

2. FIRE MANAGEMENT STRATEGIES

2.1 FIRE MANAGEMENT GOALS

As part of the NEPA process for the FMP, PRNS staff developed goals for the overall fire management program based on guidance from Federal Wildland Fire Management Policy, NPS Management Policies, Directors Orders, and other fire-related guidance documents in conjunction with public input from meetings and workshops. In the listing below, elements of the adopted FMP alternative are paired with the seven FMP goals to demonstrate how the selected alternative will help the park achieve the goals of the FMP.

Goal 1: Protect firefighters and the public.

- √ Because of the potential for risk to public and staff safety from an uncontrolled wildland fire at PRNS, the policy at PRNS is full suppression of all wildland fires, precluding the option of wildland fire use.
- √ Fuel reduction projects will focus on reducing fuel loading in strategic areas where the PORE fire management units fall within the Seashore's wildland urban interface boundary by 25% (NPS 2003c).
- √ Each spring, the fire management staff will conduct an assessment of the condition of roads and trails that serve as emergency evacuation routes. Fire staff will ensure that routes needing roadside vegetation reduction or overhead clearance will be treated prior to the fire season.

Goal 2: Protect private and public property.

- √ The fire management officer and staff will work cooperatively with fire agencies and other land managers to develop and maintain zones of reduced fuels in high priority areas to slow the rate of spread of a wildland fire.
- √ The fire management staff will maintain defensible space adequate to protect park structures, infrastructure and employee housing. Defensible space will either conform to or exceed the requirements of California Public Resource Code (PL-4290 and 4291).

Goal 3: Maintain or improve conditions of natural resources and protect these resources from adverse impacts of wildland fire and fire management practices.

- √ PRNS will suppress all wildland fires that occur in the park employing Minimum Impact Suppression Techniques to the greatest extent feasible to minimize impacts to natural resources while providing for public and firefighter safety and wildland fire control. The MIST Guidelines are in Appendix E, Section 9.
- √ Fire hazard reduction projects will incorporate natural resource protection and rehabilitation objectives especially to increase cover and improve habitat for native species.

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- √ Prescribed fire and non-fire treatments will be used to control non-native invasive species including, but not limited to, French broom, Scotch broom and eucalyptus.
 - √ Prescribed fire and non-fire treatments will be used to increase the abundance and distribution of T & E species.
- Goal 4: Maintain or improve conditions of cultural resources and maximize efforts to protect cultural resources from adverse effects of wildland fire and fire management practices.
- √ Prescribed burning and non-fire treatments will be used to protect cultural resources and restore or maintain cultural landscapes and viewsheds.
 - √ Adequate defensible space will be established and maintained to protect historic structures.
 - √ Use of MIST to the greatest extent feasible will minimize impacts to both cultural and natural resources by avoiding unnecessary ground disturbance to known or suspected locations of sensitive resources. The MIST Guidelines are in Appendix E, Section 9.
- Goal 5: Foster and maintain effective community and interagency fire management partnerships.
- √ PRNS staff will participate in the National Fire Plan working cooperatively with other local fire agencies, jurisdictions, land managers and homeowners to help them to secure federal funding and meet federal compliance requirements.
 - √ PRNS will continue to participate with the Marin County Fire Department on the development and implementation of the Community Wildfire Protection Plan (CWPP).
 - √ The NPS will work cooperatively with the Marin Municipal Water District to create a zone of reduced fuels along the shared boundary on Bolinas Ridge. (MMWD 1995).
 - √ The NPS will regularly attend the meetings and participate in relevant planning and projects of FireSafe Marin and its members.
- Goal 6: Foster a high degree of understanding of fire and fuels management among park employees, neighbors, and visitors.
- √ PRNS will implement a comprehensive public information and education program to address fire safety and prevention, fuels management, the role of fire in the ecosystem, prehistoric and historic fire history in Marin, and fire research programs and opportunities.
 - √ Fire management facilities, offices and equipment will be moved to the main administration area in order to decrease response time and facilitate communication between park fire staff and staff from the other divisions.

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Goal 7: Improve knowledge and understanding of fire through research and monitoring and continue to refine fire management practices.

- √ Research and monitoring efforts will address the comparative effectiveness of various fuels treatments and their effects on the environment.
- √ Research results will be used to adaptively guide the fire management program by using results and trends to continually fine tune project objectives to achieve the maximum resource benefit.
- √ Research topics will include the fire history of PRNS, the effects of fire on abiotic and biotic resources, effects of fire on rare native plant and animal species, methods for controlling non-native plants using prescribed fire and methods for restoring native grasslands using prescribed fire (NPS 1999).

2.2 GENERAL MANAGEMENT CONSIDERATIONS

2.2.1 Legal Considerations

The NPS is constrained from implementing fire management actions that do not comply with relevant federal laws, regulations, or policies. These include NPS Organic Act, legislation establishing PRNS and GGNRA, NPS Management Policies (revised in 2000), Director's Orders 12 (regulations for implementing the National Environmental Policy Act), Director's Order 18 (regulations for Fire Management Programs), and the PRNS and GGNRA General Management Plan, and guidance from adopted PRNS planning and policy documents.

Enabling Legislation. Congress established PRNS on September 13, 1962 “to save and preserve, for purposes of public recreation, benefit and inspiration, a portion of the diminishing seashore of the United States that remains undeveloped (Public Law 87-657).” An amendment to Public Law 94-544 (passed in 1976) instructs the NPS to administer the Seashore without impairment of its natural values.

Congress established GGNRA by Public Law 92-589 “in order to preserve for public use and enjoyment certain areas of Marin and San Francisco Counties, California (San Mateo County added by P.L. #96-607).” In addition to providing for recreation and educational opportunities consistent with sound principles of land use planning and management, the NPS was also instructed to “preserve the recreation area, as far as possible, in its natural setting, and protect it from development and uses which would destroy the scenic beauty and natural character of the area.”

Wilderness Act (16 USC 1133) applies to all work that could directly or indirectly affect the areas of the park that are currently or are proposed as wilderness. All actions undertaken in the wilderness, including suppression of wildfires and other aspects of fire management, must conform to the “minimum requirement” concept, and be conducted in such a way as to protect natural and cultural resources (NPS, 2000, Sec. 6.3.9).

The minimum requirement concept is a two-step documented process that is used to determine:

1. Whether the proposed action is appropriate or necessary to administer the area as wilderness and does not pose a significant impact to wilderness resources and character, and

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2. Which techniques or types of equipment should be used to ensure minimum impact to wilderness resources and character (NPS, 2000, Sec. 6.3.5).

Endangered Species Act as amended (PL 93-205, 87 Stat. 884, 16 USC §1531 et seq.) protects threatened and endangered species from unauthorized take and directs federal agencies to ensure



California red-legged frog
by Marc Jennings

that their actions do not jeopardize the continued existence of such species. There are currently 1,300 species that found entirely or in part in the USA and its water that are listed or proposed for listing as threatened or endangered under the Endangered Species Act (ESA). In the FMP planning area, there are 22 animal and 19 plant species listed under the ESA. The National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) share responsibility for implementing the ESA. Generally, USFWS manages land and freshwater species, while NMFS manages marine and "anadromous"¹ species. During the FMP NEPA process, the NPS completed formal consultations with the FWS and NMFS as required by Section 7 of the ESA. All measures to avoid adverse effects to listed plants and animals recommended by

NMFS and FWS through consultation have been incorporated into the FMP mitigation measures. It is the responsibility of NPS staff to ensure these measures are followed as FMP projects are implemented.

Clean Air Act. All PRNS prescribed burns must be submitted to the Bay Area Air Quality Management District (BAAQMD) with a Smoke Management Plan for approval. The BAAQMD grants approval to burn based on air basin air quality and competing requests to burn submitted by other entities. Due to these extenuating circumstances, plans for burning may not always be approved for implementation if air basin conditions are poor or there are too many competing requests for approval to burn.

National Historic Preservation Act requires agencies to take into account the effects of their actions on properties listed in or eligible for listing in the National Register of Historic Places. The NPS, in consultation with the Advisory Council, the California State Historic Preservation Officer (SHPO), American Indian tribes, and the public has developed a Programmatic Agreement for operations and maintenance activities on historic structures. This Programmatic Agreement provides a process for compliance with National Historic Preservation Act, and includes stipulations for identification, evaluation, treatment, and mitigation of adverse effects for actions affecting historic properties. The NPS sent a scoping notice and the Draft Fire Management Plan/EIS to the State Historic Preservation Officer and the Advisory Council for Historic Preservation. No response or comments were received from these offices. To avoid significant adverse effects to cultural resources while



Pierce Point Ranch
by Richard Hitchman

¹ **Anadromous:** Anadromous fish are born in fresh water, migrate to the ocean to grow into adults, and then return to fresh water to spawn. In the FMP planning area, anadromous fish listed under the ESA are coho salmon and steelhead.

implementing the FMP, the NPS adopted cultural resource mitigation measures to address the pre-project, implementation and post-project periods. It is the responsibility of NPS staff to ensure these measures (CR-1, CR-2 and CR-3) are adhered to for each FMP project.

2.2.2 Jurisdictional Considerations

Direct Protection Areas (DPA). The NPS has wildland fire protection responsibility for all federally owned lands inside the boundary of the Seashore. Hence federally-managed lands within the congressionally designated boundary of the Seashore are Federal Responsibility Areas or National Park Service - Direct Protection Area (DPA). For Point Reyes National Seashore, this DPA includes all lands within the Seashore boundary that are federally managed and, through agreement, the northern lands of Golden Gate National Recreation Area on Bolinas Ridge. The NPS has the financial responsibility, as well as the fire protection force to accomplish this. However due to the limited capability of its protection force Marin County and other nearby West Marin fire agencies provide strong backup and reinforcement to any fire in or near the Seashore.

2.2.3 Technical or Logistic Considerations

Limited Season for Effective Use of Prescribed Burning. The normal weather window for prescribed burning at Point Reyes is from mid-June to November. Burning in grasslands should be conducted after the grasses have cured which can be as late as early July. Summer and fall burns must be timed to occur between the dissipation of the morning coastal fog, which can keep much of the planning area moist throughout the day, and the onset of the strong afternoon sea breezes. The later months of the prescribed burning period, from late September until the first rains in November, can be relatively fog free but prescribed burns can be difficult to schedule or complete if red flag conditions develop quickly given that fuels moistures are already very low.

Risk-related Considerations. There are four communities bordering PRNS that are listed as federal “communities at risk from wildfire” under the National Fire Plan. Because of the potential for risk to public safety or property from an uncontrolled wildland fire at PRNS, the policy at PRNS is full suppression for all wildland fires, precluding the fire management tool of wildland fire use. Since the risk of escape of a prescribed burn is a major factor when deciding between prescribed burning and mechanical fuel reduction, prescribed burns near the interface may be modified to minimize smoke production and limit the duration of the fire to a single day. This precludes fire management strategies involving large-scale landscape fire restoration at PRNS.

Park Resources or Values Considerations. PRNS has significant populations of threatened and endangered plant and animal species, and other unique wildlife. These biota can and do affect the time, location and layout of fire management activities. Avoiding these sensitive resources can result in burn units that are not optimally laid out for operational defensibility. This could require more firefighters or a prescription that calls for a slower, smaller or more precisely drawn prescribed fire than could optimally be achieved.

PRNS has significant prehistoric and historic resources including archaeological sites, structures, isolated artifacts and cultural landscapes. Subsurface and surface resources include at least 124 Coastal Miwok sites, mainly processing areas and shell middens, numerous shipwrecks, and 92 archeological sites from the historic period. It is estimated that only 87% of the park area has

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been surveyed so many sites remain undiscovered. The majority of the over 300 historic structures in PRNS are ranch structures in the Minimal Management FMU, but several of the 10 treatment FMUs contain National Register Status structures, such as the Olema Lime Kilns and Upper Pierce Ranch, and other historic structures. In addition, PRNS manages 39 cultural landscapes; 16 of which are within the treatment FMUs.

Staffing Considerations. The NPS has instituted new guidelines for prescribed burning (NPS 2005b, Chapter 10), which, among other changes, require that all NPS prescribed burns have “contingency resources” (such as fire trucks on stand-by) committed and assigned to every burn. These contingency resources must be available based on the prediction of a worst-case scenario. Resources may be requested from competing projects especially in the peak of the national fire season in the summer months when resources needed for prescribed burns are also needed for emergency fire suppression.

2.3 WILDLAND FIRE MANAGEMENT OPTIONS

To accomplish FMP goals, wildland fires will be suppressed and prescribed fire will be introduced where appropriate for hazard fuel reduction and/or resource benefit. Mechanical fuel reduction projects will focus on Wildland Urban Interface areas and protection of park visitors, staff and sensitive natural and cultural resources. Mitigation measures addressing potential environmental impacts will be incorporated into site specific projects as assigned through interdisciplinary project review as required by the NEPA process completed for the FMP. Fire managers will balance the potential resource impacts of wildland fire with the potential resource impacts of fire suppression activities in choosing the Appropriate Management Response.

PRNS contains significant natural and cultural resource values. Values to be protected and their susceptibility to damage or loss by fire are discussed in more depth in the descriptions of the Fire Management Units (FMU), Section 2.4 of this FMP. Resource management objectives, in turn, drive strategies that aim toward the restoration and maintenance of naturally functioning ecosystems, restoration of cultural landscapes and protection of sensitive natural and cultural resources.

Wildland fires at the PRNS are managed with the support of local community fire departments and federal land management agencies. This community-based approach to wildland fire management involves partnership, cooperation and collaboration between PRNS and Marin County Fire Department (MCFD) and local government and volunteer fire districts, local homeowners associations and special districts such as Marin Municipal Water District (MMWD).

The PRNS Division of Fire Management provides technical assistance to Pinnacles National Monument on fire management matters, including fire management programs such as the Weather Information Management System (WIMS), the Wildland Fire Management Information (WFMI) System, the National Fire Danger Rating System (NFDRS), the Resource Ordering System Status (ROSS), the Incident Qualification and Certification System (IQCS), Fire Program Analysis (FPA), and FIREPRO budgeting. The Division also assists the Pinnacles National Seashore with wildland fire qualification and certification programs, coordination of fire training and mobilizations, development of agreements with local and state agencies, administration of Rural Fire Assistance Program grants to local rural fire departments, fuel

reduction activities, prescribed burning, and developing fire prevention, preparedness, and suppression operational plans.

PRNS, in accordance with NPS policy, uses Minimum Impact Suppression Tactics (MIST) in all fire management activities. MIST is defined as the application of techniques that effectively accomplish wildland fire management objectives while minimizing the impacts to cultural and natural resources commensurate with ensuring public and firefighter safety and effective wildland fire control. Further information is provided in Section 3.2 and the MIST Guidelines are in Appendix E, Section 9.

2.4 ENVIRONMENTAL FACTORS INFLUENCING FIRE MANAGEMENT

2.4.1 Historic Role of Fire

When compared to research into the prehistoric fire record, fire frequency in California has been decreasing over the past century as a result of fire suppression. The lack of periodic fire in the current period has resulted in changes in vegetation structure and species composition. For example, it is generally assumed that forest stand density in many areas has increased, and shrub and grassland habitats in many areas are being reduced in size due to encroachment by conifers. Populations of the Marin manzanita, a fire dependent plant, are becoming increasingly rare as a result of habitat loss due to shading from increasing forest stand density.

It has been well documented that fires in the Point Reyes area and within California coastal ranges were frequently set by Native Americans (Slaymaker, 1982; Keely, 2002) and European settlers. Fire history studies conducted in and around the peninsula show the northern coastal prairie was very important to the Coastal Miwok as a source of food. Seeds were harvested from the coastal prairie and other grasslands in late summer. Individual seed fields were the possession of specific families and were probably often burned after harvest to improve growth the next year. Documentation of Coast Miwok culture indicates burning of grasslands for several purposes, but information on the extent and timing is minimal. Some sources indicate that fields were burned frequently, as often as once a year (Lewis, 1973; Slaymaker, 1982). Pre-contact burning along the coast may have focused on grasslands, while later burning during the Spanish and Anglo periods focused on shrublands to increase pasture acreage. The latter probably did not burn grasslands because of the need for winter livestock forage, leading to a very different fire regime (Greenlee and Langenheim, 1990). A small percentage of historic fires were probably lightning caused.

Ecosystems of Point Reyes are not burning today with nearly the frequency they did in the past. This change in fire frequency can result in shifts from understory to overstory dominance, increases in fuel loads and changes in forest structure, including increases in ladder fuels, which may lead to increased incidence of overstory, stand-replacing fires (Covington et al., 1994).

The best records of Point Reyes fire history reside in fire-scarred tree rings in redwood, and to a lesser extent, in Douglas-fir trees. Bishop pines are relatively short-lived trees (100 to 120 years), and generally occur in single-aged stands which arise after a stand-replacing fires. While the age of a Bishop pine stand can give solid evidence of a single large fire, it yields little insight into longer-term fire history. Shrubs respond to burning by either sprouting back from their stumps, or by regenerating via seeds in the soil so little record of the physical evidence of fire is retained. The same is true of grassland species.

2.4.2 Research Studies on Fire History

Due both to past logging and the relatively thin bark and low resistance to burning in Douglas-fir, Douglas-fir forests are a limited source of data on fire history. However, at least one research team (Brown et al., 1999) was able to extract data from fire scars on Douglas-fir and redwood trees at three locations in Point Reyes. The researchers found that fire scars did not extend much beyond the late 1700s. The oldest Douglas-fir tree found in the park dated to 1680, but this individual had no fire scars. Within the approximately two hundred-year period of fire scars (roughly 1800 to the present), researchers calculated a mean fire interval ranging from 7.0 to 13.0 years for the Douglas-fir forests. They were unable to cross-date any pre-settlement redwood trees, although some post-settlement trees did contain fire scars that successfully cross-dated with the Douglas-firs. Researchers speculated these trees were likely basal sprouts that established after the original redwood stand was logged, or grew in response to fire. Using fire scar information for burns from the early 1800s to the early 1900s, the researchers calculated a mean fire return interval in the redwood groves of 7.7 to 8.5 years.

Adjacent to Point Reyes, Finney (1990) found mean fire intervals between 1850 and 1900 that ranged from 6 to 33 years, with a mean of 14 years in coast redwood stands on Bolinas Ridge. He was able to document high fire frequency in the grove studied dating from the middle 1400s. Jacobs et al. (1985) calculated mean fire intervals of 22 to 27 years from stumps containing fire scars on ridges surrounding Muir Woods National Monument.

Work at Humboldt Redwoods State Park revealed a larger range in fire intervals, although this area has higher precipitation levels than Point Reyes and so is not directly comparable. Stuart (1987) calculated mean pre-settlement fire intervals in Humboldt from fire scars and redwood sprouts varied between 11 and 44 years. In the same area, Fritz (1932) estimated that at least 45 severe fires had burned during the previous 1,100 years, with a mean fire interval of 25 years. At Salt Point State Park, Finney and Martin (1989) found fire return intervals of 20.6 to 29.0 years. The authors state that all of these studies probably overestimate the actual mean fire interval.

Sediment taken from the bottoms of the lakes at the south end of Point Reyes Peninsula provides further evidence of forest fires over the past several centuries (Russell, 1983). In an on-going charcoal stratigraphy study by Anderson (2001), sediment cores from Glenmire and Wildcat lakes are being analyzed with radiocarbon dating. The Glenmire sample within the Douglas-fir forest; the Wildcat Lake area is dominated by coastal scrub. Sediments from both lakes indicated a near absence of fire during the past 100 years. Ongoing research is examining additional sediment cores from wetland areas in Point Reyes through radiocarbon dating and pollen analysis with the goal of constructing a more complete fire history.

2.4.3 Recent Fire History

The Marin County Fire Department has historically maintained a list of the larger fires in the county in the 20th century. Several of these fires have occurred in the project area. A fire in October 1917 burned 2,000 acres on the ridge west of Inverness. The largest fire, in September 1923, burned 40,000 acres from Lucas Valley to Bolinas including 35 homes in Woodacre.

More recently, the Mount Vision Fire burned more than 12,000 acres in 1995. It was started by an unattended campfire on October 3 at approximately 1:00 pm within Tomales Bay State Park. Driven by 40- to 50-mile per hour winds in steep terrain and heavy forest fuels, the fire rapidly

burned 700 acres and spread to PRNS and the residential community of Paradise Ranch Estates where 48 structures were destroyed. By October 6, up to 1,200 firefighters had participated in suppressing the fire. The next night, October 7, 1995, the fire was declared contained after burning a total of 12,354 acres (11,598 acres NPS lands, 386 acres State Park lands, 370 acres of private lands). The fire was declared controlled 9 days later.

Since 1997, on the average, about three wildland fires occur annually in the planning area. In all cases, the burned area was less than ten acres and most were kept to less than one acre. Most of the fires occurred in the Olema Valley and all but one were human-caused. The one exception was a single lightning caused fire.

Fires in Western Marin County also can have natural sources of ignition. Conditions conducive to lightning-caused wildfire do occur in Point Reyes, but they are rare (Martin and Sugnet, 1984). The Bay Area averages about 3 lightning days a year. On the average, two lightning storms occur each year in the Inverness vicinity with 18 percent of these storms occurring in September (Martin and Sugnet, 1984). Between 1970 and 1989, 13 lightning-ignited fires occurred in the following areas: Inverness Ridge, Mt. Tamalpais, and Stinson Beach. On September 27, 2001 a lightning fire occurred on Bolinas Ridge above Stinson Beach. During this same September storm, an observer saw about 60 lightning strikes from the Mount Barnabe Lookout near Samuel P. Taylor State Park, adjacent to the National Seashore. In addition, Pacific Gas and Electric staff counted 4,600 lightning strikes in the Bay Area during this storm (Freed, 2001).

2.4.4 Historic Weather Analysis

PRNS receives an average of 38.2 inches of rain annually. This amount is higher than much of the San Francisco Bay area due to the somewhat more elevated terrain along the coast. Most annual rainfall in Marin County occurs from November through March (see Table 1). The following general climate description is from “Climate, Physiography, and Air Pollution Potential – Bay Area and its Subregions (BAAQMD, 2003a)”:

“Areas along the West Coast of Marin County are usually subject to cool marine air. In the summer months, the marine air is cooled as it passes over the offshore upwelling region, and forms a fog layer along the coast. In the winter, proximity to the ocean keeps the coastal regions relatively warm. Temperatures do not vary much over the year at these coastal areas: high 50s in the winter and low 60s in the summer. The warmest months are September and October, which are in the mid to high 60s.”

“...wind speeds are highest along the west coast of Marin, about 8 to 10 mph. Although most of the terrain throughout central Marin County is not high enough to act as a barrier to the marine airflow, the complex terrain creates sufficient friction to slow the airflow. Downwind, at Hamilton Air Force Base in eastern Marin County, the annual average wind speeds are only 5 mph. The prevailing wind directions throughout Marin County show less variation, and are generally from the NW.”

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FIGURE 1 – DOMINANT WIND PATTERNS, CENTRAL CALIFORNIA

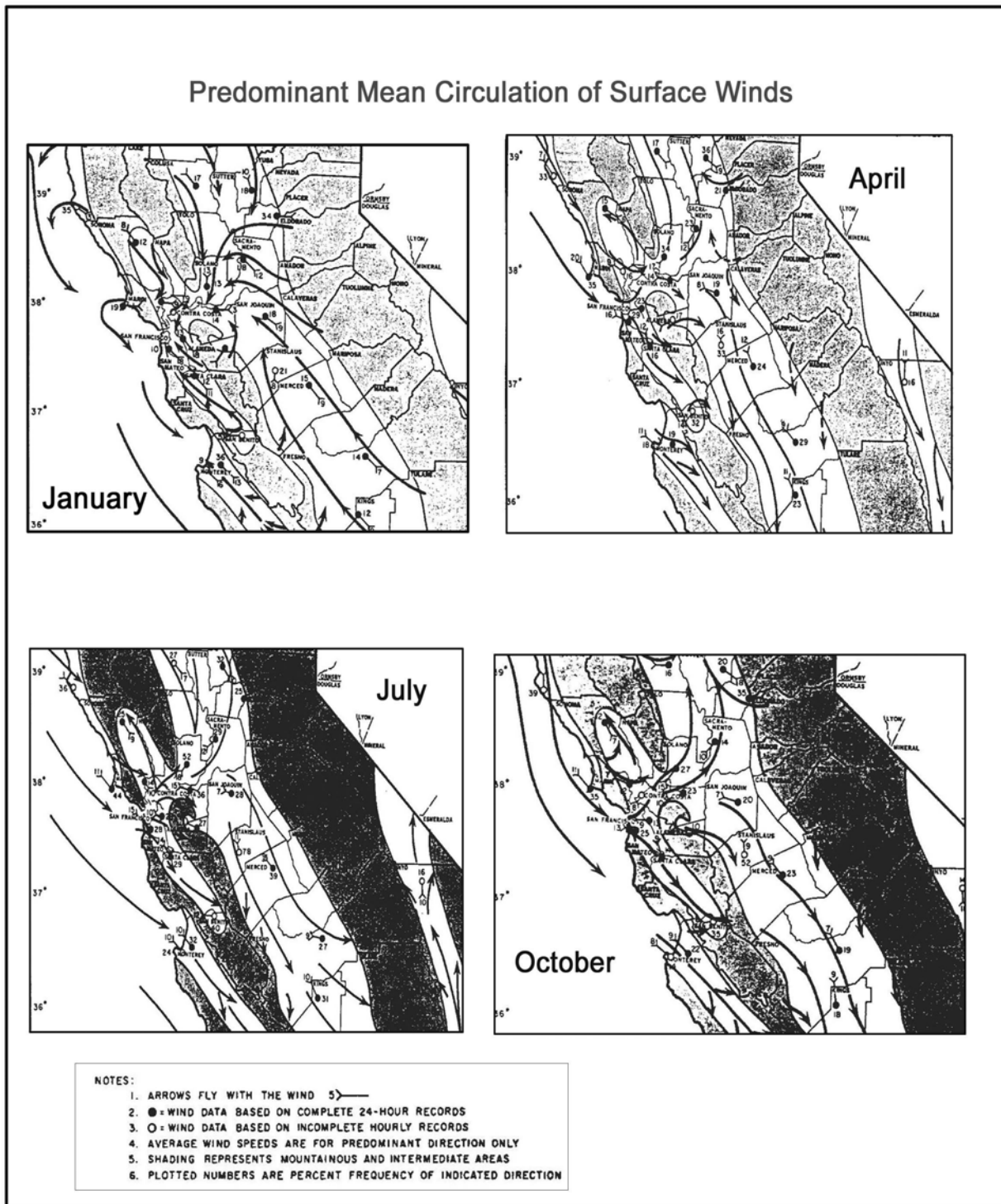


Figure 1 above illustrates predominant wind patterns occurring in California (Bell, 1958). The predominant regional surface winds during winter flow from the north-northeast. During spring and summer, stronger north-northwest winds dominate. These northwesterly winds are primarily

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caused and/or strengthened by the combination of high pressure offshore and the warmer air inland. During the fall transition, when warm easterly winds break through to the coast while inland conditions remain hot and dry, the coastal region faces its most significant fire threat.

Long-term average temperature and precipitation data have been collected at Bear Valley at the eastern part of the Point Reyes National Seashore (NPS, 2003). The Bear Valley monitoring station is the closest surface meteorological station to the project site. Surface climate data are presented in Table 1. Average temperatures (°F) during the summer vary from the high 40s to the low-to-middle 70s. Summer precipitation is low, averaging less than 0.2 inches per month, due to the strong stationary high-pressure system located off the coast and preventing weather systems from moving through the area. During the winter, average temperatures (°F) vary from the mid-to-upper 30s to the upper 50s-low 60s. About 84% of the precipitation in the area occurs during November through March, generally in association with storm systems that move through the region.

TABLE 1 -- TEMPERATURE AND PRECIPITATION DATA FOR
BEAR VALLEY, POINT REYES NATIONAL SEASHORE

Month	Average Daily Temperature (°F) ^a		Average Precipitation	
	Minimum	Maximum	Daily	(inches)
January	36.5	58.6	47.7	8.65
February	39.5	62.1	50.8	6.69
March	39.7	63.0	51.4	5.64
April	39.5	65.4	52.4	2.42
May	44.0	68.0	56.7	1.07
June	46.6	71.1	58.9	0.20
July	48.6	73.9	61.2	0.09
August	49.4	74.4	61.9	0.14
September	48.0	75.7	61.9	0.34
October	44.1	72.3	58.2	2.10
November	39.7	64.9	53.1	5.68
December	35.9	59.0	47.5	6.27
Annual Average	42.0	66.2	54.2	39.57 (total)

Source: Pt. Reyes National Seashore, 2003.

^average temperature and precipitation data for 1964-1989.

2.4.5 Fire Season

According to NPS FIREPRO III Base Analysis for PRNS, the composite "statistical" fire season can be defined by occurrence of wildfires. From this analysis, an early, mid, and late season is defined, with an embedded "core" season where annual base funding is derived. The core season is thus defined as pay period 15 through pay period 22 (July through mid-October).

The fire season at Point Reyes differs somewhat from most areas in the western United States. Following the cessation of winter rains in mid-April, fuels begin to dry and the light fuels of the annual grassland (2,000-7,000 lbs/acre) cure. During the summer months, live, dead and downed

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round wood material and duff in the understory of PRNS's forest stands gradually lose moisture. Bimodal peaks of fire danger occur in late spring and late summer/early fall. In most years, persistent fog keeps fire danger moderate in July and August when danger is highest in most of the western United States. The period from September 1 through October 31 can be considered the most critical time of fire danger for PRNS.

2.4.6 Fuel Characteristics and Fire Behavior

PRNS support a variety of vegetation classes, including hardwood forest, Monterey Pine/Monterey Cypress, Douglas fir/Coast Redwood Forest, Bishop pine forest, Riparian Woodland, Coastal Scrub, Grassland, Pasture and Coastal Dune.

Table 2 above represents an overall view of fuels on an area-wide basis.

TABLE 2 -- FUEL GROUPS AND MODELS (AREA IN ACRES)

Vegetation Type	Fuel Models	Monitoring Types	Acres
Douglas Fir Forest	6,8,10	FPSME1D10	16,301
Coast Redwood Forest	9		2,220
Bishop Pine Forest	10	FPIMU1D05	3,590
Hardwood Forest	8		7,896
Riparian Forest	8		2,336
Eucalyptus Forest	8	FEUGL1D08	219
Coastal Scrub	2,4,5,6,8	BBAPI1D105	18,577
Grassland	1	BCYSC1D05 BGEMO2D05 BLOPE1D01 BPHAQ1D03	19,842
Coastal Dune	1,5		1,862

Acreage estimates may not accurately reflect vegetation changes after the 1995 Vision Fire.

Also, not all vegetation types in PRNS are represented in this list.

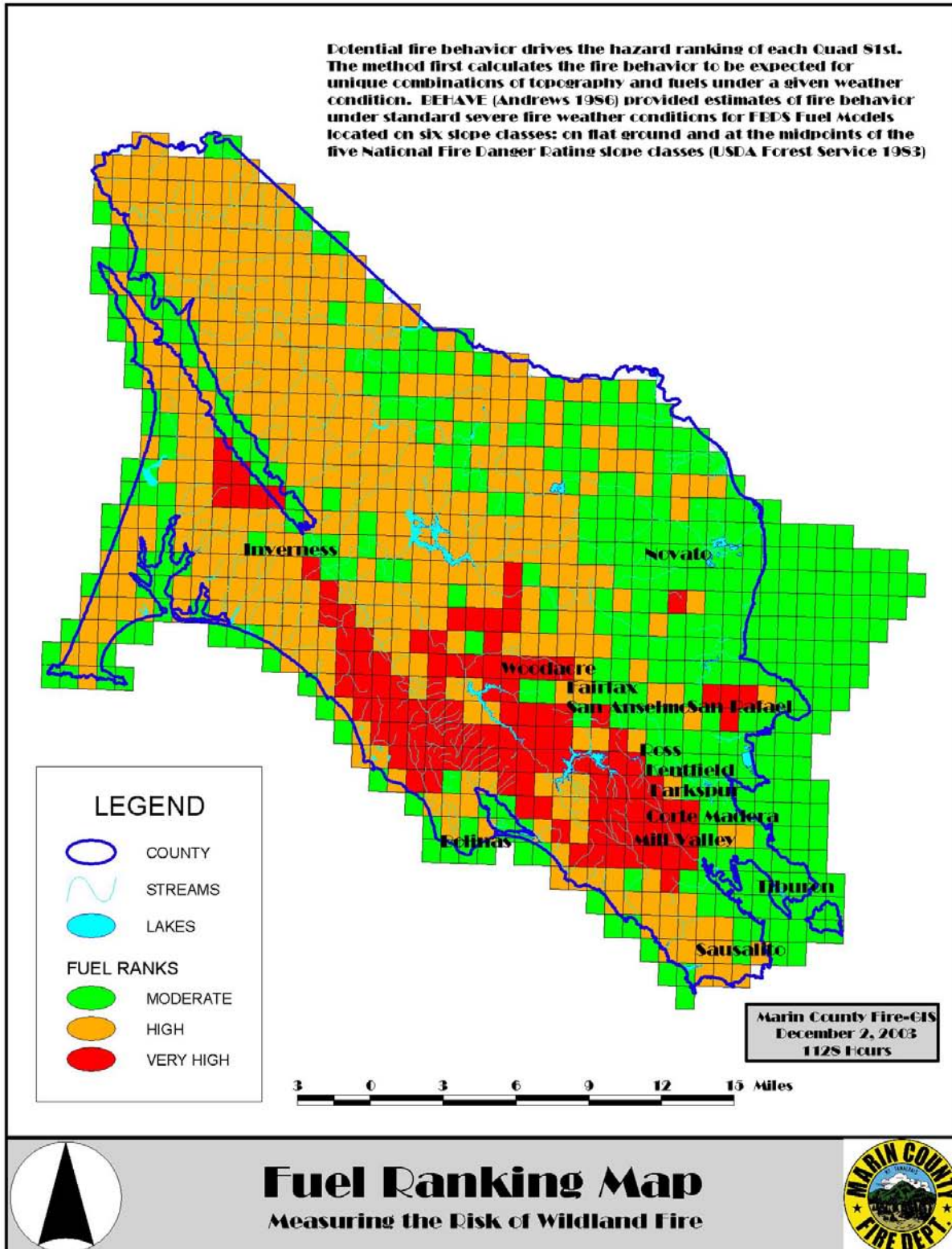
Source: PRNS GIS Database 2006

2.4.7 Hazard and Risk Modeling

Marin County Fire Department, using data provided by PRNS Fire and GIS personnel, developed a wildland fire risk model to determine areas of highest risk in the FMP planning area. Potential fire behavior was used to determine the degree of hazard (see Figure 3). Inputs to the potential fire behavior included topography and fuels under extreme weather conditions.

Using the same fire behavior inputs combined with additional variables (roadless area; certain fuel models with high rates of spread and intensity; slopes >40%;) produces another model which identifies areas where the resistance of controlling a wildland fire is amplified.

FIGURE 2 -- FUEL RANKING MAP



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The results of the model show that critical fuels and potential control problems are concentrated in the interface area along Inverness Ridge where the residential subdivision is adjacent to national parklands. Vegetation conditions here are heavier surface fuel loads and dense stands of fire adapted Bishop pine which could produce a high intensity wildland fire. The situation is compounded by the narrow road widths of the subdivision and inadequate area of defensible space providing substandard protection for many of the subdivision homes in the interface area. The largest fire in the 44-year history of the park was the 12,000-acre Vision Fire in 1995 which spread through the tree crowns driven by extreme north wind conditions. The Vision Fire destroyed 45 homes in the Inverness Ridge interface area.

Another portion of the FMP planning area with critical fuel concentrations is the southern portion of Highway One FMU. This area contains extensive stands of dense, non-native, highly flammable eucalyptus trees. Though there are few residences in the area, these eucalyptus stands represent a potential wildfire that could have a high resistance to control and, under extreme weather conditions (i.e. red flag day), spread to more densely populated communities such as Bolinas or Stinson Beach.

Many trees are killed by mostly surface fire but many survive, usually survivors include fire-resistant species of relatively large size.

Severity within individual fires varies between understory burning and stand-replacement, which creates a fine-grained pattern of young and older trees. This type of regime probably is due to fluctuations in weather during fires, diurnal changes in burning conditions, and variation in topography, fuels, and stand structure within burns. Highly dissected terrain is conducive to this fire regime.

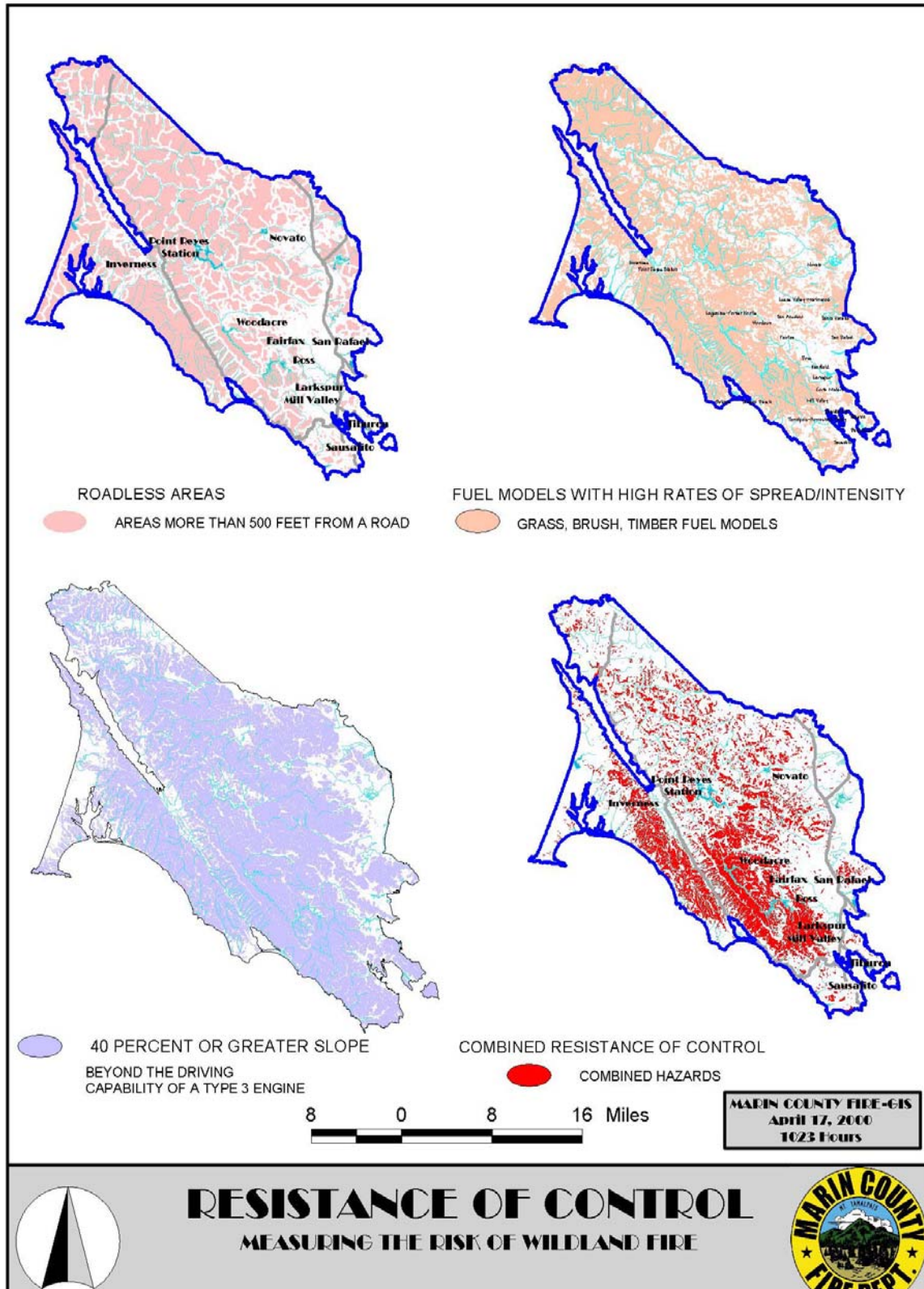
Fire severity varies over time with individual fires alternating between understory burns and stand-replacement. This regime has also been termed “variable” and has been applied to redwood forests.

Prior to Euro-American settlement, shrub-dominated or grassland plant communities in the project area may have been influenced by a stand-replacing fire regime, as most fires likely killed or removed most of the aboveground vegetation. The variability in topography, fuels, and diurnal weather fluctuations, however, could have resulted in a mixed severity fire regime, as described above for forests and woodlands.

The current fire regime for the Point Reyes area has changed dramatically since the mid-1800s as a result of Euro-American settlement patterns and practices. Effective fire suppression has resulted in large accumulations of fuels in many forest, woodland, and shrub-dominated plant communities. Thus, when fires do burn, they often are stand-replacing, as evidenced by many areas within the perimeter of the 1995 Vision Fire.

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FIGURE 3 -- WILDFIRE RISK



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2.5 PRNS FIRE MANAGEMENT UNITS: DESCRIPTION, STRATEGIES, CONSTRAINTS

A “Fire Management Unit” (FMU) is any land management area definable by common objectives, land features, access, values to be protected, political boundaries, fuel types, major fire regimes, or agency-designated special management areas directed by agency policy or congressional action (i.e., Wilderness or Wilderness Study Area).

For fire planning purposes, the planning area was divided into 11 fire management units (FMUs) based on geography, fuels management and habitat improvement needs, and on values at risk (see Figure 4). Ten of the FMUs, totaling 21,856 acres, represent the portion of PRNS where nearly all FMP actions, such as prescribed burning or mechanical fuel reduction treatments, would take place. The eleventh FMU - the Minimum Management Unit - includes most of the park and totals 71,046 acres. FMP actions in the Minimum Management FMU would be limited primarily to vegetation clearing around buildings and along roads and trails, prescribed burns with research objectives and, like the remainder of the park, full suppression of all wildfires.

Prescribed burns and mechanical treatments intended for resource objectives initially would be small and would be subject to intensive monitoring and research. If research results indicated that ecological conditions were improving after treatments in certain habitat types, the size of treatments in these habitat types could increase.

The FMP proposes small pilot project burns in habitats where the ecological effects of burning are not fully understood. These include Douglas-fir stands, Bishop pine forests, coastal scrub, and some grassland habitats. The focus for prescribed burns would be on areas where ecosystem health could be improved by burning and where fuel accumulations have created fire hazards. Prescribed burns would be conducted to approximate historic natural fire intensity and fire intervals to the extent possible while also ensuring public safety and protecting property.

Prescribed fire may also be used to reduce infestations of highly invasive non-native plant species. To increase effectiveness, PRNS staff may time these burns to suppress the invasive plants before they go to seed; this could result in prescribed burns scheduled for months that could seem contrary to burns that focus primarily on reducing fuels.

If herbicides are used, they are applied according to strict specifications using detailed Material Safety Data Sheets. Any application requires the approval of the park’s Integrated Pest Manager and the Washington Office coordinator for herbicide application. No applications occur in riparian or wetland areas (FMP FEIS page 38).

FIGURE 4 -- PRNS FIRE MANAGEMENT UNITS



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2.5.1 Tomales Bay FMU

The 2, 781-acre Tomales Point FMU encompasses all of Tomales Point north of the fence that delineates the Tule Elk Reserve. The fence runs east-west across the peninsula from Tomales Bay to the Pacific Ocean. The plant species composition of the grasslands in this FMU includes a mixture of native and non-native grasses and forbs, with scattered patches of coastal scrub dominated by coyote brush (*Baccharis pilularis*) and lupine (*Lupinus arboreus*).

No fire history data have been collected from the immediate vicinity of Tomales Point, but it can be inferred from fire history data collected elsewhere in PRNS that this FMU has been subject to periodic fire through time.

Environmental Considerations.

- Presence of approximately 450 tule elk.
- Populations of ten plant species of management concern, six of which are considered Species of Concern by the USFWS and one, Point Reyes blennosperma (*Blennosperma nanum*), is listed as rare by the state of California.
- High probability for unrecorded prehistoric sites.
- Pierce Ranch Complex, cultural site and landscape that includes eucalyptus trees.
- Presence of invasive non-native plants such as cape-ivy and velvet grass. Velvet grass is a highly invasive, non-native, perennial, rhizomatous grass that has been increasing in aerial extent and density in many areas of the PRNS Seashore, and has been identified by the park's Exotic Plant Management Plan (NPS 1989) as a priority for management.
- Portions of the FMU are within the Tomales Bay Watershed which is listed by the Regional Water Quality Control Board as impacted by sediments, nutrients and pathogens. FMP actions should not further impact this watershed.

Fire Management Strategies.

- Based on results of research conducted in other California grasslands, application of prescribed fire to the coastal grassland plant communities would be evaluated to determine if fire can be used to increase native species richness and density,
- Small prescribed burns would be conducted in the Tomales Point FMU and would be carefully monitored to determine the response of the plant communities, including the plants of special concern, to fire.
- Based on the results of research burns, prescribed burning would be considered to improve or expand habitat and forage for tule elk

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- Research burning will examine the use of prescribed burning to increase numbers of host plants for Myrtle's silverspot butterfly.
- Studies could be conducted to determine the response of the invasive non-native velvet grass to prescribed burning at different times of the year.
- Mechanical treatments include managing eucalyptus and Monterey cypress trees around Pierce Point Ranch using cutting and stump treatment of the eucalyptus with herbicides.

2.5.2. Headlands FMU

The Headlands FMU comprises 881 acres including the Point Reyes Lighthouse bluffs and Chimney Rock area at the westernmost tip of the Point Reyes peninsula. It contains some areas of designated wilderness along the outer bluffs. Vegetation on the unit is dominated by grassland and patches of mixed coyote brush and coastal scrub. The Headlands FMU has been subject to intense grazing pressure from cattle in the past, and currently some areas continue to be grazed, while others have more recently been excluded from agriculture.

Prescribed burns have not been conducted in this FMU in the past. Although fire history data have not been collected in this area, it is unlikely that this area has historically burned frequently due to the prevailing fog and moist conditions occurring most of the year.

Environmental Considerations.

- Twelve plant species of management concern occur in this FMU (Appendix B, Species List); five of these are federal Species of Concern, one is state-listed as rare (Point Reyes blennosperma), and one is state-listed as endangered (Point Reyes meadowfoam – *Limnanthes douglasii* var. *sulphurea*).
- The Headlands harbor sensitive animal species such as brown pelican and Steller sea lions. Other sensitive animal species include nesting seabirds such as ash storm petrel.
- Marine mammals such as harbor seals are sensitive to human activities including low flying helicopters.
- Lands within this FMU receive very high levels of visitor use, and are popular for wildflower viewing in the spring.
- Cultural landscapes and historic structures including the Point Reyes Historic Ranch District, Ranch A, the Point Reyes Lifeboat Station and the Point Reyes Lighthouse.
- High probability for unrecorded prehistoric sites.



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- Half of this FMU is within the watershed of the Drakes Bay Drainages parts of which support steelhead trout so water quality of the creeks must be protected during FMP actions.

Fire Management Strategy.

- Small, prescribed burns would be applied in this FMU on a trial basis to determine if fire can be used to reduce the aerial extent and density of invasive non-native plants such as velvet grass, and to increase the percentage of native plant species in the headlands communities.
- Headlands - the effects of prescribed burning on coastal grassland plant communities would be evaluated to determine if fire can be used to increase native species - both animal and plant - richness and density, and/or to reduce density and aerial extent of non-native species.

2.5.3 Estero FMU

The 1,638-acre Estero FMU is located at the northern end of Drakes Estero, along the edges of Schooner and Home bays. Vegetation is primarily grassland and mixed coyote brush and poison-oak scrub habitats, with patches of wax-myrtle (*Myrica californica*) in seasonal drainages. A stand of Monterey pine is in the southeast corner of the FMU. PRNS has been using prescribed fire and mowing treatments to control the non-native Scotch broom (*Cytisus scoparius*) since 1993.

Environmental Considerations.

- Populations of Pt. Reyes mountain beaver occur in shrubby drainages within this unit. This species, although not federally listed, is of concern to Seashore managers as it is a rare species whose populations were significantly reduced by the Vision Fire in 1995.
- Nine plant species of management concern; five are federal Species of Concern.

Fire Management Strategy.

- Prescribed burns would be conducted to contain and reduce the extent and density of the non-native plants Scotch broom, Monterey pine, Monterey cypress, and eucalyptus. Eucalyptus should be treated with herbicides to prevent resprouting. Monterey pine will not resprout from the cut stump if the stumps are cut low enough to the ground surface (Cal-IPC 2004).
- Continue cutting and mowing to suppress Scotch broom.
- Conduct research burns on the effects of prescribed burning on the areal extent and density of Scotch broom.

2.5.4 Inverness Ridge FMU

The linear 1,250-acre Inverness Ridge FMU runs from the western edge of Tomales Bay State Park south along Inverness Ridge to the Bayview Trail parking area. Inverness Ridge - To date, prescribed burns have not been conducted in this FMU. The ridge is dominated by dense stands of Bishop pine (*Pinus muricata*) in the north, which grade into Douglas-fir (*Pseudotsuga menziesii*) forests further south. The understory vegetation beneath the Bishop pine forest is dense consisting of species such as salal, huckleberry and manzanita (*Arctostaphylos ssp.*). The understory of the Douglas-fir forests can be sparse, consisting primarily of grasses and herbs, or more dense, with salal and huckleberry.

Environmental Considerations.

- Four federal plant species of management concern, including two federal Species of Concern - Marin manzanita (*Arctostaphylos virgata*) and Mount Vision ceanothus (*Ceanothus gloriosus var. porrectus*).
- Northern spotted owls, federally listed as a threatened species, nest within this FMU.
- The Inverness Ridge FMU is immediately adjacent to residences and small commercial areas in Inverness Park.
- Portions of the FMU are within the Tomales Bay Watershed which is listed by the Regional Water Quality Control Board as impacted by sediments, nutrients and pathogens. FMP actions should not further impact this watershed.



Fire Management Strategy.

- The proximity of dense, flammable vegetation to the communities of Inverness and Inverness Park makes this area a focus for mechanical and prescribed fire fuel reduction projects.
- Conduct small pilot prescribed fire projects (less than 30 acres) in Bishop pine forest to determine:
 - a. whether understory biomass and dead and downed fuels can be effectively reduced without increasing invasive plant populations.
 - b. the effects on populations of plant and animal species associated with the Bishop pine community (including Marin manzanita and Mount Vision ceanothus).
 - c. the effects on dusky-footed woodrats, northern spotted owls, and Point Reyes mountain beavers.

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- Conduct prescribed burns and mechanical fuel reduction projects to promote regeneration of rare plant species that respond to fire and/or disturbance.
- Mechanical fuel reduction would include the creation and maintenance of a 3-mile shaded fuel break along the ridge. The purpose of the fuel break would be to reduce the risk of a wildfire burning in the park spreading into adjacent private lands. Initially, a 0.25-mile section of fuel break would be constructed and evaluated for effectiveness and to determine the significance of resultant environmental effects from both construction and maintenance of the fuel break. The fuel break could eventually extend from the Bay View Trail Parking Area to Point Reyes Hill and would be approximately 50-60 feet wide. Within the fuel break, the objective would be to reduce dead and downed woody debris by 60%, limb up trees to 10 feet in height, thin trees up to 4 inches in diameter, and brush cut vegetation in a mosaic pattern to break up fuel continuity.

2.5.5 Limantour Road FMU

This 4,142-acre FMU consists of a corridor along the entire length of Limantour Road from the Limantour Beach parking area, east over Inverness Ridge, and descending down to the intersection of Limantour Road and Bear Valley Road. Much of the unit is within the Philip Burton Wilderness Area. For management purposes, it also includes the area encompassing the PRNS headquarters buildings, the Bear Valley Visitor Center, and the Coast Miwok cultural exhibit at Kule Loklo.



The southwestern portion of this FMU, from Limantour Beach to Inverness Ridge, spreads out east and west of the road to include portions of the Phillip Burton Wilderness Area. Vegetation in this area is dominated by grassland and mixed coastal scrub in the southwest, which intergrades into Bishop pine stands and Douglas-fir forests on Inverness Ridge. An extensive salt water and brackish marsh system occurs at the Estero de Limantour, and high quality riparian corridors are located along several northeast to southwest trending creeks (e.g., Muddy Hollow, Laguna, Coast). The section of this FMU that stretches from Inverness Ridge west to the Bear Valley area supports Douglas-fir forest, mixed conifer/hardwood forest with coast live oak, California bay, coyote brush scrub, and grasslands.

Environmental Considerations.

- Six plant species of management concern, three considered federal Species of Concern.
- A free-ranging herd of approximately 28 tule elk.
- Federally-listed threatened coho salmon (*Oncorhynchus kisutch*) and steelhead trout (*Oncorhynchus mykiss*) in streams within the FMU.
- Large tracts of eucalyptus at Kule Loklo.

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- High probability for unrecorded prehistoric sites.
- Northern spotted owls are known to nest in the eastern section of this FMU.
- Portions of the FMU are within the Tomales Bay Watershed which is listed by the Regional Water Quality Control Board (RWQCB) as impacted by sediments, nutrients and pathogens. Approximately one fifth of the FMU flows to the Drakes Bay by creeks that may support steelhead trout. FMP actions should not degrade the water quality of these watersheds.

Fire Management Strategies.

- Prescribed burns would be conducted to reduce the density of Monterey pines, reduce hazardous fuel accumulations along the road corridor, and maintain defensible space around buildings and visitor use areas.
- Roadside thinning and limbing up of trees
- Cut to suppress Monterey pine.
- Conduct prescribed burns to assess the effects of fire on highly invasive non-native Harding grass.
- Conduct prescribed burning to determine if the effects may benefit populations of the rare plant fragrant fritillary (*Fritillaria liliaceae*).

2.5.6 Wilderness North FMU

The Wilderness North FMU is 1,591 acres. It is primarily Douglas-fir forest interspersed with small open meadows. It trends along Inverness Ridge southeast from the Bayview Trail parking area to the Bear Valley Trail. The terrain is characterized by steep slopes that climb up from the east and west toward the central ridge. The FMU contains Mt. Wittenberg, the highest point in the planning area at 1,407 feet. Much of the unit is within the Philip Burton Wilderness Area and contains Sky Camp, a backcountry campground.

Environmental Considerations.

1. Spotted owls are known to nest in this unit.
2. The FMU supports one plant species of management concern – the California bottlebrush grass (*Elymus californicus*).
3. Portions of the FMU are within the Tomales Bay Watershed which is listed by the RWQCB as impacted by sediments, nutrients and pathogens. Approximately one fifth of the FMU flows to the Drakes Bay by creeks that may support steelhead trout. FMP actions should not degrade the water quality of these watersheds.

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Fire Management Strategies.

- The initial burns in this FMU would be small pilot projects in Douglas-fir forest and grassland near Mt. Wittenberg. The primary objectives of these burns includes:
 - Reducing or breaking up the continuity of areas of very dense fuel loading in the forest thereby reducing the overall risk of more adverse effects associated with an unplanned ignition (e.g., potential stand-replacing crown fire, loss of homes or other structures);
 - Establishing areas of reduced fuel loading where fire suppression crews could be staged in the event of a wildfire; and
 - Reintroduce fire into forests that may have burned as frequently as a 7-14 year fire return interval, but which have not burned for 50-100 years.
- If small burns effectively reduce understory biomass, larger burns may be conducted in this FMU in the future.
- Use mechanical treatment to thin forests prior to prescribed burning to determine if this pre-treatment can be beneficial to Douglas fir ecosystem and can increase firefighter safety.
- When working in appropriate habitat, efforts should be made to evaluate the effects of prescribed burning and mechanical treatments on spotted owl habitat and on dusky-footed woodrats.

**2.5.7 Wilderness South**

This 2,297-acres unit is largely comprised of designated wilderness lands south of the Vedanta Society property. It is aligned along Inverness Ridge south of Wilderness North FMU and extends to just south of Mud Lake. Wilderness South FMU includes Firtop peak at 1,324 feet above sea level and lands southwest of Firtop, reaching to the coast at Wildcat Camp. Vegetation in this FMU is dominated by dense stands of Douglas-fir with significant amounts of dead and downed material present. The southwest corner of the FMU supports high quality stands of coastal scrub, including coffeeberry, California sagebrush, coyote brush, bush monkeyflower, and lizardtail. There are a few remnant stands of Marin manzanita in this FMU. The plant reproduces most readily after fire. The absence of fire and increasing overshadowing by the overstory has led to significant manzanita mortality. Encroachment of Douglas-fir into the areas with Marin manzanita has further reduced direct sunlight reaching the Marin manzanita.

Environmental Considerations.

- This FMU supports two plant species of management concern, Marin manzanita (*Arctostaphylos virgata*), and California bottlebrush grass (*Elymus californicus*).
- Northern spotted owls, federally listed as a threatened species, nest within this FMU.
- Cultural landscapes and historic structures including Olema Valley Historic Ranch District's Five Brooks Ranch and Stewart Ranch and Wildcat Military Reservation.
- Roughly one third of the FMU is within the Olema Creek Watershed which supports coho salmon, steelhead trout and California red-legged frogs while the remainder of the FMU flows to the Drakes Bay Drainages whose creeks support steelhead trout. FMP actions should not contribute to the degradation of water quality of these watersheds.

Fire Management Strategies.

- Projects should treat the area supporting Marin manzanita, either through prescribed burning or mechanical fuel reduction projects. The initial prescribed burns would be smaller pilot projects in Douglas-fir forest and grassland near Firtop, and in Douglas-fir forest near Mud Lake. The primary objectives in these locations would be to determine if prescribed burning can effectively reduce understory biomass and be safely conducted. If the burns prove effective, larger burns may be conducted in the future.
- Mechanical treatment should be used as a pre-treatment prior to prescribed burning to reduce understory and forest density.
- When working in appropriate habitat, efforts should be made to evaluate the effects of prescribed burning and mechanical treatments on spotted owl habitat, dusky-footed woodrats and Marin manzanita.

2.5.8 Highway One FMU

The 2,874-acre Highway One FMU begins immediately south of Five Brooks and runs south along the Olema Valley on both sides of Highway One south to the Bolinas-Fairfax road. The FMU includes the riparian corridors on Olema and Pine Gulch creeks and their tributaries which support coho salmon and steelhead trout. At higher elevations above the riparian areas, the vegetation is dominated by annual grassland, mixed scrub, and hardwood communities; many of the grasslands are grazed by cattle.

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Environmental Considerations.

- The Highway One FMU contains dense stands of French broom and eucalyptus.
- Most unplanned ignitions at PRNS occur in this FMU and are related to vehicle traffic on Highway One.
- Northern spotted owls, federally listed as a threatened species, are found within this FMU.
- Cultural landscapes and historic structures including Bolinas Copper Mines, Hagmaier Ranch, Ralph Giacomini Ranch, Teixeira Ranch, Wilkin's Ranch, and Olema Lime Kilns.
- High probability for unrecorded prehistoric sites.
- Roughly a quarter of this FMU is within the Olema Creek Watershed and one third drains to the Pine Gulch Watershed, both of which support coho salmon, steelhead trout and California red-legged frogs. FMP actions should not contribute to the degradation of the water quality within these watersheds.

Fire Management Strategies.

- Use mechanical treatments such as mowing to reduce grasses and control non-native French broom.
- Mechanical treatments to thin or remove eucalyptus.
- Prescribed burning to reduce roadside fuels and suppress French broom.
- Where appropriate, evaluate the effects of prescribed burning and mechanical treatments on creeks, riparian habitat, coho salmon and steelhead, and California freshwater shrimp.

2.5.9 Bolinas Ridge FMU

The Bolinas Ridge FMU is a long, linear FMU, 2,381 acres, stretching from Olema, east along Sir Francis Drake Blvd, and then south along Bolinas ridge to the Bolinas-Fairfax Road. The northern half of the unit contains grasslands grazed by cattle. Drainages within the northern portion of the FMU support mixed scrub, hardwood woodlands, and some Douglas-fir. The southern half of the unit supports primarily Douglas-fir and redwood forests, hardwood forests, and mixed scrub plant communities. A large portion of the northern half of this FMU is subject to grazing by cattle, which serves to reduce fuels. Prescribed burns have been conducted in the northern portion of the FMU on the site of a former Christmas tree farm and at Beebe Ranch. Burns would continue at this site, and would also be conducted in the Beebe Ranch area, and in grasslands and shrublands along Bolinas Ridge.

Environmental Considerations.

- At the southern end, the FMU supports a dense stand of maritime chaparral that supports three rare species – glory brush manzanita, Marin manzanita and Mason's ceanothus. The latter species is a federal Species of Concern and is state-listed as rare.
- No mechanical treatment was anticipated for the Bolinas FMU with the exception of routine roadside fuel reduction, trail clearance, mechanical treatments to prepare for prescribed burning and clearing for defensible space around structures. Mechanical fuel reduction projects that fall outside these categories would require additional NEPA review and possibly ESA consultation.



- Cultural landscapes and historic structures including the North Pacific Coast Railroad Grade.
- Northern spotted owls, federally listed as a threatened species, are found within this FMU.
- A quarter of the FMU is within the Olema Creek Watershed which supports coho salmon, steelhead trout and

California red-legged frogs. The northern portion of this FMU is within the Lagunitas Creek Watershed which supports California freshwater shrimp in addition to the three species also found in Olema Creek. FMP actions should not contribute to the degradation of the water quality within the watersheds.

Fire Management Strategies.

- Prescribed burning of the grasslands along the western portion of Sir Francis Drake Boulevard would be conducted to create a corridor of defensible space along the road.
- In the southern half of the FMU, the emphasis for prescribed burning would be along the Bolinas Ridge Fire Road. Burns would be conducted in cooperation with the Marin Municipal Water District for both fuel reduction and to achieve a natural resource benefit by stimulating reproduction in the rare, fire adapted species Marin manzanita, glory brush ceanothus and Mason's ceanothus.
- Prescribed burns in the southernmost portion of the ridge in coastal chaparral and mixed scrub habitats would be evaluated to determine if fire can be used to increase native species richness and/or density.

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2.5.10 Palomarin FMU

The 2,021-acre Palomarin FMU begins near Double Point in the Philip Burton Wilderness Area and follows the coastline southeast to the U.S. Coast Guard property, then turns inland on the northeast side of Mesa Road. This FMU supports primarily mixed coastal scrub and grasslands. The area flanking the Palomarin trailhead is characterized by an exceptional diversity of nonnative plants, including eucalyptus, French broom, cape-ivy (*Delairea odorata*), pittosporum (*Pittosporum oblongata*), periwinkle (*Vinca major*), Harding grass (*Phalaris aquaticus*), kikuyu grass (*Pennisetum clandestinum*), oblong spurge (*Euphorbia oblongata*), and others. To date, prescribed burns have not been conducted in this FMU.

Environmental Considerations.

- Three plant species of management concern are located in the Palomarin FMU.
- Cultural landscapes and historic structures including the Bolinas Military Reservation.
- High probability for unrecorded prehistoric sites.

Fire Management Strategies.

- Mechanical treatments would be used to reduce the densities of non-native invasive plants, including eucalyptus trees, beyond the Palomarin Trailhead and into the wilderness area in this section of the park.
- Mechanical treatment would include clearing of trees along roadways, mowing grasslands along the road, and cutting Douglas-fir encroaching into coastal scrub before these areas are burned.
- Prescribed burns would be conducted to reduce hazardous fuel accumulations and French broom populations near the Commonwealth garden site and along roadsides.
- The effectiveness of prescribed burning at reducing the density or diversity of non-native, invasive plants would be assessed by park staff in conjunction with PRBO Conservation Science staff (formerly known as PRBO - Point Reyes Bird Observatory) in the area near the Palomarin Trailhead.
- Small-scale pilot burns also would be conducted to reduce fuels, and to discourage Douglas-fir encroachment on coastal scrub habitats around the Point Reyes Bird Observatory (PRBO) field station to create a mosaic of vegetation in the area and improve habitat for birds. Burns in coastal scrub would generally be less than 100 acres and used in part to determine effects.



2.5.11 Minimum Management FMU

The Minimum Management FMU is 68,455 acres and includes all area of PRNS not included in any of the other ten FMUs. The majority of the pastoral zone (roughly 19,000 acres) is in this FMU and is dominated by grasslands and grazed by cattle. The area also includes large tracts of the Wilderness Area that support mosaics of forest, scrub and grassland. The FMU includes large bodies of water such as Drakes Estero, Limantour Estero, Abbotts Lagoon, and Tomales Bay.



Environmental Considerations.

- All known populations of the seven federally threatened and endangered plant species in PRNS occur only in the Minimum Management FMU, so would not regularly be subject to either prescribed burning or landscape-scale mechanical fuels treatments. Proposed FMP projects that could impact these species would require additional consultation.
- All known populations of Myrtle's Silverspot Butterfly and Western Snowy Plover in PRNS occur in the Minimum Management FMU. The FMP anticipated no impact to these species from FMP actions. If FMP projects are proposed that have potential to affect either of these species or habitat, additional consultation would be required.
- Numerous cultural landscapes and historic structures including most of the Olema Valley and Point Reyes Historic Ranch Districts, the Coast Guard Facilities, many of the Coastal Defense Sites and the RCA Marine Radio Station.
- Leaseholder improvements for dairy farming and ranching operations, the youth hostel and water supply for Bolinas.

Fire Management Strategies.

- Clear sufficient defensible space around all park structures.
- Provide adequate overhead clearance along all park roads and fire roads to allow for the passage of emergency vehicles (14 foot overhead clearance).
- Thin roadside vegetation within 10 feet of the edge of park roads and fire roads.
- Remove hazardous trees along roads and fire roads.
- Small areas within pastoral lands that have invasive non-native species, such as Scotch or French broom or Monterey pine, may be burned or mowed to reduce the density and aerial extent of these invasive species (NPS 2004, p. 294).

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