Ck-West	#16-14
1974	FA #1	10N-1E-36	RNP #	4003	8/5/74	---	O-Undet.	Redw Ck-West	#16-15
1977	Lightning #65	9N-1E-24	CDF #	---	8/7/77	---	Lightning	Redw Ck-West	#16-20
1977	#64	9N-2E-32	CDF #	---	8/7/77	---	Lightning	Redw Ck-West	#16-21
1977	B-Deck #62	9N-1E-25	CDF #	155/156	7/10/77	I	Lightning	Redw Ck-West	#16-22
1977	Light series #3	9N-1E-3	CDF #	262	8/7/77	---	Debris Burn	Redw Ck-West	#16-23
1984	Redwood Cr.	9N-2E-8	RNP #	4204	9/8/84	---	Lightning	Redw Ck-West	#16-24
1969	#17	9N-2E-5	CDF #	114	7/24/69	---	O-Undet.	Redw Ck-East	#17-02
1969	Maneaze #15	9N-2E-22	CDF #	111	7/24/69	I	Lightning	Redw Ck-East	#17-03
1970	#24	10N-2E-31	CDF #	---	6/8/70	---	O-Smoking	Redw Ck-East	#17-06
1971	#30	10N-2E-30	CDF #	---	7/20/71	---	O-Equipment	Redw Ck-East	#17-07
1974	---	10N-1E-36	SIBLEY	---	---	---	Campfire	Redw Ck-East	#17-08
1974	#39	10N-2E-31	CDF #	---	8/5/74	---	Lightning	Redw Ck-East	#17-09
1974	Arco	10N-1E-24	CDF #	376	10/24/74	II	O-Equipment	Redw Ck-East	#17-11
1976	Snag #50	9N-2E-9	CDF #	18	2/19/76	---	Campfire	Redw Ck-East	#17-13
1976	Redwood meadows	10N-1E-2	RNP #	6003	1/12/76	---	Campfire	Redw Ck-East	#17-16
1977	Arco #60	10N-2E-18	CDF #	7	1/18/77	I	Campfire	Redw Ck-East	#17-17
1977	Arco #2 #67	9N-2E-5	CDF #	354	9/29/77	II	Debris Burn	Redw Ck-West	#17-19
1961	Roadside County #11	10N-2E-28	CDF #	130	9/19/61	I	Debris Burn	Bald Hills	#18-01
1968	RNP #1	10N-2E-33	CDF #	---	---	II	Debris Burn	Bald Hills	#18-03
1969	#22	9N-2E-23	CDF #	---	9/27/69	III	O-Undet.	Bald Hills	#18-04
1969	Arco #4	10N-2E-29	CDF #	99	7/24/69	I	Lightning	Bald Hills	#18-05
1969	Schoolhouse #5	9N-3E-19	CDF #	90	7/24/69	I	Lightning	Bald Hills	#18-06
1973	#33	9N-2E-14	CDF #	---	5/17/73	II	O-Undet.	Bald Hills	#18-07
1973	#35	9N-2E-10/	CDF #	---	8/2/73	II	O-Undet.	Bald Hills	#18-08
1976	#69	10N-2E-33	CDF #	---	11/8/76	II	Debris Burn	Bald Hills	#18-10
1977	#63	9N-2E-32/	CDF #	---	8/1/77	---	Lightning	Bald Hills	#18-11
1982	Counts Hill	9N-2E-10	RNP #	2128	7/9/82	---	O-Undet.	Bald Hills	#18-13

NOTE: --- = Unavailable, I=0-.25A, II=.26-9A, III=10-99A, IV=100-299A, V=300-999A, O=Other

FIRE OCCURRENCE IN REDWOOD NATIONAL PARK 1960-1984

YEAR	NAME OF FIRE	LOCATION	SOURCE	#	DATE	SIZE	IGNITION SOURCE	FIRE MANAGEMENT UNIT	MAP #
1983	Williams R.	9N-2E-24	RNP #	3197	11/13/83	---	Lightning	Bald Hills	#18-14
1962	Rdw.Cst Prk #2	10N-1E-5	CDF #	59	6 27/62	---	Campfire	Mouth of Redw.Ck.	#19-01
1972	Redw.Ck.Co.Park	10N-1E-5	RNP #	72-39	8/4/72	---	Campfire	Mouth of Redw.Ck.	#19-03
1972	Cal Pac Lumber Bch	10N-1E-5	RNP #	72-70	8/30/72	---	Campfire	Mouth of Redw.Ck.	#19-04
1973	Spit N of Cal Pac	10N-1E-5	RNP #	73-71	6/10/73	---	Campfire	Mouth of Redw.Ck.	#19-05
1973	Cal Pac Mill Orick	10N-1E-5	RNP #	73-108	7/29/73	---	Campfire	Mouth of Redw.Ck.	#19-06
1973	Orick Co Beach	10N-1E-5	RNP #	73-132	8/22/73	I	Campfire	Mouth of Redw.Ck.	#19-07
1973	Cal Pac Mill Peninsula	10N-1E-5	RNP #	73-129	8/18/73	---	Campfire	Mouth of Redw.Ck.	#19-08
1973	Freshwater Lagoon	10N-1E-5	RNP #	73-117	8/5/73	---	Campfire	Mouth of Redw.Ck.	#19-09
1974	Freshwater Rock	10N-1E-8	RNP #	---	8 8/74	---	0-Smoking	Mouth of Redw.Ck.	#19-11
1975	Cal Pac Mill #43	10N-1E-5	RNP #	---	5/1/75	II	Campfire	Mouth of Redw.Ck.	#19-12
1975	Threat	10N-1E-5	RNP #	119	7/6/75	---	Campfire	Mouth of Redw.Ck.	#19-13
1975	Mouth of Redw.Ck	10N-1E-5	RNP #	---	9/1/75	---	Campfire	Mouth of Redw.Ck.	#19-14
1975	Bch nr. Freshwater	10N-1E-5	RNP #	---	9/18/75	---	Campfire	Mouth of Redw.Ck.	#19-15
1975	#46	11N-1E-32	CDF #	---	7/6/75	II	Campfire	Mouth of Redw.Ck.	#19-16
1976	Redwood Ck Bch.	10N-1E-5	RNP #	---	7/4/75	---	Campfire	Mouth of Redw.Ck.	#19-17
1977	Beach	10N-1E-5	CDF #	---	5/21/77	I	Campfire	Mouth of Redw.Ck.	#19-18
1977	Cal Pac	10N-1E-5	CDF #	---	7/10/77	I	Campfire	Mouth of Redw.Ck.	#19-19
1977	Sand	10N-1E-5	CDF #	---	6/18/77	I	Campfire	Mouth of Redw.Ck.	#19-20
1977	Wet	10N-1E-5	CDF #	309	8/20/77	I	Campfire	Mouth of Redw.Ck.	#19-21
1977	Orick Beach	10N-1E-5	CDF #	---	8/5/77	I	Campfire	Mouth of Redw.Ck.	#19-22
1979	C-Pac Bch	10N-1E-5	RNP #	---	10/5/79	---	Campfire	Mouth of Redw.Ck.	#19-23
1979	NW Cal Pac	10N-1E-5	RNP #	---	6/30/79	---	Campfire	Mouth of Redw.Ck.	#19-24
1979	Freshwater Lagoon	10N-1E-5	RNP #	---	7/13/79	---	Campfire	Mouth of Redw.Ck.	#19-25
1979	Beach Area	10N-1E-5	RNP #	9106	6/29/79	---	Campfire	Mouth of Redw.Ck.	#19-26
1980	NW of Cal Pac	10N-1E-5	RNP #	9105	8/15/80	---	Campfire	Mouth of Redw.Ck.	#19-27
1980	Redw. Ck Co Prk	10N-1E-5	RNP #	0252	8/16/80	---	Campfire	Mouth of Redw.Ck.	#19-28
1980	Cal Pac	10N-1E-5	RNP #	---	8/5/80	---	Campfire	Mouth of Redw.Ck.	#19-29
1980	Cal Pac /Ocean	10N-1E-5	RNP #	222	8/5/80	---	Campfire	Mouth of Redw.Ck.	#19-30
1980	Orick Beach	10N-1E-5	CDF #	---	7/13/80	I	Campfire	Mouth of Redw.Ck.	#19-31
1980	Orick Beach #2	10N-1E-5	CDF #	---	7/13/80	I	Campfire	Mouth of Redw.Ck.	#19-32
1980	Orick Beach #3	10N-1E-5	CDF #	---	8/5/80	I	Campfire	Mouth of Redw.Ck.	#19-33
1980	Orick Beach #4	10N-1E-5	CDF #	---	8/16/80	I	Campfire	Mouth of Redw.Ck.	#19-34
1980	Orick Beach #5	10N-1E-5	CDF #	---	8/19/80	I	Campfire	Mouth of Redw.Ck.	#19-35
1980	Orick Beach #2	10N-1E-5	CDF #	---	7/5/81	I	Campfire	Mouth of Redw.Ck.	#19-36
1981	Orick Beach #4	10N-1E-5	CDF #	---	7/24/81	I	Campfire	Mouth of Redw.Ck.	#19-37
1981	Sawpit	10N-1E-5	RNP #	---	7/14/81	---	0-Undet.	Mouth of Redw.Ck.	#19-38
1981	Orick Beach #5	10N-1E-5	CDF #	---	7/24/81	I	Campfire	Mouth of Redw.Ck.	#19-39
1981	Orick Beach #6	10N-1E-5	CDF #	---	7/26/81	I	Campfire	Mouth of Redw.Ck.	#19-40
1981	Orick Beach #3	10N-1E-5	CDF #	---	7/6/81	I	Campfire	Mouth of Redw.Ck.	#19-41
1981	le petit feu	10N-1E-5	RNP #	---	9/2/81	---	Campfire	Mouth of Redw.Ck.	#19-42
1981	---	11N-1E-32	SIBLEY	---	---	---	0-Undet.	Mouth of Redw.Ck.	#19-43
1981	Orick Beach #7	10N-1E-5	CDF #	---	7/28/81	I	Campfire	Mouth of Redw.Ck.	#19-44
1982	Three log	10N-1E-5	RNP #	---	6/30/82	---	Campfire	Mouth of Redw.Ck.	#19-45
1982	No Ot Fire	11N-1E-32	RNP #	2074	6/1/82	---	Campfire	Mouth of Redw.Ck.	#19-46
1982	Big Log	10N-1E-5	RNP #	2222	9/12/82	---	Campfire	Mouth of Redw.Ck.	#19-47
1982	Campfire	10N-1E-5	RNP #	2091	6/1/82	---	Campfire	Mouth of Redw.Ck.	#19-48
1983	Picnic	10N-1E-5	RNP #	3157	9/21/83	---	Campfire	Mouth of Redw.Ck.	#19-50
1983	Cal Pac	10N-1E-5	RNP #	3167	9/25/83	---	Campfire	Mouth of Redw.Ck.	#19-51
1984	Outhouse	10N-1E-5	RNP #	4211	9/18/84	---	Campfire	Mouth of Redw.Ck.	#19-52

NOTE: --- = Unavailable, I=0-.25A,II=.26-9A,III=10-99A,IV=100-299A,V=300-999A, O=Other

FIRE OCCURRENCE IN REDWOOD NATIONAL PARK 1960-1984

YEAR	NAME OF FIRE	LOCATION	SOURCE	#	DATE	SIZE	IGNITION SOURCE	FIRE MANAGEMENT UNIT	MAP #
1984	Bench	10N-1E- 5	RNP #	4226	9/29/84	--	Campfire	Mouth of Redw.Ck.	#19-53
1984	Cannon	10N-1E- 5	RNP #	4179	9/2/84	--	Campfire	Mouth of Redw.Ck.	#19-54

NOTE: ----- = Unavailable, I=0-.25A, II=.26-9A, III=10-99A, IV=100-299A, V=300-999A, 0=Other

SUMMARY: FIRE OCCURRENCE WITHIN REDWOOD NATIONAL PARK
1960 - 1984

FMU #	Ignition Source					Total
	Campfire	Lightning	Debris Burn	Incendiary	Other	
1	--	--	--	--	--	0
2	1	2	--	--	--	3
3	--	--	--	--	--	0
4	--	1	--	--	--	1
5	17	--	--	--	7	24
6	--	1	3	1	5	10
7	1	1	--	--	--	2
8	6	--	--	--	--	6
9	4	--	--	2	6	12
10	1	--	--	1	--	2
11	4	2	2	--	6	14
12	-	4	2	--	2	8
13	--	1	1	1	1	4
14	3	1	3	2	7	16
15	--	1	2	--	5	8
16	--	10	3	--	3	16
17	4	3	1	--	3	11
18	--	4	3	--	4	11
19	48	--	--	--	3	51
Totals	89	31	20	7	52	199

SUMMARY: FIRE OCCURRENCE OUTSIDE REDWOOD NATIONAL PARK
 WITHIN 3.5 MILES OF THE PARK BOUNDARY
 1960 - 1984

FMU #	Ignition Source					Total
	Campfire	Lightning	Debris Burn	Incendiary	Other	
1	--	--	--	--	--	0
2	--	1	1	1	2	5
3	--	--	--	--	--	0
4	--	--	--	--	--	0
5	--	--	--	--	--	0
6	--	2	--	--	1	3
7	--	1	--	--	1	2
8	2	--	--	--	1	3
9	--	1	3	--	2	6
10	--	--	--	--	--	0
11	--	1	--	--	--	1
12	--	5	1	--	--	6
13	--	--	--	--	--	0
14	--	--	--	--	2	2
15	--	--	1	--	2	3
16	2	4	--	--	2	8
17	--	5	--	1	2	8
18	--	2	--	1	--	3
19	1	--	1	--	1	3
Totals	5	22	7	3	15	52

APPENDIX D

RESEARCH NEEDS

RESEARCH NEEDS

A complete fire management program includes gathering and organizing information about local fire history, fire effects, fuels and fire behavior. The present status of fire in parklands is also determined and compared with fire's natural pre-European role.

Fire History: The historical role of fire (frequency and post-fire vegetation succession) is only sketchily known for some redwood and oak woodland stands. No data exist for much of the park. Areal distribution and chronologies of past fires will be mapped on the basis of fire scars, age classes of post-fire vegetation and historical documentation. Sources of ignition, fire intensity and effects (stand-destroying crown fires, light ground fires, etc.) will be determined where possible. Native Americans and descendants of early settlers will be interviewed to determine historical use of fire.

Fire Effects: The relative effects of natural fire in park vegetation and the influence of Native Americans during the pre-settlement period (before 1850) will be determined insofar as is possible. This information will be compared with the effects and frequency of fire during the post-settlement period (1850-1935) and for the more recent period of fire suppression (1935-present) for various vegetation types within the park. Where necessary, experimental burning will be conducted to clarify the effects of fires of different intensity, seasonality, etc. for comparison with evidence of earlier fires in the various vegetation types.

Burning as a management tool will be evaluated for restoration of natural conditions, removal of exotic plants, thinning of dense stands of young second-growth forests, slash reduction and removal of Douglas-fir from prairie roadsides and oak woodlands. Effects of fire on air quality, soils, water and nutrients will be monitored.

Fuels: A few estimates of fuel loading in prairies, oak woodlands, old- and second-growth redwood/Douglas-fir stands have been made for prescribed burning projects or as Humboldt State University forestry class projects. Additional sampling will be needed in conjunction with other prescribed burns. The contribution of live vegetation in second-growth forests to fire behavior, effects and hazard will be evaluated. Natural rates of fuel loading and decay will be compared with that in logged areas. With time downed fuels, particularly in logged areas, will decrease and fuel models will change. Periodic sampling will be needed to detect these changes.

Presently, the California Department of Forestry's fire lookout on Schoolhouse Peak uses NFDRS Fuel Models "C" and "G". Other models should be considered for addition to the Affirms System. Fuel moistures of various fuels will be correlated with fire weather to develop predictions of fire behavior.

Fire Behavior: Observations of fire behavior during prescribed burns and the effects on vegetation will be used to interpret past fires and their effects, and to refine prescriptions for prescribed natural fire and prescribed

burns. As staff gain experience with natural fires, additional areas may be designated prescribed natural fire zones.

See Redwood National Park's Resources Management Plan for specific research project descriptions.

APPENDIX E

PRESCRIBED BURN PLAN FORMAT

INSTRUCTIONS FOR COMPLETING THE

PRESCRIBED BURN UNIT PLAN

I. Burn Unit Description.

1. Location: enter township, range, section
2. Size: area in acres
3. Elevation Range: enter maximum and minimum elevations of unit, if more than 500' of relief is present.
4. Description of boundaries: describe the physical or artificial boundaries of the fire.
5. Vegetation type: describe the vegetation type that will fuel the fire, the percent of the unit composed of this type, and the NFFL fuel model which corresponds to it.
6. If fuel reduction is an objective of the burn, describe preburn characteristics (load, depth, crown height, etc.); after the burn, describe changes in these characteristics.

II. Purpose of Burn.

1. Objectives: list percent of fuel to be reduced and desired average scorch height, and any other purposes for the burn. Objectives would be quantifiable, so the value of the prescriptions can be evaluated? Quantify the results of the burn and assess the degree to which the objectives were achieved.

III. Fire Organization.

1. List names of personnel on burn.
2. List work days required for each function, and expected cost.
3. List equipment needs and expected cost.

IV. Scheduling -- Self Explanatory.

V. Preburn Considerations.

1. List preparation needs for burn, both on site such as chains of line to construct or improve or snags to remove, and off site, such as newspaper articles and burn permits.

2. Special precautions: identify all historic sites, trails, rare or sensitive plants and animals, and power or fence posts in the burn unit. Specify precautions taken to protect these items and notify the proper authorities of these potential problems.
3. Describe safety concerns on the fire, who will provide first aid, and if evacuation transportation is available.
4. Describe who will conduct day and night patrols to watch for escapes and safety problems which arise. Specify to whom these problems should be reported.
5. Describe safety problems or accidents that occurred on fire and corrective actions taken.

VI. Burning Prescriptions and Observed Conditions.

List the NFFL fuel mode, its prescription, and both the average and range of prescription parameters at the standard observations time of 1400. Attach additional sheets if significant changes in prescription parameters occurred at other times, or if more than one fuel model is burned.

VII. Firing Techniques and Ignition Methods.

1. Narrative of methods, techniques, and patterns to be used.
2. Describe results in terms of actual methods used and their effectiveness.

VIII. Smoke Management Considerations.

1. Describe expected direction of day and night smoke drift, the location of smoke sensitive areas, and the expected, or maximum tolerable, duration of smoke.
2. Describe actual smoke conditions produced by fire, any problems that occurred and management strategies for dealing with them.

IX. Holding Plan.

1. Describe number, kind, and position of forces involved in containing the burn. Describe weak points of control line, and places needing intensive protection (cabins, historical objects, significant natural features), and the techniques to be used to protect these features.
2. Under results, describe any variations from the plan.

X. Contingency Plan for Fire Escape.

1. Particularly when multiple prescribed burns are scheduled around the same time, an escape of one or more of these burns will overtax Park suppression forces. The prescribed burn boss should evaluate the chances for escape, and from where will personnel be obtained to attack a worst case situation. This information will aid in the prioritization and scheduling by the Fire Management Officer of the various burns.
2. Describe any fire escapes and actions taken to control their escapes. Analyze why the escapes occurred.

XI. Communication and Coordination.

1. Describe how many radios will be needed, who will have them, and what channel will be used. If other forms of communication will be used, describe them.
2. Analyze any problems that occurred and how they were corrected; include recommendations for future burns.
3. No matter how well the burn turns out, a burn which catches other agencies, visitors, staff personnel, and air pollution regulatory agencies by surprise will cause many problems. Signing of trails and roads, public information, and the need for naturalists on the fire should be specified and detailed to specific people.

XII. Monitoring and Evaluation Process.

1. Describe the methods of establishing that the fire is within prescription, and the methods of documenting that the burn's objectives were met.
2. Monitoring report, if lengthy, may be included as an attachment to this completed plan.

XIII. Other Considerations.

1. Cover miscellaneous factors in the burn not mentioned elsewhere (political ramifications, visitor impacts, training opportunities, interagency cooperation, etc.).
2. The burn unit should be left with as few scars as possible. Firelines should be waterbarred where needed, firelines that intersect trails should be obliterated or blocked to prevent confusion by the public as to which is the trail, stumps should be flushed, and all litter collected, including signs and flags.
3. Describe actions actually taken post-fire.

XIV. Costs.

1. List preburn costs (monitoring, line construction, planning, etc.) as well as burning and post-burn analysis costs. List personnel, pay scale, and hours worked. List personnel who actually worked on fire, not observers.
2. List all equipment used on the fire and the associated cost of their use. Count helicopter cost, but not vehicle rent or mileage.
3. List fuel and ignition device cost, as well as any mop-up or suppression costs.
4. Total all costs and compute cost/acre and man-days/acre.

Western Region Prescribed Burn Plan*

_____ park

PRESCRIBED BURNING UNIT PLAN

Burn Unit #/Name _____

Prepared By _____
PFM/PBB

Date _____

Received By _____
PFM/PBB

Date _____

Approved By _____
Superintendent

Date _____

*Plan Format approved by Regional Director in a memorandum to all Areas and Offices, dated July 27, 1983, under file designation Y18(WR-RN)

I. Burn Unit Description

Location: T. _____ R. _____ S. _____

Size: _____

Elevation Range: _____ upper _____ lower

Description of Boundaries:

Burn Unit Map Showing Vegetation Types or Fuel Models (Attach)

Slope(s)

Aspect(s)

Vegetation Type	% of Burn Unit	Fuel Model
-----------------	----------------	------------

_____	_____	_____
-------	-------	-------

_____	_____	_____
-------	-------	-------

_____	_____	_____
-------	-------	-------

Living and Dead Fuels

(assess loadings pre and post burn by dead size classes, biomass, dead to live ratio, age classes, depth, etc., as applicable to fuel type)

II. Purpose of Burn:

Circle:

Preserve Natural Processes

Hazard Fuel Reduction

Other: (Specify) _____

Objectives

(quantify with specific data if possible)

III. Fire Organization;

Manpower:

Prescribed Burn Boss : _____
Asst. Prescribed Burn Boss: _____
Safety Officer : _____
Burn Monitor : _____
Crew : _____

Projected Person Hours

Projected Costs*

Unit Preparation	_____
Burning	_____
Holding	_____
Monitoring	_____
Mop-up/ Evaluation	_____

Equipment:

Item

Projected Costs*

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

*Record required actual cost data on pages 10 and 11.

IV. Scheduling:

Proposed Ignition Date:

Projected Burn Duration:

Actual Ignition Date:

Date Declared Out:

V. Pre Burn Considerations:

A. Preparation Needs:

On site:

Off site:

B. Special precautions/ regulations (utility lines, historical sites, safety, etc.):

VI. Burning Prescriptions and Observed Conditions:

Fuel Model _____

Prescription		Observed*	
<u>Weather</u>		Average	Range
Temperature	_____	_____	_____
Relative Humidity	_____	_____	_____
Wind Direction	_____	_____	_____
Wind Speed	_____	_____	_____
<u>Fuel Moistures</u>			
1 hr.	_____	_____	_____
10 hr.	_____	_____	_____
100 hr.	_____	_____	_____
1000 hr.	_____	_____	_____
Woody (live)	_____	_____	_____
Herbaceous (live)	_____	_____	_____
<u>Fire Characteristics</u>			
Rate of Spread	_____	_____	_____
Spread Component	_____	_____	_____
Heat/ Unit Area	_____	_____	_____
Energy Release Com.	_____	_____	_____
Flame Length	_____	_____	_____
Burning Index	_____	_____	_____
_____	_____	_____	_____

* Standard Observation Time _____

Dates of Burn _____

Comments:

VII. Firing Techniques and Ignition Methods:

VIII. Smoke Management Considerations:

IX. Holding Plan:

X. Contingency Plan for Fire Escape:

XI. Communications and Coordination:

XII. Monitoring and Evaluation Procedures:

XIII. Other Considerations (Cultural, Rehabilitation, T. and E. Species, etc.)

Date _____

Date _____

Total

Actual
Cost of Supplies and Equipment:

Actual
Cost of Supplies and Equipment:

[illegible]

Total

Grand Total

Cost/acre _____

Mandays/acre _____

APPENDIX F

PRESCRIBED NATURAL FIRE PRESCRIPTION

FIRE BEHAVIOR FUEL MODEL 10/NFDRS FUEL MODEL G

Weather

Temperature: 50 to 85 F
Relative Humidity: 35 to 90 percent
Wind Direction: North/ West/ South/ Northwest/ Southwest
Wind Speed at 20 ft.: 0 to 20 mph

Fuel Moistures

1-hour time-lag: 5 to 10
10-hour: 10 to 20
100-hour: 10 to 20
1000-hour: 20 plus
Woody-Live: 100 to 150
Herbaceous-Live: 100 to 150

Fire Characteristics

Rate of Spread: 2 to 6 chns/hour
Ignition Component: 17
Heat/Unit Area: 1000 to 1200 BTU/ft.²
Reaction Intensity: 4000 to 5000 BTU/ft.²
Flame Length: 2 to 5 ft.
Burning Index: 0 to 40

This generalized prescription is based upon on-site weather and fuel observations and is applicable to both the Flint Ridge and the Little Lost Man Creek Research Natural Areas for prescribed natural fire. On-site monitoring during an actual fire will determine whether the fire is in prescription and will provide baseline fire behavior data for future prescriptions. Because of the variable elevation and weather conditions in Little Lost Man Creek, the National Park Service has developed a response plan for the area.

The Research Natural Area would be divided into three elevation zones in which natural fires would be treated differently by the Incident Commander. The three zones are the lower basin (below 1200 ft. elevation), middle basin (1201-1600 ft.) and the upper basin (above 1600 ft.).

The general responses to natural ignitions and fire in these zones would be as follows, subject to on-site modification by the Incident Commander:

Lower Basin (less than 1200 ft.)

Low to moderate fire weather: Incident Commander performs initial inspection, posts daytime fire monitor and prepares step-up plan.

Moderate to high fire weather: Incident Commander inspects and establishes hand line at 1200 ft., and back fires if necessary.

Middle Basin (1200-1600 ft.)

Low to moderate fire condition: East fire flank would be managed by short hand lines at 1600 ft. or below to prevent a run to the east.

Moderate to high fire danger: Incident Commander may implement suppression, taking into consideration escape potential and the Research Natural Area Fire Policies.

Upper Basin (1601-2250 ft.)

Low to moderate fire conditions: Incident Commander would manage the east flank with short hand lines and backing fires or implement suppression.

Moderate to high fire conditions: Incident Commander would implement suppression.

APPENDIX C

WILDFIRE STEP-UP PLAN

REDWOOD NATIONAL PARK
Wildfire Step-up Plan

AREA INFORMATION: Climate class - 4, Herbaceous class - P, Slope - 3, Model - G				
Burning Index	Manning Class	Personnel	Step up Action	Resources/Facilities
0-15	I (low)	Regular duty schedule	None	All facilities open. No restrictions.
16-30	II (moderate)	Regular duty schedule	Fire crew-maximum 30 min. response time.	All facilities open. No restrictions.
31-61	III (high)	Regular duty schedules. Fire qualified rangers and technicians alerted.	Fire crew-maximum 10 min. response time. No back country projects. Dispatch contact cooperating agencies for status.	Trails posted. Open ground fires restricted. Stoves permitted. Visitor center notices. Public contact by patrol personnel. Prescribed burning will be cancelled depending upon site-specific conditions & suppression resources available. Backcountry camping restricted. No open fires. Rehabilitation projects reduced equipment use. No slash or debris burning.
50+ with lightning level at 4 or higher, go to MC-IV				
62-73	IV (very high)	All fire crew on duty (lieu days cancelled-O.T. authorized) Fire qualified personnel from all divisions alerted. Adjust staffing to meet coop. agreement commitments.	Fire crew standby at stations. Rangers and technicians on fire patrol with public contact. Dispatch contact cooperators every two hours for status. All equipment ready and available.	
Level 4 or higher lightning predicted go to MC-V				
74+	V (extreme)	All fire crew on duty. Off duty rangers and technicians on O.T. Schedules extended. Fire qualified personnel from other divisions on O.T. as needed.	Rangers and technicians on fire patrols. Fire dress and equipped for instant response. All other fire personnel on standby at fire stations. Cooperator status checked hourly. Dispatch manned 6am-9pm.	All fires restricted. Campgrounds closed. Trails into high fire risk areas closed.
Additional costs above budget levels for coverage during MC's IV & V to be funded through emergency presuppression accounts (PWE 343). Fire crew size authorized - 4. Scheduling supplemented with fire qualified rangers and technicians for maximum coverage as needed. Crews and equipment may be shifted to cover cooperators stations vacated due to going fire commitments, in accordance with cooperative agreements.				

APPENDIX H

NFDRS FUEL MODELS

NATIONAL FIRE DANGER RATING SYSTEM FUEL MODELS

Fuel models found in Redwood National Park are as follows [definitions are from the National Fire Danger Rating System (NFDRS) as found in Deeming, et al. 1977]:

Fuel Model "A" represents western grasslands vegetated by annual grasses and forbs as found in the coastal and inland prairies. Woody fuels such as shrubs and trees can be present, but collectively occupy less than one-third of the area. Curing time varies from coastal sites to inland, higher sites.

Fuel Model "L" represents western grasslands whose composition is primarily perennial grasses. The difference between this model and that of Model A is that in L the fuel loadings are heavier and the species are coarser. Also, shrubs and trees occupy less than one-third of the area.

Forest vegetation is covered by Fuel Model "G" representing dense conifer growth with a heavy accumulation of both litter and down woody fuels. There is a high percentage of woody material more than 3 inches in diameter. The old-growth stands of Sitka spruce, western hemlock, coast redwood and Douglas-fir are all included.

Young, second-growth redwood Douglas-fir forests are represented by Fuel Model "J". The ratio of standing live to slash fuels varies with logging techniques, post-logging treatment and age of stand. Generally, the total loading of materials less than 6 inches in diameter is less than 25 tons/acre. As the slash ages, the fire potential will be overrated.

Fuel Model "C" is used for the open Jeffrey pine stands found on the serpentine site of the Little Bald Hills. Perennial grasses and forbs are the primary ground fuel. Some brush and shrubs are present but do not contribute significantly to the fuel loading.

Dense stands of chaparral and senescent knobcone pine are represented by Fuel Model "B". High fuel loads and foliage which readily burns created the potential for an intense, fast moving fire.

APPENDIX I

PRESCRIBED FIRE PERSONNEL QUALIFICATIONS

WESTERN REGION PRESCRIBED FIRE JOB QUALIFICATIONS

Park: REDWOOD

Approved by: Douglas G. Warnock

Date: May 31, 1983

PRESCRIBED FIRE MANAGER

DUTIES

Core: Responsible for the development of burning prescriptions and prescribed burning plans in addition to those duties outlined in the PRESCRIBED FIRE QUALIFICATION GUIDE.

Park Expansion:

TRAINING

Core: A. S-130
B. S-190
C. S-390

D. Western Region Prescribed Fire (TBA)
E. T.I. 59
F. *Natural Resource Management Training

Park Expansion:

EXPERIENCE

Core: 3 Prescribed Burns; with at least one with some degree of overhead responsibility and two in the fuel or vegetation type to be burned (within last 5 years).

Park Expansion:

PHYSICAL FITNESS

Core: A. Achieve Step Test (or alternative running test) fitness score of 40 annually.
B. Completion of a physical fitness examination within 5 years of actual employment in fire management activities.

Park Expansion:

ADDITIONAL PARK REQUIREMENTS

PRESCRIBED BURN BOSS

DUTIES

Core: Responsible for the implementation of burning prescriptions and prescribed burning plans in addition to those duties outlined in the PRESCRIBED FIRE QUALIFICATION GUIDE.

Park Expansion:

TRAINING

Core: A. S-130
B. S-190
C. S-211

D. S-215
E. Western Region Prescribed Fire
F. T.I. 59

Park Expansion: None

EXPERIENCE

Core: 3 Fires; with at least one in prescribed burning condition within the fuel type or vegetative type to be burned. If wild fires are used for this experience; at least one of the two allowable must have been in the capacity of squad boss or higher.

Park Expansion: Prior to full certification new candidates will run at least two prescribed burns in a fuel type with a fully qualified burn boss on site so he can be evaluated on his actual performance.

PHYSICAL FITNESS

Core: A. Achieve Step Test (or alternative running test) fitness score of 45 annually.
B. Completion of a physical fitness examination within 5 years of actual employment of fire management activities.

Park Expansion:

ADDITIONAL PARK REQUIREMENTS

CREW MEMBER (Ignition Specialist)

DUTIES

Core: Responsible for all duties as assigned by the Prescribed Burning Boss which may include acting as holding boss or prescribed fire monitor depending upon personnel available and complexity of burn.

Park Expansion:

TRAINING

Core: A. S-130
B. S-190
C. Western Region Prescribed Fire (TBA, low priority)

Park Expansion:

EXPERIENCE

Core: None

Park Expansion:

PHYSICAL FITNESS

Core: A. Achieve Step Test (or alternative running test) fitness score of 45 annually.
B. Completion of a physical fitness examination within 5 years of actual employment in fire management activities.

Park Expansion:

ADDITIONAL PARK REQUIREMENTS

WESTERN REGION PRESCRIBED FIRE JOB QUALIFICATIONS

Park: REDWOOD

Approved by: Douglas G. Warnock

Date: May 31, 1983

* Prescribed Fire Manager may fulfill this requirement through attendance at one of the following:

- A. Advanced Fire Behavior and Effects for Prescribed Fire Managers held at Redmond, Oregon, in March 1982 (GRANDFATHER).
- B. Fire Management Workshops held at YOSE and GRCA in 1980-82 (GRANDFATHER).
- C. Prescribed Fire for Managers (Marana Course).
- D. Advanced Fire Management (Marana Course).
- E. Natural Systems Workshop (Albright Course).
- F. Fire and Resources Management for Line Officers (Marana Course).
- G. Management of Natural Resources (Albright Course).
- H. Wilderness Fire Symposium (Missoula, Montana in 1983).

COMMENTS:

APPENDIX J

COOPERATIVE AGREEMENTS

1. California Department of Forestry.
2. Interagency agreement between the Bureau of Land Management, Bureau of Indian Affairs, National Park Service, U.S. Fish and Wildlife Service and the U.S. Forest Service.
3. Six Rivers National Forest.
4. Interagency agreement for cooperative use of prescribed fire in California.
5. National agreement for meteorological services in support of agencies with land management and fire protection responsibilities.
6. Klamath Fire District #5.
7. Orick Community Services District/Orick Volunteer Fire Department.



United States Department of the Interior

NATIONAL PARK SERVICE

WESTERN REGION

450 GOLDEN GATE AVENUE, BOX 36063
SAN FRANCISCO, CALIFORNIA 94102

IN REPLY REFER TO:

14(WR-OR)

July 7, 1982

Memorandum

To: Superintendents, Channel Islands, Joshua Tree, Pinnacles, Redwood,
Sequoia-Kings Canyon, Whiskeytown and Yosemite

ACTING

From: Regional Director, Western Region

Subject: California Department of Forestry/National Park Service
Master Agreement

Enclosed for your information and guidance is a copy of the recently signed Statewide agreement for mutual aid between the California Department of Forestry and the National Park Service. Your attention is directed to the following changes in this agreement, which replaces the previous one dated June 1970:

1. No charges to the receiving agency for the first 24 hours of initial attack assistance; however, hand crews, aircraft, and bulldozers are not considered initial attack resources.
2. Local operating plans are to be jointly prepared by individual parks and adjoining CDF Ranger units, and are to include all items listed in section D of the agreement.

We are also enclosing a copy of California Department of Forestry Temporary Directive #82-3, concerning reimbursement to the State from federal agencies for fire suppression costs. Any billings from the State should be sent promptly to the Regional Finance Office so that we can cooperate in meeting the 120 day deadline mentioned in the Directive.

Leri E. Lopez

Enclosure

TEMPORARY DIRECTIVE

MS 6 3 771

NUMBER

82-3

SUBJECT

9420 Fire Suppression Cost Recovery

ISSUE DATE

JUNE 1982

REFERENCE

MANUAL OF INSTRUCTIONS (Section 9420.2)
HANDBOOK 6000/9400 (Sections 9422.6, 9424.5, 9425.5
and 9426.5)

EXPIRATION DATE

JUNE 1983

To speed up the recovery of reimbursement from federal agencies for suppression costs and meet the 120-day deadline imposed upon the Department by the Legislature, all federal agencies that have contracts with the California Department of Forestry for fire suppression reimbursement have agreed to accept partial billings.

The following procedures will be followed:

- (1) All FC-40's will still be submitted within 30 days as stated in the Manual of Instructions and the Fire Law Administration Handbook;
- (2) If the FC-40 is a partial billing, it will be marked in the upper right hand corner Partial Billing;
- (3) If a partial billing, a cover letter or memo should be attached to the FC-40 stating what bills are missing and the estimated cost, and the approximate time that the final billing will be forthcoming.

AGREEMENT

THIS AGREEMENT, made and entered into this 1st day of June, 1982, by and between Director, California Department of Forestry, hereinafter called "STATE", under authority of California Public Resources Code Section 4141, and the United States Department of the Interior, Western Region of the National Park Service, hereinafter called "PARK SERVICE", under authority of 16 U.S.C. 17J-2 (e).

W I T N E S S E T H

WHEREAS, STATE and PARK SERVICE have the responsibility of preventing and suppressing fires in areas containing some of the nation's most important natural resources; and

WHEREAS, many of these said areas are contiguous and a fire which occurs in one is a potential threat to the other; and

WHEREAS, STATE and PARK SERVICE have in the past rendered mutual assistance in the prevention and suppression of fires threatening the resources and lands of the other and will continue to do so;

NOW, THEREFORE, it is mutually agreed as follows:

A. Cooperative Fire Action

1. Under normal conditions each agency will take prompt, independent and complete action to suppress fires burning upon the land for which it is responsible. However, under conditions as described below, it will be necessary or desirable for the forces of both agencies to cooperate in the fire control effort. For the purpose of this agreement the parties hereto shall be distinguished as follows: either party which may be responsible for the suppression of a fire because of its location shall be called the "PROTECTING AGENCY" regardless of the fact that the other party may temporarily assume all responsibility and effort during the suppression of the particular fire; the agency not possessing such basic responsibility for suppression of the fire shall be called the "SENDING AGENCY".
2. Either agency may, upon its own initiative, go upon land which is the responsibility of the other agency to engage in fire suppression work; provided, however, its forces shall not perform any act of a nature which will reflect to the discredit or which is contrary to the established policy of the responsible agency; and provided further, the PROTECTING AGENCY shall be recognized as being in charge of all work of fire suppression if there is present and available an employee of the PROTECTING AGENCY competent to assume responsibility.
3. There will be no delay in attack of fires which occur along the border line of areas of protection responsibility pending determination of the precise location of the fire. Unless it is clearly and mutually

understood that one agency will promptly attack and follow through on all necessary action, it shall be the agreed policy that both agencies shall send forces promptly to start suppression action on borderline fires.

4. When both agencies are engaged upon a fire at or near the common protection boundary, the ranking officers of each agency shall agree upon the fire control strategy and the areas and line of separate suppression responsibility, then the ranking officer of the PROTECTING AGENCY shall assume responsibility of Incident Commander as mentioned in Clause 2 above. Each party shall assume the cost of expenditures made by their respective agency for work upon such borderline fires, regardless of the relative areas burned.

B. Joint use of firefighting forces. This is the most economical and efficient method of meeting temporary fire emergencies which may demand more suppression effort than can be provided through the normal forces of any one fire control organization. Joint use of resources for the purpose of this agreement is divided into two categories; the conditions thereof are described below:

1. Mutual Aid Assistance is that effort put forth without reimbursement within the first 24 hours of a fire by initial attack forces of the SENDING AGENCY within the Mutual Threat Zone, either voluntarily or upon the request of the PROTECTING AGENCY provided the SENDING AGENCY is able to make the initial attack firefighting forces available.
 - a. The Mutual Threat Zone is an area jointly agreed upon and adjacent to either side of common protection boundaries where a fire burning on one side of the protection boundary represents a threat to the direct protection area of the agency providing protection on the other side. Mutual Threat Zones will be delineated on protection maps and incorporated as a part of local operating plans where PARK SERVICE and STATE have adjacent protection responsibilities.
 - b. The 24-hour period shall begin when the first report of the fire is made to the responsible agency. Fire suppression effort by initial attack forces beyond the 24-hour initial attack period will be considered assistance by hire as outline in Section 2 below. Since mutual aid assistance is supplied from regular initial attack forces of the SENDING AGENCY, it is agreed that such forces shall be released for return to their regular stations at the earliest practical time. In no event shall they be held for a period longer than 24 hours unless the responsible supervising officer representing the SENDING AGENCY gives specific consent.
2. "ASSISTANCE BY HIRE" upon a full reimbursement basis may be extended by one agency to the other regardless of any provision for voluntary (non-pay) mutual aid mentioned above. The request to hire fire protection assistance must be clear and precise and such requests shall be processed and recorded through the dispatching systems of both agencies. Requests for assistance should arise for the PARK SERVICE from the office of a Park Superintendent or the Regional Director, and for the STATE, from the Office of the Ranger-in-Charge, a Regional Chief or the Director.

Neither agency shall obligate the other to perform a service or make an expenditure except in a manner that is clearly understood and agreeable to

the agency making the expenditure or performing the service. Only those items specifically requested shall be subject to reimbursement by the PROTECTING AGENCY. Services or material furnished by the SENDING AGENCY over and beyond the request shall be considered to be a voluntary contribution.

- a. PARK SERVICE hand crews as well as STATE hand crews shall not be considered initial attack crews or mutual aid in respect to reimbursement. Fire work performed for the PROTECTING AGENCY by such hand crews shall be considered ASSISTANCE BY HIRE.
- b. For the purpose of providing ASSISTANCE BY HIRE, agency-owned motorized equipment as well as operators shall not be considered initial attack or mutual aid in respect to reimbursement. Rental rates paid for all agency owned motorized ground equipment by either agency to the other shall be at the rate established by each agency for its equipment and shall include the estimated cost of operation, repair and allowance for replacement, but shall not include the wage of the operator unless so agreed specifically for the particular case.

Rental rates for privately owned motorized ground equipment rented under terms of a written contract will be reimbursed at the actual rental price, which may include an operator.

- c. Use of aircraft will be in accordance with operational procedures mutually acceptable to the PARK SERVICE and STATE. The PROTECTING AGENCY will be responsible for payment of the hourly flight and operating costs in accordance with the provisions in the applicable aircraft contract. The rate for PARK SERVICE and STATE-owned or operated aircraft shall be at the flight rate established by the SENDING AGENCY. Fire retardant used on fires shall be reimbursed at SENDING AGENCY'S costs. In the case of helitack crews, the PROTECTING AGENCY will be responsible for payment of the contract rate (including pilot and aircraft). The helitack crew will be treated as an initial attack crew in instances where 24-hour free mutual aid assistance is applicable.
- d. Except as provided for in B. 1. above, each agency shall be responsible for suppression costs within their direct area of fire protection responsibility for any one fire burning on both agencies' lands.

C. Claims - The transmittal and payment of claims under this agreement shall be governed by the following procedures and conditions:

1. Whenever either agency intends to present a claim for reimbursement, it shall, for each particular fire, list by major category the items and costs for which reimbursement is to be claimed. Thereupon, the indebted agency shall have the opportunity to scrutinize the proposed claim to the end that obvious errors may be adjusted prior to entering the claim into regular fiscal channels. The respective Park Superintendent on the part of the PARK SERVICE, and the respective Regional Chief on the

part of the STATE shall cooperate in preparation of said claim for reimbursement.

Attached to all claims shall be such pertinent facts as the Director and Regional Director deem necessary to identify, justify and explain the situation.

2. Reimbursements to the PARK SERVICE shall be made payable to the National Park Service, and mailed to National Park Service, Western Region Finance Division, 450 Golden Gate Avenue, Box 36063, San Francisco, California 94102 for deposit to the credit of the appropriations originally obligated, or to similar appropriations currently available at the time of deposit. Reimbursements to the STATE shall be made payable to the State of California and mailed to the Department of Forestry, 1416 Ninth Street, Sacramento, California 95814; check must be referenced to the invoice number of the billing.
3. Subsistence, travel, equipment operation, salaries, wages, as well as overtime and related employee benefit costs, and any special expenditures related directly to the fire are considered to be reimbursable items of expense under this agreement in the manner prescribed herein.
4. Reimbursement for the salary or wage of any employee by either agency to the other shall be computed upon the direct or prorated daily or hourly wage of that employee including actual overtime payments, and related employee benefit costs. In all cases not involving regular employees of either agency, every reasonable attempt shall be made by the PROTECTING AGENCY to make direct payment to the employee rather than through Reimbursement to the SENDING AGENCY. This would be limited to pick up firefighters.
5. Dispatching services and personnel associated with dispatch and related office work are always provided at no expense to the other agency.
6. Other indirect costs as determined by each agency may be added to all billings under this agreement.

D. Operating Plans

Adjoining National Parks and Ranger Units will formulate and adopt local operating plans for coordination of interagency fire protection activities. Annually, prior to May 1, adjoining field units will review and update these plans. Such plans will include fire protection organization, dispatching and initial attack procedures, fire prevention considerations, special protection areas requiring modified suppression tactics, maps identifying special protection areas and mutual threat zones, if applicable, and the name and title of park resource advisers authorized to represent the Park Superintendent on fires burning on PARK SERVICE Lands.

E. General

1. Neither the STATE nor the PARK SERVICE shall be bound to make any expenditure under the terms of this agreement except as funds are

appropriated by the State Legislature of California or the Congress of the United States, or which may otherwise be made available.

2. Each party agrees that it will be responsible for its own acts and the results thereof, and each party shall not be responsible for the acts of the other party or the results thereof so far as they may be legally able to do so under appropriate laws and statutes.
3. PARK SERVICE officers holding appointments as Voluntary Fire Warden-Peace Officers will enforce State Fire Laws and issue permits for burning on private lands inside the National Park Service boundaries. When requested by the PARK SERVICE, the Director may delegate to other employees of the PARK SERVICE authority for certain fire prevention and law enforcement actions defined and stipulated below. This is intended to make specific PARK SERVICE employees representatives of the Director. As such, they will enforce State fire laws on State Responsibility Area under PARK SERVICE direct protection for the following purposes:
 - a. Issuing burning permits (except for range improvement burning or prescribed burning).
 - b. Making fire prevention inspections.
 - c. Requesting criminal prosecution through the District Attorney.

By April 15 of each year, Park Superintendents will submit to appropriate Regional Chiefs, the names of PARK SERVICE employees who are trained to perform fire prevention and law enforcement duties and request the authority for them to perform the duties noted in a., b., and c above. Regional Chiefs will review these requests and, if approved, issue a letter to the Park Superintendent granting such authority annually. Additional names of employees may be submitted during the year as those employees are needed and trained by the PARK SERVICE. The letter of authority will expire May 31 of the following year.

4. This agreement, or any provision contained herein, may be amended or modified at any time by mutual agreement.

F. Term

1. The term of this agreement shall be for a period of five (5) years, beginning June 1, 1982 and ending May 31, 1987.
2. This agreement may be terminated by either party upon the giving of sixty (60) days prior written notice to the other party.

G. Supersedure

This agreement cancels and supersedes that certain agreement between STATE and PARK SERVICE, dated June 24, 1970.

IN WITNESS WHEREOF, the parties hereto have executed this agreement on the day, month and year first hereinabove written.

APPROVED AND RECOMMENDED
FOR EXECUTION BY THE STATE:

1. CDF, Fire Protection
By: Gerald A. Letson
Signature

GERALD A. LETSON
Printed Name

CHIEF, FIRE PROTECTION
Title

2. DEPARTMENT OF GENERAL SERVICES
By:

Signature

Printed Name

Title

FORM	POLICY	RECORDS
Department of General Services		
APPROVED		
JUN 10 1982		
BY	ORIGINAL SIGNED BY THOMAS H. CLAYTON	
	Asst. Chief Counsel	

STATE OF CALIFORNIA
Department of Forestry
By:

Signature

Printed Name Thomas Kowens
Departmental Accounting Office
Department of Forestry

Title

U.S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE, WESTERN
REGION

By: Howard H. Chapman
Signature

(Sgt) HOWARD H. CHAPMAN

Printed Name

Regional Director, Western Region

Title



United States Department of the Interior

NATIONAL PARK SERVICE

WESTERN REGION

450 GOLDEN GATE AVENUE, BOX 36063
SAN FRANCISCO, CALIFORNIA 94102

IN REPLY REFER TO:

A44
XY14

April 7, 1983

Memorandum

To: All Areas and Offices, Western Region
From: ~~ACCTG~~ Regional Director, Western Region
Subject: Interagency Agreement on Wildland Fire

Enclosed for your information, is a copy of a new master agreement concerning wildland fire management between the National Park Service, the U. S. Forest Service, Bureau of Land Management, Bureau of Indian Affairs, and the U. S. Fish and Wildlife Service. This new agreement cancels the October 17, 1981, agreement between the Forest Service and NPS, but does continue the provision of no cross-billing for fire suppression expenditures between the several federal agencies involved.

W. Russell White

Enclosure



United States Department of the Interior

NATIONAL PARK SERVICE
WASHINGTON, D.C. 20240

IN REPLY REFER TO:

A44

MAR 28 1983

X Y14(9560/545)

Memorandum

To: Directorate and Field Directorate

From: Director

Subject: Interagency Agreement on Wildland Fire

We have enclosed a newly executed Interdepartmental Agreement which replaces the existing agreements with the U. S. Forest Service, the Bureau of Indian Affairs, and the Bureau of Land Management. It also adds, for the first time, an agreement with the U. S. Fish and Wildlife Service on the national level.

This agreement now provides the vehicle for multi-agency coordination of all aspects of wildland fire and supercedes the existing agreements. The various regional staffs will want to bring this to the attention of their counterparts and initiate whatever actions they feel appropriate in order to effectively utilize the authorities contained in this agreement.

This agreement continues the provision that the participating agencies will not rebill costs of fire suppression activities. The costs of fire suppression support to other agencies still need to be documented so that the Service will be able to provide information to those agencies, should they request it. In order to meet that provision, we will continue to exercise the procedure found in the Planning and Financial Management System and in NPS-18, Fire Management Guideline, regarding the establishment of discrete project management plans for assistance to other agencies.

This agreement should simplify subsequent cooperative activities among the participating agencies, particularly those activities that involve most or all of the agencies. We look forward to the results of implementation and the increased efficiency in the national fire management program.

Russell E. Dickinson

INTERAGENCY AGREEMENT

Between the

BUREAU OF LAND MANAGEMENT

BUREAU OF INDIAN AFFAIRS

NATIONAL PARK SERVICE

U.S. FISH AND WILDLIFE SERVICE

of the

UNITED STATES DEPARTMENT OF THE INTERIOR

and the

FOREST SERVICE

of the

UNITED STATES DEPARTMENT OF AGRICULTURE

I. Introduction

Fire loss in the forests and on the rangelands of the Nation continues to be a matter of great concern to the American public and to the land management Bureaus and Services of the Department of the Interior and the Forest Service of the Department of Agriculture, hereafter called "agencies." Considerable progress has been made in the development of fire plans and in methods of fire suppression by the agencies. More progress can be made by closer cooperation between the responsible agencies. The value of cooperation in fire management and fire suppression has been demonstrated by the agencies. Many of the land areas under jurisdiction of these agencies are so located geographically that fire on lands in one jurisdiction may become a threat to the resources on an adjoining jurisdiction. It is therefore desirable and in the public interest to provide specifically for coordinated action between these agencies.

II. Purpose

To provide a basis for cooperation between the agencies of the Departments of the Interior and Agriculture on all aspects of wild-fire management and to facilitate the cooperative use of fire related resources during national or regional non-fire emergencies. This agreement rescinds and cancels all previous agreements, dated February 21, 1963, and amended October 3, 1977 (BLM-FS); June 9, 1980 (BIA-FS); and October 17, 1981 (NPS-FS).

III. Authority

1. Protection Act of 1922 (16 U.S.C. 594).
2. Memorandum of Understanding between United States Department of the Interior and the Department of Agriculture, dated January 28, 1943.
3. Reciprocal Fire Protection Act of May 27, 1955 (69 Stat. 66; 42 U.S.C. 1856a).
4. Economy Act of June 30, 1932 (47 Stat. 417; 31 U.S.C. 686), as amended. (For USDI Agencies only.)
5. Federal Land Policy and Management Act of 1976 (43 U.S.C. 1702).
6. National Park Service Organic Act of August 1916 (16 U.S.C. 1).
7. Forest Service Cooperative Agreement Act of December 12, 1975 (16 U.S.C. 565al-3).
8. Granger-Thye Act of April 24, 1950, as amended (16 U.S.C. 572c).
9. National Wildlife Refuge System Administrations Act of 1966 (16 U.S.C. 668dd-668ee; 80 Stat. 927) as amended.
10. Disaster Relief Act of 1974 (42 U.S.C. 1521).

IV. Activities

The agencies agree to cooperate in the full spectrum of fire management activities including the use of fire to achieve land management goals. Cooperative efforts shall be provided for at the national, regional, and local levels to facilitate efficient use of personnel, supplies, and equipment. Those activities will include but not be limited to:

1. Prevention of human-caused wildfires;
2. Training of personnel to common standards;
3. Presuppression activities;
4. Suppression of wildfires;
5. Rehabilitation of areas burned by wildfire;
6. Development and exchange of technology and data bases;

7. Development and distribution of cost information;
8. Use of resources on national or regional emergencies.

V. Objectives

1. Interagency fire management and wildfire suppression developed through coordination and cooperation.
2. Efficient use of fire management personnel of the agencies.
3. Provision for field offices of the signatory agencies to develop annual regional and local operating plans.
4. Provision for the use of fire personnel, equipment, and supplies to meet non-wildfire emergencies.

VI. Provisions

1. Agencies will develop cooperative arrangements to cover administrative and jurisdictional responsibilities which will provide for:
 - a. Use of closest-forces and total mobility concepts for support of large fires, including personnel, equipment, and supplies.
 - b. Development and use of fire equipment and supply caches compatible with total interagency requirements by local, area, regional, and national needs.
 - c. Training to mutually agreeable standards and curriculum.
 - d. Mutually acceptable performance qualifications and standards for wildfire fighting and wildfire management personnel.
2. Local representatives of the agencies are expected to jointly identify geographic areas where:
 - Exchanges of protection will provide the best cost benefit to the involved agencies; and
 - Cooperative efforts, both staffing and funding, is the best cost-conscious, efficient approach.
3. Agency representatives shall exchange fire management plans including fire resource information on available personnel, equipment, and supplies as necessary.
4. Agency representatives may agree to finance jointly, any or all fire management activities on intermingled or adjacent agency lands. One agency may agree to pay the other at a specified rate per acre or other amounts agreed upon in advance for any fire management activities on lands under its jurisdiction.

5. Agencies should mutually monitor fire suppression equipment and supplies stocking levels to assure proper distribution and quantities are on hand to meet the potential needs.
6. An agency is expected to take prompt initial action, with or without request, unless otherwise provided for, on fires of another within zones of mutual interest. Where one agency takes initial action in the suppression of a fire in a zone of mutual interest but in the protective unit of the other, that agency shall continue to fight the fire until relieved by an officer of the other agency.
7. When fires burn on or threaten lands of more than one agency, joint planning will be conducted by local officials to suppress the fire. Should disagreements occur, they will be elevated to the next higher management level.
8. Upon request, any authorized agency shall render assistance in significant non-fire emergencies to another, both within and outside zones of mutual interest, with its regular firefighting personnel and fire suppression facilities, when suitable assistance is available and when such action shall not leave areas in its own protection unit unduly exposed to fire danger, except in cases involving the threat to human life.
9. As provided for in the Reciprocal Fire Protection Act of May 24, 1955 (69 Stat. 66; 42 U.S.C. 185a), the agencies shall not bill each other for the services rendered in the suppression of wildfires. Each agency shall, upon request, forward specific cost information for billings to third parties, for management review and use. Cost for the other fire management activities, including appropriate administrative charges, shall be billed to the requesting agency unless otherwise provided for.
10. Billing for reimbursement of services rendered in response to non-fire emergencies shall be mutually agreed to on a case-by-case basis.
11. Upon request, any authorized agency shall render assistance in fire suppression to another, both within and outside zones of mutual interest, with its regular firefighting personnel and fire suppression facilities, when assistance is available and when such action shall not leave areas in its own protection unit unduly exposed to fire danger.

VII. General Provisions

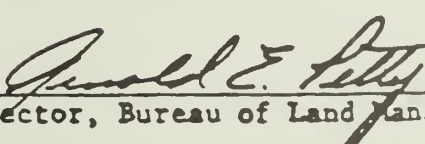
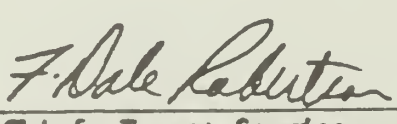
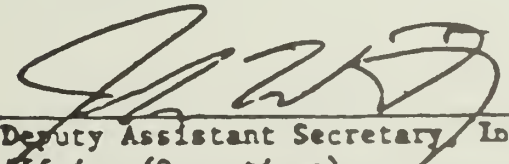
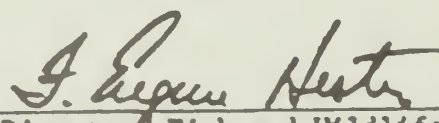
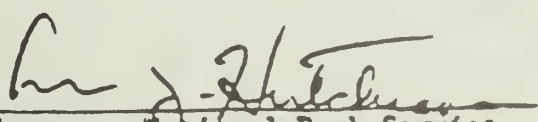
1. Each agency shall make direct settlement from its own funds for all liabilities it incurs under this agreement.

2. Parties to this agreement are not obligated to make expenditures of funds under terms of this agreement unless such funds are appropriated for the purpose by the Congress of the United States, or are otherwise legitimately available. If some extraordinary emergency or unusual circumstance arises which could not be anticipated involving an expenditure in excess of available funds for the protection of life or property, all agencies shall seek deficiency appropriations to meet their respective shares of such emergency obligations.

3. This agreement shall take effect October 1, 1982. Any signatory agency may terminate this agreement by written notice to all other signatory agencies provided that such notice shall be given between the dates of October 31 of any year and March 1 of the following year. The remaining signatory agencies may continue the provision of this agreement.

4. Changes or modifications of this agreement may be initiated by any signatory agency. The changes or modifications shall not be incorporated until all parties agree, they are in the form of an amendment to the agreement, and are signed by all agencies.

5. Each party to this agreement does hereby expressly waive all claims against the other party for compensation for any loss, damage, personal injury or death occurring in consequence of the performance of this agreement.

 Deputy Director, Bureau of Land Management	 Chief, Forest Service
 Deputy Assistant Secretary, Indian Affairs (Operations)	 Director, Fish and Wildlife Service
 Director, National Park Service ALLING	

INTERAGENCY AGREEMENT BETWEEN
SIX RIVERS NATIONAL FOREST AND
REDWOOD NATIONAL PARK

PURPOSE AND AUTHORITY

This agreement between Redwood National Park (Park) and Six Rivers National Forest (Forest) is to supplement the Interagency Agreement between the NPS and USFS of August 17, 1981, to define agency actions for suppression of wildfires threatening the resources of either agency.

ACTIVITIES

Zones of mutual aid will be reviewed annually prior to fire season and equipment and manpower inventories exchanged.

Fires discovered within the Forest will be reported to the Forest Dispatcher in Eureka.

Fires discovered within the Park will be reported to the Park Dispatcher in Crescent City.

When a fire involves both Forest and Park lands, both agencies will cooperate and handle the fire using the Incident Command System. Each agency will designate an Incident Commander. These individuals will jointly lead an ICS Team. Each agency will maintain full command authority within its jurisdiction at all times.

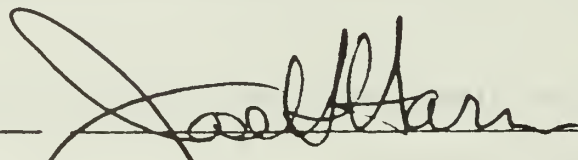
Use of dozers for line construction within the Park shall be approved by an NPS officer.

This agreement shall take effect as of the date of last signature. This agreement shall continue in force and effect until terminated by either agency in writing, provided that notice of termination of agreement shall be given only between the dates of October 31 and March 1 of the following year. The agreement shall be reviewed annually by both agencies and revised if necessary.

Each of the agencies to this agreement do hereby expressly waive all claims against the other party for compensation for any loss, damage, personal injury or death occurring in consequence of the performance of this agreement.

Dec 6, 1982

Date



Forest Supervisor,
Six Rivers National Forest

12/10/82

Date



Park Superintendent,

Redwood National Park



United States Department of the Interior

NATIONAL PARK SERVICE

WESTERN REGION

450 GOLDEN GATE AVENUE, BOX 36063
SAN FRANCISCO, CALIFORNIA 94102

IN REPLY REFER TO:

Y18(WR-RN)

November 25, 1983

Memorandum

To: Superintendents, Death Valley, Grand Canyon, Joshua Tree, Lava Beds, Lassen Volcanic, Pinnacles, Point Reyes, Redwood, Santa Monica Mountains, Sequoia and Kings Canyon, Yosemite
General Superintendent, Golden Gate

From: Associate Regional Director, Resource Management and Planning
Western Region

Subject: Interagency Agreement for the use of prescribed fire

Enclosed find a copy of the approved subject agreement. Any questions with respect to this agreement should be directed to Tom Gavin, Regional Fire Ecologist, at FTS 556-8373. Only those agencies which have approved the agreement are presently participating. However, various other agencies listed may elect to enter into the agreement at a later date.

Enclosure

INTERAGENCY AGREEMENT
FOR
COOPERATIVE USE
OF
PRESCRIBED FIRE
IN
CALIFORNIA

I. Purpose

THIS AGREEMENT is made by and among the agencies signatory for the purpose of establishing guidelines under which two or more agencies may cooperate in projects where such cooperation best serves the public interest and where prescribed burning is mutually beneficial. Each agency agrees to cooperate with each other agency signatory to this agreement under the provisions provided herein.

II. Authority

- A. THE FOREST SERVICE, U.S.D.A., is authorized to enter into this agreement under provisions of the Act of April 24, 1950 (16 U.S.C. 572) and of the Economy Act (31 U.S.C. 686).
- B. THE CALIFORNIA DEPARTMENT OF FORESTRY is authorized to enter into this agreement under provisions of Section 4141 of the Public Resources Code.
- C. THE BUREAU OF LAND MANAGEMENT, U.S.D.I., is authorized to enter into this agreement under provisions of the Act of October 21, 1976 (43 U.S.C. 1737).
- D. THE CALIFORNIA DEPARTMENT OF FISH AND GAME is authorized to enter into this agreement under provisions of _____.
- E. THE NATIONAL PARK SERVICE, U.S.D.I., is authorized to enter into this agreement under provisions of 16 U.S.C. 1 and 31 U.S.C. 686.
- F. THE CALIFORNIA DEPARTMENT OF PARKS AND RECREATION is authorized to enter into this agreement under provisions of _____.
- G. THE BUREAU OF INDIAN AFFAIRS, U.S.D.I., is authorized to enter into this agreement under provisions of _____.
- H. THE CALIFORNIA STATE LAND COMMISSION is authorized to enter into this agreement under provisions of _____.

I. _____

J. _____

K. _____

III. Recitals

WHEREAS: Each agency signatory to this agreement has a management program involving the use of prescribed fire, and

WHEREAS: Agencies managing lands adjacent to lands managed by other agencies often find it beneficial to use prescribed fire which benefits both the agencies and the public, and

WHEREAS: Ridgetops, roads, canyon bottoms and other topographical features often make more logical project boundaries than property lines, and

WHEREAS: Agencies may accrue benefits through cooperation in excess of what they could accomplish if only one agency is involved, and

WHEREAS: Projects can often be accomplished with the most efficient use of public funds if done cooperatively, and

WHEREAS: Qualification standards, planning requirements and training needs can best be determined on an interagency basis, and

WHEREAS: A mechanism for determining costs, benefits, responsibilities and payments is required by all signatory agencies, and

WHEREAS: Each agency signatory needs to retain jurisdictional autonomy while cooperating with others.

THE AGENCIES HEREBY AGREE THAT:

1. Each project undertaken under the terms of this agreement will require an individual Project Agreement which contains the Prescribed Burn Plan. (Format attached hereto as Appendix A.) The Project Agreement, signed by authorized representatives of each agency cooperating on the project, shall briefly summarize the nature of and the reasons for the cooperative project, and shall display the project costs (including administrative costs), project benefits and suppression cost responsibility should an escape be declared a wildfire, and the amounts of each to be assumed by the cooperators.

- a. Prescribed burn projects should be planned and responsibilities, costs and benefits, other than suppression cost responsibility, apportioned so that the project can be conducted with no monetary exchange.
- b. On projects which are mutually beneficial but which cannot be apportioned on a nonmonetary basis, cooperating agencies shall agree upon rates, amounts and billing, and payment or other reimbursement procedures, and shall document such in the Project Agreement. (Agency accounting office addresses should be included, if appropriate.)

2. A Prescribed Burn Plan, approved by the agency representative (or representatives) with authority to approve such plans, will be appended to, and made a part of, the Project Agreement. This Plan will include all standards and specifications for project execution. Execution of the Project Agreement certifies the adequacy of the Burn Plan and signifies that the qualifications of personnel designated in the plan are accepted by the cooperating agencies. Each agency will determine and certify the qualifications of its own personnel for prescribed fire positions.

3. The Burn Boss (or Prescribed Fire Manager, if assigned) shall be designated in compliance with individual agency policy requirements, and is responsible for on-site implementation of the Prescribed Burn Plan.

a. The Burn Boss (or Prescribed Fire Manager, if assigned) shall declare a prescribed fire a wildfire when:

(1) The fire burns outside the area designated for burning in the Burn Plan into an area where reinforced suppression action is required, or

(2) The fire behavior is determined to be such that assigned holding forces will not be adequate to maintain control.

b. The Burn Boss (or Prescribed Fire Manager, if assigned) may declare a prescribed fire a wildfire when the fire behavior is determined to be exceeding the prescription or when designated land management objectives are not being met. Fire behavior exceeding prescriptions, spotfires or slop-overs outside the planned perimeter or other unplanned events which can be resolved with the assigned resources within project cost constraints will ordinarily not be declared a wildfire.

4. The suppression action on prescribed fires which are declared wildfires will be directed by the agency which has protection responsibility for the area, and will be conducted in a manner

consistent with the terms and conditions of existing fire protection agreements, except for suppression cost responsibility, which shall be determined as follows:

- a. Any agency may, upon its own initiative, attack escaped prescribed fires which have been declared wildfires, regardless of protection responsibility when wildfire threatens lands or improvements under its ownership, control or administration.
- b. Wildfire resulting from prescribed fire escapes which were ignited by, or at the direction of, or under the supervision of one of the parties to this agreement, shall be the responsibility of that party, and all suppression costs shall be borne by that party.
- c. Wildfire resulting from prescribed fire escapes which were ignited by, or at the direction of, or under the supervision of two or more parties to this agreement shall be the responsibility of those parties, and all suppression costs will be borne by those parties in accordance with an agreed-upon acceptance or apportionment of those costs in the Project Agreement, except as otherwise provided in Section III, #7 of this agreement.
- d. The responsible party or parties shall reimburse other parties for suppression costs incurred through direct billing, as provided in the particular Project Agreement. All services rendered to one party by another shall be considered to be assistance by hire, regardless of the location of the escape or the location of the final control perimeter.
- e. Entities which incur costs, losses or damages and are not party to this agreement or whose requests for cost recovery or reimbursement fall outside the scope of this agreement may file claims through established claims procedures with the agency identified in Section 4b.

Methods for apportionment of suppression costs may be based upon percent of cost shared, percent of benefits received, percent of project acres, lead agency vs. supporting agency, or amount of potential damage should a wildfire result. Whichever formula is selected, it should be displayed in the Project Agreement in addition to the amounts apportioned.

Where it is determined that the cause of an escape and subsequent wildfire resulting from a cooperative prescribed burn project should be reviewed, cooperating agencies agree to conduct the review jointly. The review team shall consist of representatives from the "lead agency," which will determine the team make-up, and at least one representative from each cooperating agency. (The "lead agency" will normally be the agency which initiated the project, prepared the Burn Plan or provided the supervisory burn personnel.) The selection of the "lead agency" will be documented in the Project Agreement.

- a. Agency representatives may withdraw from a joint review at any time.
 - b. Agencies are not obligated to accept the conclusions of a joint review.
 - c. Individual agencies may conduct independent reviews, with full support and data access provided by cooperating agencies.
7. The parties hereby waive all claims against each other for compensation for any loss, damage, personal injury, or death resulting from the performance of this agreement, and any Project Agreement entered into pursuant hereto unless the result of (1) a tortious act of the other party or its employee(s), or (2) the failure of the other party or its employee(s) to comply with the Prescribed Burn Plan.
8. Insofar as possible, agencies will jointly develop standards and qualifications, and will provide training on an interagency basis where cost-efficient to do so or where such training will further cooperation among the parties.

IV. Standard Provisions

- A. This agreement will be binding on any party from the date of its signature hereto until the agreement is dissolved by mutual agreement of all the parties, or until any party provides a written notice of termination to the other parties, thereby removing itself from the agreement.
- B. This agreement may be changed at any time by mutual written agreement of all the parties.
- C. No member of, or Delegate to, Congress or resident Commissioner shall be admitted to any share or part of this agreement or to any benefit that may arise therefrom, unless it is made with a corporation for its general benefit.
- D. Nothing herein contained shall be construed to obligate any of the parties beyond the extent of available funds allocated or programmed for this work, or contrary to applicable laws, rules, regulations or policy.

IN WITNESS WHEREOF, the parties have executed this agreement in multiple counterparts by their duly authorized officials on the respective dates written below.

AUG 16 1983

(Date)

U.S.D.A., FOREST SERVICE

By:

Lester May Jr.

for Regional Forester

CALIFORNIA DEPARTMENT OF FORESTRY

By: _____

Title Director

(Date)

U.S.D.I., BUREAU OF LAND MANAGAEMENT

By: _____

Title State Director

9/20/83
(Date)

CALIFORNIA DEPARTMENT OF FISH AND GAME

By: _____

Title _____

(Date)

U.S.D.I., NATIONAL PARK SERVICE

By: _____

Title Howard H. Chapman
Regional Director, Western Region

9/26/83
(Date)

CALIFORNIA DEPARTMENT OF PARKS & RECREATION

By: _____

Title _____

(Date)

U.S.D.I., BUREAU OF INDIAN AFFAIRS

By: _____

Title _____

(Date)

CALIFORNIA STATE LANDS COMMISSION

By: _____

Title _____

(Date)

By: _____

Title _____

(Date)

By: _____

Title _____

(Date)

By: _____

Title _____

(Date)

By: _____

Title _____

(Date)

(Date)

By: _____
Title _____

(Date)

By: _____
Title _____

PROJECT AGREEMENT
FOR
PRESCRIBED BURNING

HIS AGREEMENT, entered into in conformance with the provisions contained in the 1983 INTERAGENCY AGREEMENT FOR COOPERATIVE USE OF PRESCRIBED FIRE IN CALIFORNIA, is made by and _____ the:
(between/among)

_____ (hereinafter referred to as _____)

_____ (hereinafter referred to as _____)

_____ (hereinafter referred to as _____)

_____ (hereinafter referred to as _____)

for the purpose of cooperatively executing the _____ Prescribed Burn Project,
located in _____,
_____, State of California.

1. The attached Prescribed Burn Plan for the _____
Project, prepared by _____, establishes the standards to be
met and will govern project execution. The Prescribed Fire Plan is
appended hereto and is accepted by all parties as a part of this
agreement.
2. This project is a cooperative effort because _____

3. Costs and benefits are apportioned as follows:

4. Reimbursements and/or payments will be made as follows:

5. Suppression cost responsibility is assigned as follows:

6. Should an escaped fire review be necessary, the _____
_____ is hereby designated as "lead agency"

IN WITNESS WHEREOF, the parties have signed this agreement by their authorized representatives and this agreement is in effect as of the last date written below:

(Date)

By: _____

(Date)

By: _____

(Date)

By: _____

(Date)

By: _____

(Date)

By: _____

(Date)

By: _____

March 1983

NATIONAL AGREEMENT
FOR
METEOROLOGICAL SERVICES
IN SUPPORT OF
AGENCIES WITH
LAND MANAGEMENT AND FIRE PROTECTION RESPONSIBILITIES

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I. INTRODUCTION

This National Agreement is between the National Weather Service (NWS) and agencies with land management and fire management responsibilities signatory to this agreement. They are referred to in this agreement as "NWS" and "USER AGENCIES," respectively.

The User Agencies are responsible for the maintenance, improvements, and protection of the wildlands of, owned or held in trust by, the United States. Accurate and timely weather information is required to manage effectively and efficiently this valuable national resource. The NWS has the expertise, organization, and legal charter to satisfy this need nationally. It is with this knowledge that this Agreement is entered into. Its purpose is to combine resources so as to best serve the needs of the public and to fulfill the obligations of the respective agencies.

II. AUTHORITY

This agreement is authorized under the Economy Act, 31 U.S.C. 685; 15 U.S.C. 313; and 49 U.S.C. 1463; and the Cooperative Forestry Assistance Act 16 U.S.C. 210i, et. sec.

III. OBJECTIVES

The objectives of this Agreement are to identify meteorological services to be provided, establish the interagency relationships, and define financial and other obligations of the NWS and User Agencies.

IV. RESPONSIBILITIES

A. National Weather Service

1. Basic meteorological services will be provided during normal working hours in accordance with Operating Plans for designated NWS offices to the extent of NWS fire weather resources. NWS regional headquarters will identify to the User Agency headquarters a list of the designated NWS fire weather offices on an annual basis. These services will be made available without cost and may include:

- a. Routine daily fire weather forecasts
- b. Outlooks and discussions
- c. Weather observations
- d. Red flag forecasts
- e. Spot forecasts
- f. Prescribed burn forecasts
- g. Smoke management forecasts and information

h. Consultation and technical advice

i. Amendments/updates.

2. Fire weather training

The NWS recognizes the need for training in fire weather meteorology for NWS forecasters. To the extent of available resources, the NWS will meet this need.

3. Special meteorological services

These services will be provided by designated NWS offices on a reimbursable basis as stated in Section IV B.

a. Weather observer training

b. Weather observation station visitations

c. Participation in User Agency training activities

(1) Course development carried out at User Agency facilities

(2) Classroom training

d. On-site meteorological service

e. Other special services.

B. User Agencies

The following services and resources will be provided by User Agencies:

1. Fire-management computer systems

Where existing fire management computer systems are locally available, access to the systems will be provided.

2. Fire weather observations

a. Provide daily surface weather observations and enter data into fire-management computer systems.

b. Provide all equipment, equipment maintenance, and inspection of weather-observing sites.

c. Meet all travel and per diem costs associated with User Agencies' requests for visits of NWS personnel to weather-observing sites,

d. Provide for collection of remote automatic weather systems data and entry into the fire-management computer system.

- e. Provide observations for site-specific and other special forecasts.

3. On-site meteorological support

- a. Meet costs directly associated with on-site meteorological support by NWS personnel. This includes costs incurred by the backup NWS office.
- b. Provide logistical and weather observation support to NWS personnel at on-site operations.
- c. Provide access to telecommunication services where available.

4. Training

- a. Meet per diem and travel costs for NWS personnel participating in the conduct of User Agency training.
- b. Provide technical assistance, instruction, and supporting material for NWS-sponsored fire weather training sessions.

5. Other special services

User Agencies will provide logistics support and meet all overtime, travel, and per diem costs of NWS personnel associated with the provision of all other special services.

C. Joint Responsibilities

NWS and User Agencies shall prepare an annual Operating Plan for individual fire weather office areas of responsibility. This plan will identify the basic weather services covered under Section IV.

V. PROCEDURES FOR REQUESTING SERVICES

Procedures for ordering services will be specified in Operating Plans for each NWS fire weather office.

VI. BILLING PROCEDURES

Costs to be recovered from User Agencies will be calculated on the basis of expense reports submitted to NWS regional headquarters by field personnel. Copies of expense reports will be forwarded to appropriate User Agencies by NWS regional headquarters. This procedure will enable agencies to accurately determine costs to be reimbursed during a given fiscal year. Billing of User Agencies will be accomplished by NWS regional submission of appropriate expense reports to the NOAA Reimbursables Division. Bills will include a statement of service rendered, dates it was provided, and location where provided.

All questions relating to billing procedures, charges, current costs, and individual expense reports should be directed to the appropriate NWS regional contact or the NWS Technical Monitor.

VII. AMENDMENTS

Upon written notice, the terms of this Agreement are subject to amendment at any time by mutual agreement of the parties.

The signatory agencies agree to consider expansion of this Agreement to cover areas of mutual concern, e.g., changing technology and improved procedures, as opportunities for such cooperation become available.

VIII. TERMS OF NATIONAL AGREEMENT

- A. The terms of this Agreement shall become effective upon execution by NWS and any or all User Agencies and shall remain in effect until such times as the Agreement is terminated by mutual agreement. Any agency may withdraw at any time by ninety (90) days written notice to all parties.
- B. This Agreement does not constitute a financial obligation for any party in excess of appropriations authorized by law and administratively allocated for the purposes intended.

IX. TECHNICAL MONITOR FOR NWS

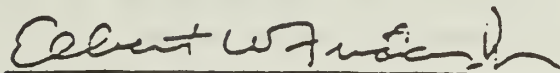
The NWS Technical Monitor for this Agreement shall be:

Fire Weather Program Leader (W/DM14x2)
National Weather Service
8060 13th Street
Silver Spring, Maryland 20910

X.

SIGNATORY PAGE

A. National Weather Service

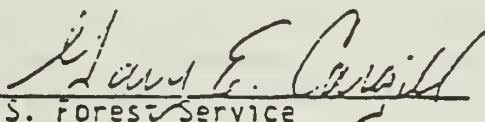


National Weather Service U

Date: 5/5/83

B. User Agencies

DEPARTMENT OF AGRICULTURE



U.S. Forest Service

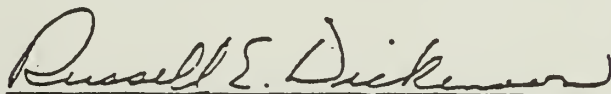
Date: MAY 20 1983

DEPARTMENT OF INTERIOR



Bureau of Land Management

Date: MAY 27 1983



National Park Service

Date: 6-8-83



Bureau of Indian Affairs

Date: 6-29-83

Acting Deputy Assistant Secretary (Operations)

 Demit

U. S. Fish and Wildlife Service

Date: 6-22-83

APPENDIX

DEFINITIONS

When the following terms are used in this Agreement or in an Operating Plan, such terms will have the meanings stated below.

A. Fire Weather Office Operating Plan

A procedural guide which describes the services provided within the area of a fire weather office's responsibility.

B. Basic Meteorological Services

Basic meteorological services are those state-of-the-science meteorological forecasts, warnings, observations, and statements produced in a designated NWS fire weather office during normal working hours.

C. Fire Weather District

A fire weather district is the area of routine service responsibility as defined by the NWS. This area is usually defined by climatological factors, but may be modified somewhat to the administrative boundaries of the User Agencies.

D. Normal Working Hours

Normal working hours are defined in the Operating Plan, but usually cover 8-hour workdays, Monday through Friday, except during fire season when the normal hours cover 7 days a week.

E. Prescribed Fire

Prescribed fire is a fire burning in wildland fuels according to a planned prescription and confined within planned boundaries for the purpose of achieving specific objectives of resource management. (Prescribed burning is the practice of prescribed fire use.)

F. Red Flag

Red flag is a program which highlights the onset of critical weather conditions conducive to extensive wildfire occurrences.

G. Special Meteorological Services

Meteorological services uniquely required by User Agencies which cannot be provided at a designated NWS fire weather office during normal working hours:

H. Spot Forecasts

Spot forecasts are site-specific weather forecasts. They are issued upon request of User Agencies for wildfires, prescribed burns, or special projects.

I. On Site

That special service which dedicates a fire weather forecaster to a wildfire, prescribed fire, or special project such that the fire weather forecaster is removed from providing basic services at his/her assigned fire weather office.

MEMORANDUM OF AGREEMENT

This agreement made and entered into by and between the National Park Service (Redwood National Park) hereinafter called Park Service and the Klamath Fire District #5, hereinafter called Klamath District, concerning the use of personnel and equipment for fire fighting purposes.

Whereas both the Park Service and the Klamath District have the responsibility of preventing and suppressing fires in the Klamath Fire District #5 and adjoining residences; and

Whereas Park Service is authorized to render cooperative fire fighting assistance to nearby fire prevention agencies under Title 16, United States Code, Section 1b. (1).

Now, therefore, it is mutually agreed as follows:

1. Each organization will take complete and independent action to suppress fires for which it is responsible. Under certain circumstances however it may be necessary or desirable for both agencies to cooperate in the fire control effort. Either agency may, upon its own initiative, respond to a fire in the area for the purpose of suppression regardless of its location, provided however the organization responsible for fire suppression in that location shall be in charge of all suppression efforts if there is present and available a member of the responsible organization competent to assume command.
2. No reimbursement shall be made for any suppression efforts in any respects including wages, fees, transportation, or the use of any equipment during the period of suppression.

3. Park Service and the Klamath District agree to waive all claims against each other for compensation for any loss, damage, personal injury, or death occurring in consequence of the performance of this agreement.

4. No member of, or delegate to Congress, or resident commissioner, shall be admitted to any share or part of the Memorandum of Understanding or to any benefit to arise therefrom, unless it is made with a corporation for its general benefit.

5. During performance of this Agreement, the cooperators agree to abide by the terms of Executive Order 11246 on nondiscrimination and will not discriminate against any person because of race, color, religion, sex or national origin. The cooperators will take affirmative action to ensure that applicants are employed without regard to their race, color, religion, sex or national origin.

6. This agreement shall be in effect from the date of signature of responsible officers of the organizations and remain in effect until December 31, 1986. At or before this time, the organizations should reassess the benefits that have occurred and determine if the agreement will be reaffirmed.

7. This agreement shall be voided 60 days following a notice to terminate the agreement by either Park Service or Klamath District representatives.

Approved:

Klamath Fire District #5

BY W. Fox Kenneth
TITLE Sec. Head of CFM
DATE 5-21-83

National Park Service
Redwood National Park

BY Douglas Warnock
TITLE Superintendent
DATE May 12, 1983

COOPERATIVE AGREEMENT

This agreement made and entered into by and between the National Park Service (Redwood National Park) hereinafter called Park Service and the Orick Community Services District/Orick Volunteer Fire Department, hereinafter called Orick District, concerning the use of personnel and equipment for fire fighting purposes.

Whereas both the Park Service and the Orick District have the responsibility of preventing and suppressing fires in the Orick Community Services District and adjoining residences; and

Whereas Park Service is authorized to render cooperative fire fighting assistance to nearby fire prevention agencies under Title 16, United States Code, Section 1b.(1).

Now, therefore, it is mutually agreed as follows:

1. Each organization will take complete and independent action to suppress fires for which it is responsible. Under certain circumstances however it may be necessary or desirable for both agencies to cooperate in the fire control effort. Either agency may, upon its own initiative, respond to a fire in the area for the purpose of suppression regardless of its location, provided however the organization responsible for fire suppression in that location shall be in charge of all suppression efforts if there is present and available a member of the responsible organization competent to assume command.
2. No reimbursement shall be made for any suppression efforts in any respects including wages, fees, transportation, or the use of any equipment during the first twelve hour period of suppression.
3. Park Service and the Orick District agree to waive all claims against each other for compensation for any loss, damage, personal injury, or death occurring in consequence of the performance of this agreement.
4. No member of, or delegate to Congress, or resident commissioner, shall be admitted to any share or part of the Memorandum of Understanding or to any benefit to arise therefrom, unless it is made with a corporation for its general benefit.
5. During performance of this Agreement, the cooperators agree to abide by the terms of Executive Order 11246 on nondiscrimination and will not discriminate against any person because of race, color, religion, sex or national origin. The cooperators will take affirmative action to ensure that applicants are employed without regard to their race, color, religion, sex or national origin.
6. This agreement shall be in effect from the date of signature of responsible officers of the organizations and remain in effect until July 31, 1984. At or before this time, the organizations should reassess the benefits that have accrued and determine if the agreement will be reaffirmed.

7. This agreement shall be voided 60 days following a notice to terminate the agreement, by either Park Service or Orick District representatives.

Approved:

Orick Volunteer Fire Department

BY Dale R. Rocha Jr

TITLE Fire Chief

DATE 9/17/79

National Park Service
Redwood National Park

BY Robert D. Barlow

TITLE Superintendent

DATE 9/17/79

Orick Community Service District

BY Joseph H. Hafford

TITLE Chairman

DATE 9/12/79

APPENDIX K

FIRE-RELATED FUNDING REQUESTS

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICEPAGE ____ OF ____
FOR THIS PACKAGE

DEVELOPMENT/STUDY PACKAGE PROPOSAL

PACKAGE NO. 0520
REVISION NO.

ORG. NO. 8480	PARK (OR OTHER ORIGINATOR) Redwood National Park	DEVELOPED AREA (NAME) Park General	D.A. CODE --	REGION WRO
STATE California	STATE CODE CA	COUNTY(S) Humboldt, Del Norte	CONGRESSIONAL DISTRICT 02	
PACKAGE TITLE MAP AND DESCRIBE EFFECTS OF HISTORIC FIRES		STUDY PACKAGE NEW CONSTRUCTION B <input checked="" type="checkbox"/> REHABILITATION A <input type="checkbox"/>	NEW PACKAGE <input checked="" type="checkbox"/> REVISION <input type="checkbox"/>	
CRITERIA (INSERT X'S) 2 2 0		PARK PRIORITY 15	DATE	REG. N. PRIORITY DATE
PROGRAM THRUST, STATUS AND OTHER INFORMATION				
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32				
WILL ADDITIONAL OPERATING FUNDS AND POSITIONS BE NEEDED UPON COMPLETION OF THIS PACKAGE? (IF YES EXPLAIN NEEDS IN SECTION XI OUTLINE OF PLANNING AND MANAGEMENT REQUIREMENTS)				
YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>				

FULL PACKAGE DESCRIPTION

FY1 & FY2 Areal distribution and chronologies of past fires will be mapped on the basis of fire scars, age classes of post-fire vegetation and historical documentation. Sources of ignition and fire intensity and effects (stand-destroying crown fires, light ground fires, etc.) will be determined where possible. Native Americans and descendants of early settlers will be interviewed to determine historical use of fire.

FY3 The information will be contrasted with unburned stands and the results of experimental prescribed fires. Results will be used in evaluation of park fire management policies and to revise and update the park fire management plan.

PACKAGE JUSTIFICATION CONSEQUENCES

- Management Problem: Previous park policies of total fire exclusion do not meet resource management objectives of perpetuating natural systems. The transition from total suppression of fire to the use of prescribed natural fires and prescribed burning requires a reasonable understanding of the past influence of fire on the area. The historical role of fire (frequency and post-fire vegetation succession) at Redwood National Park is only sketchily known for some redwood and oak woodland stands. No data exists for much of the park.
- Management Needs: The information gathered on fire frequency distribution and effects will be contrasted with unburned areas and the results of experimental prescribed fires. Results will be used in evaluation of park fire management policies and to revise and update the park fire management plan.

PLANNING AND MANAGEMENT REQUIREMENTS (Follow instructions and outline provided in Program Formulation Guideline)

- Available Information: limited information on fire history is known for some park redwood and oak woodland stands. No information is known for any of the other major park vegetation types.
- Project Type: A. Research - project type 78
- Mandated Project? No

(continued on reverse)

ORIGINATOR (Signature and Title) Donald W. Nelson ch. Res. Mgt.	DATE 3/28/84	CONCURRENCE (Signature and Title) Douglas Conner	DATE 3/28/84
APPROVAL (Signature of Regional Director or Equivalent Official)		DATE	

Park Resources: The park was created to preserve and protect significant examples of redwood forests and associated vegetation types. Fire is a natural part of the ecosystem and should be considered in management considerations.

Immediacy: Redwood National Park is presently revising its fire management plan to include small scale experimental use of prescribed natural fires and prescribed burning. A better understanding of the historical role of fire is important to have before long-range decisions can be made.

Magnitude: Fires within the 78,000 acres of National Park lands will be mapped. Adjacent State Park lands will be mapped where specific fires crossed ownership boundaries.

Health/Safety: The project is not related to human health or safety.

Scope of Contribution: Information gathered in this project will be used to refine Redwood National Park's fire management policies. This information could also be used by the three State Parks with Redwood National Park's boundaries in development and refinement of their fire management policies.

Data Collection: Areal distribution and chronologies of past fires will be mapped on a minimum of 1:24000 scale 7.5 minute topographic maps. Post-fire vegetation will be sampled and the data computer analyzed and stored.

Cost/Staffing Estimates

Cost: \$54,000 estimated total. FY1 - \$22,000; FY2 - \$22,000; FY3 \$10,000

Funding/Staffing Commitments: Park will commit existing technical expertise and supervision. Work would be accomplished through extension of LFT NTE 4-year term staff or as graduate student thesis/dissertation projects.

Other Funding Sources: None

Benefits of Immediate Funding: Park staff (4-year term) are now available to do the work.

Contact: Donald W. Reeser, Chief, Resource Management (707-822-7611)

APPENDIX L

COMMENT AND RESPONSE ON DRAFT PLAN

DEPARTMENT OF FORESTRY

118 Fortuna Blvd.
Fortuna, CA 95540
Telephone: (707) 725-4413



March 27, 1985

Douglas G. Warnock, Superintendent
Redwood National Park
791 Eighth Street, Fourth Floor, Suite O
Arcata, CA 95521

Attn: Donald Spalding, Assistant Superintendent

Dear Mr. Spalding:

Thank you for the opportunity of commenting on the Redwood National Park Draft Fire Management Plan. It is a comprehensive document and is quite informative and useful to CDF in that parts of it can be extrapolated to neighboring private land.

I am sending you my comments and at the same time forwarding the Draft to our Region I Headquarters for review. Any comments they may make will not meet your March 29 deadline but may be useful to you anyway.

My comments are:

Page 39, item E.1.a

We too fly special supplemental detection flights during and after lightning activity and other high fire danger periods. Since NPS is a subscriber to the cooperative air patrol, that aircraft will pay special low-level attention to RNP during these flights. As an operational matter it will be essential that your flyers and ours are coordinated with each other.

Page 40, item a

You may wish to incorporate the 911 Emergency Telephone Number System which will become operational in Humboldt County in the fall of 1985.

Page 41, item 2c

Under CDF policy the EOC Officer (Dispatcher), who is a Fire Captain, is Incident Commander until the arrival of the first qualified individual on the ground. The Air Tanker Coordinator, also a Fire Captain or Battalion Chief, assumes the I.C. role if he/she arrives before any ground units. Not everyone in CDF is qualified to be an initial attack I.C. and I presume the same is true in NPS. We would be most happy to have one of your fire-qualified people take over until arrival as long as they are in radio communication with us, either directly or through your radio operator. It might be useful to specify the classes of NPS employees to whom you have delegated that authority.

Page 42, Fire Management Unit #1

Item 1,d. states that bulldozers will not be used on grasslands in this unit. Containment of fire in this area, by initial attack forces, would not be possible without the use of bulldozers, under conditions which do exist there at times. The assembled fire agencies in the area (USFS, CDF, NPS) cannot muster enough other forces, during the first few hours of initial attack, to offset the inability to use bulldozers. Thus the arbitrary exclusion of bulldozers from all fires in grasslands may present a threat to adjacent state and private lands.

A more acceptable policy would be one which permits on-scene decisions by the Incident Commander whether to use bulldozers or not.

Page 53, Fire Management Unit #9

(See also comments on FMU #13 which are applicable to FMU #9.)
The Flint Ridge unit borders private land. While the historical frequency of lightning-caused fire there is low, a fire in certain parts of the unit during certain weather conditions would be a clear threat to non-park lands.

A fire which is allowed to become well established within the limits of the prescription can be a long-lasting fire (perhaps several weeks). Periodically conditions in this area are conducive to large damaging fires, as your fire history investigation has disclosed. A deep seated, well established fire which has been under prescription will not be readily extinguished or even contained when conditions go out of prescription.

Page 57, Fire Management Unit 13

This portion of the plan attracts our most significant concern. Following are comments from our Redwood Creek District Ranger who is quite familiar with the area.

A. Fire Suppression Policy

1. No fuelbreaks--dozer, hand line, or natural barriers--are identified to contain the uninhibited spread of fire. Past history has shown that ground fire spread in Unit #13 will continue until receipt of about four (4) inches of rain. Fires will continue to spot from dead snags to dead snags in any weather and during any time of the year. Ground fires will develop with the spread of crown fires until the unit receives approximately four inches of rain. A fire in this unit should be considered to be out of control from the outset.

2. Fire Unit #13 shares a common boundary (at the southeast corner) with private timber companies. Logging haul roads and National Park access roads are present at this location but are not adequate to constitute a fire control line or fuelbreak. No authority exists to let a fire encroach on private lands at this or any other location.

A. Fire Suppression Policy (continued)

3. At the northeast boundary, the fire can be expected to spread to Unit 12, a no-burn unit. A tree-to-tree crown spread at the ridge line will spot into Lost Man Creek drainage, creating an uncontrolled situation.

4. Fireline safety is understated in Fuel Model "G" because slow intense fires will undermine windfalls and other forest debris. It is not practical to think that a simple fire control line could be constructed at will without the threat of serious injury.

5. Fires in old growth redwood are dangerous to observe up close and even more dangerous to control. Live tree tops and slabs break off when rotten wood, within the live tree, is burned away, falling to the ground without warning. Fires in cat faces cause sound-looking trees to break in half and fall to the ground without warning. The falling trees create a safety hazard more dangerous than the spread of the fire.

B. Prescribed Natural Fire Prescription (pages 121-122)

1. The generalized prescription as stated is not a site-specific one, but is a broad open window to let-burn. Temperatures and relative humidities stated are at extremes for this area, suggesting uncontrolled fire. Realistic temperature peak is 70° and the minimum relative humidity suggested is 40°.

2. Fuel moistures (10-hour and 100-hour) are too low for this geographical area. 100 hour fuels with less than 17% fuel moisture are going to burn with enough intensity to completely consume themselves.

3. No mention is made of the time of year that the "prescribed natural fire zone" will be allowed to exist. CDF experience in heavy fuel, redwood slash and old growth timber fires has been one of 7 days to control, the next 6 weeks of daily perimeter mop up and control by engine crews, followed by daily vehicle and aircraft patrol up to the fall rains.

4. I feel the elevation change of 50' through 2,250' is too great to make generalizations. No mention is made of predictable updrafts throughout the drainage; i.e., of Little Lost Man Creek versus ridgetops. The coastal influence and fog line should be mentioned for the fact of erratic winds and sudden changes in humidity.


B. Prescribed Natural Fire Prescription (continued)

5. The prescribed natural fire plan states lightning as the instrument to start the burn but does not recognize the increase in 1 hour, 10 hour, and 100 hour fuel moistures from a wet storm. Redwood National Park will find the fire out of prescription during a wet storm and in prescription at a later date. To accommodate the goal as stated (P-58) "Management Guideline Number 6," modifications will have to be made in the fuel moisture values.

Again, thank you for the opportunity of commenting. Our comments are founded in our concern for the state and private lands adjacent to the park, and in our wish for your success in meeting your fire and resource management needs. We hope they have been constructive comments.

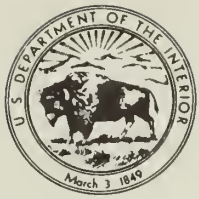
My staff is available to you if there is anything we can do to help.

Sincerely,



William T. Imboden
Ranger-In-Charge

WII:ms



United States Department of the Interior

NATIONAL PARK SERVICE

REDWOOD NATIONAL PARK

1111 SECOND STREET

CRESCENT CITY, CALIFORNIA 95531

IN REPLY REFER TO:

Y14

July 23, 1985

Mr. William T. Imboden
Ranger-In-Charge
California Department of Forestry
118 Fortuna Blvd.
Fortuna, California 95540

Dear Mr. Imboden:

Thank you for your comments on Redwood National Park's Draft Fire Management Plan. We have reviewed and discussed them and offer the following response.

Page 1. Cooperative Air Patrol. We have modified our plan to indicate our supplemental patrols during high fire danger and after lightning are ground, not air, patrols. We will continue to subscribe to the cooperative air patrol.

Page 1. 911 Emergency Telephone Number. We have modified our plan to include reference to the 911 system. However, even with the 911 system, we wish to stress that fires in the park must be reported immediately to park headquarters in Crescent City.

Page 1. Incident Commander. For most in-park fires, we believe the plan clearly states our District Rangers will serve as Incident Commanders. We have changed the plan with respect to mutual aid fires outside the park. On those, dispatched park personnel will provide whatever assistance is requested until relieved by the agency in charge. Our employees generally would not be the Incident Commander on fires outside the park.

Page 2. Use of bulldozers. Due to the erodible nature of our prairies and large number of cultural resources concentrated on them, we will not permit the use of bulldozers on the park's grasslands. Currently, CDF response cards provide specific instructions on the use of bulldozers in the second-growth stands adjacent to the prairies where grassland fires may spread. Generally, use of bulldozers outside the prairies is only permitted with the on-site approval of park staff.

Page 2. Flint Ridge Area. Of all the areas within RNP for a prescribed fire implementation and a prescribed natural fire program, Flint Ridge is the most secure and risk-free site. A two-lane road defines the complete triangle; in addition, the proximity of the ocean and Klamath River not only are perfect barriers, they provide high humidity most days during the fire season. We see a prescribed fire or a natural fire being allowed to run its course here without total suppression; however, we recognize that it is the nature of fire

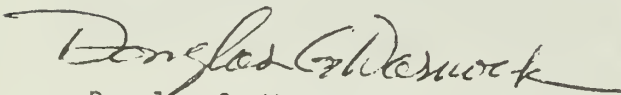
in old-growth redwood to persist in spots for several weeks or months. Should the fire become of such a size to prevent suppression in the onset of adverse conditions, we would begin containment of specific flanks or areas.

Page 2. Little Lost Man Creek. We recognize that this unit poses more difficult problems for prescribed natural fires. However, with important caveats, NPS policy mandates that Research Natural Areas be managed to preserve and protect their ecological processes without any indirect or direct modification. One of those caveats is that within Research Natural Areas fire will not normally be controlled unless the fire exceeds the prescription for prescribed natural fires, threatens adjacent areas, if adequate control forces are not available, or if the fire was man caused. Our Incident Commanders are well aware of the constraints imposed by Research Natural Area status and the concerns of CDF and nearby landowners. We will be meeting with your staff on-the-ground to discuss specific problems and solutions in Little Lost Man Creek.

Page 3. Fire Prescription. We also recognize the broad nature of the Prescribed Natural Fire Prescription contained in the plan. However, the current and mutual lack of experience with natural fire in old-growth redwood makes it difficult for us to propose more stringent guidelines. As prescribed management and prescribed natural fires occur both in Redwood National Park and in nearby State Parks, we expect to be able to refine our prescription significantly. We also view this initial prescription as a guideline for our Incident Commander who would be authorized to initiate containment or suppression if site conditions warrant, whether or not the prescription was being exceeded.

Thank you again for your review and comments on our Draft Fire Plan. Our next step will be to incorporate the above changes, along with other minor corrections in the text, and prepare and distribute the final fire management plan.

Sincerely,

A handwritten signature in dark ink, reading "Douglas G. Warnock". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Douglas G. Warnock
Superintendent

3 1604 004 719 292

[illegible]

Demco, Inc 38-293

