Santa Monica Mountains
Community Wildfire Protection Plan

Santa Monica Mountains
Community Wildfire Protection Plan
Mutual Agreement Page

The Community Wildfire Protection Plan developed for the Santa Monica Mountain Communities:

- ✓ Was collaboratively developed. Interested parties and federal land management agencies managing land in the vicinity of the Santa Monica Mountains have been consulted.
- ✓ This plan identifies and prioritizes areas for hazardous fuel reduction treatments and recommends the types and methods of treatment.
- ✓ This plan recommends measures to reduce the ignitability of structures throughout the area addressed by the plan.

The following entities mutually agree with the contents of this Community Wildfire Protection Plan:

Daryl L. Osby, Chief County of Los Angeles Fire Department	05/02/13 Date
Mark Lorenzen, Chief Ventura County Fire Department	5/24/13 Date
Zev Yaroslavsky, County Supervisor County of Los Angeles, Representative 3rd District	3/25/13 Date
Linda Parks, County Supervisor County of Ventura, Representative 2rd District	6/3/13 Date

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County of Los Angeles, Representative 3rd District

//signature on previous page// ______________________ Date ______________________
Linda Parks, County Supervisor
County of Ventura, Representative 2nd District

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Acknowledgements

The Santa Monica Mountains Communities Wildfire Protection Plan (CWPP) Planning Area incorporates numerous stakeholders. We wish to acknowledge and thank the organizations that took an active part in creating the CWPP by attending meetings, providing feedback, commenting on the drafts, facilitating, and contributing to the content of the CWPP.

Santa Monica Mountains CWPP Collaborator Organizations:

Big Rock Mesa Fire Safe Council
California Coastal Commission
California Department of Parks and Recreation
City of Calabasas
City of Malibu
Corral Canyon Fire Safety Alliance
County of Los Angeles Fire Department
County of Los Angeles Fire Department, Division of Forestry
Las Virgenes Federation of Homeowners Association
Horizon Hills Fire Safe Council
Malibu Lake Fire Safe Council
Malibu Lakeside Homeowners Association
Malibu West Fire Safe Council
Monte Nido Homeowners Association
Mountains Recreation Conservation Authority
Mountains Restoration Trust
National Park Service
National Resource Conservation Service
North Topanga Fire Safe Council
Resource Conservation District
Santa Monica Mountains Conservancy
Santa Monica Mountains Fire Safe Alliance
South Topanga Fire Safe Council
Topanga Community Emergency Plan T-CEP
University of California Cooperative Extension
Ventura County Fire Department
West Topanga Fire Safe Council

Santa Monica Mountains CWPP Collaborator Acknowledgements

Thank-you to the stakeholder agencies, homeowner associations, fire safe councils and individuals whose efforts and staff collaborated heroically to create the content of the CWPP, including

Anthony Williams – County of Los Angeles Fire Department
Beth Burnham – North Topanga Fire Safe Council
Betsy Landis – Native Plant Society
Brad Davis – City of Malibu
Brad Weisshapt – County of Los Angeles Fire Department, Division of Forestry
Cathy Brooke – California Fire Safe Council
Clark Stevens – Resource Conservation District SMM
Cynthia Scott – County of Los Angeles 3rd District
Gary Burden – County of Los Angeles Fire Department
Gregory Elwood - National Park Service SMMNRA
J Lopez – County of Los Angeles Fire Department, Division of Forestry
Jo Kitz – Mountains Restoration Trust
Julie Clark de Blasio – Mountains Restoration Trust
Kathryn Kirkpatrick - National Park Service SMMNRA
Katie Ziemann – California Fire Safe Council
Keith Gurolla - Ventura County Fire Department
Maria Grycan – County of Los Angeles Fire Department
Mike Wilson - National Park Service SMMNRA
Paul Mora – Corral Canyon Fire Safety Alliance
Robert Taylor - National Park Service SMMNRA
Ron Oatman – Ventura County Fire Department
Rorie Skei – Santa Monica Mountains Conservancy
Rosi Dagit – Resource Conservation District SMM
Ryan Ulyate – North Topanga Fire Safe Council
Sabrina Drill- UC Cooperative Extension
Steve Hess – Las Virgenes Federation of Homeowners Associations
Steve Williams – Resource Conservation District SMM
Susan Nissman – County of Los Angeles 3rd District
Susanne Goode – California State Parks
Tim Pershing – County of Los Angeles 3rd District
Walt Young – Mountains Recreation Conservation Authority
Wolfgang Knauer – Horizon Hills Fire Safe Council

Initial Draft SMM CWPP Writing and Production

The creation of the Santa Monica Mountains CWPP has taken two years and several drafts. ForEverGreenForestry laid the foundation of this document facilitating numerous collaborative meetings with agencies, planning units and individuals, and gathering the research and contributions from participants. Tracy Katelman and her staff, and contributors compiled the first draft of the SMM CWPP, including:

Tracy Katelman, ForEverGreenForestry, www.forevergreenforestry.com
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Betsy Landis, Native Plant Society

Final SMM CWPP Editing and Production

Geo Elements, LLC reviewed and synthesized the large volume of information from the earlier draft, developed site-specific hazard and risk assessments, and produced the final version of the SMM CWPP. The Geo Elements, LLC Team included:

Carol Henson, Geo Elements, LLC, www.geoelementsllc.com
David Kerr
Chris Clervi
Julie Thrupp Titus

When you search for web versions of this plan will be available on several Santa Monica Mountain cooperator websites.

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Chapter 1 - Introduction

1.1 Plan Purpose

This Community Wildfire Protection Plan (CWPP) serves to guide future actions of local fire safe councils (FSCs), private landowners, land management agencies, and local emergency service providers in their efforts to reduce wildfire risks and hazards to human lives, improvements, and natural values in California's Santa Monica Mountains. In addition, this CWPP will:

- Identify strategies to reduce structure ignitibility while protecting the environmental integrity of the Santa Monica Mountains wildlands.
- Identify priority projects to reduce risks and hazards from wildfire at the neighborhood or community scale, while protecting conservation values in the Santa Monica Mountains.
- Provide community input to public land management within the Santa Monica Mountains National Recreation Area.
- Meet community collaboration requirements under the National Fire Plan and other government funding sources, in order to qualify for public funds allocated to this purpose.

1.2 Planning Area Boundaries

The CWPP Planning Area covers approximately 129,000 acres of the Santa Monica Mountains and focuses primarily on residential areas of the Santa Monica Mountains in both Los Angeles and Ventura Counties. It spans approximately 32 miles from east to west, bordered by the Pacific Ocean and Point Mugu Naval Air Station (on the west) and Topanga State Park (on the east). From north to south, the Planning Area is approximately 7 miles in length (See Figure 1).

The Planning Area boundary lines are based on residential communities, watersheds, property boundaries, and the Santa Monica Mountains National Recreation Area (SMMNRA) boundary in Los Angeles and Ventura Counties. The section of the SMMNRA that is north of Highway 101 and east of the East Topanga Fire Road are not included in the CWPP Planning Area.

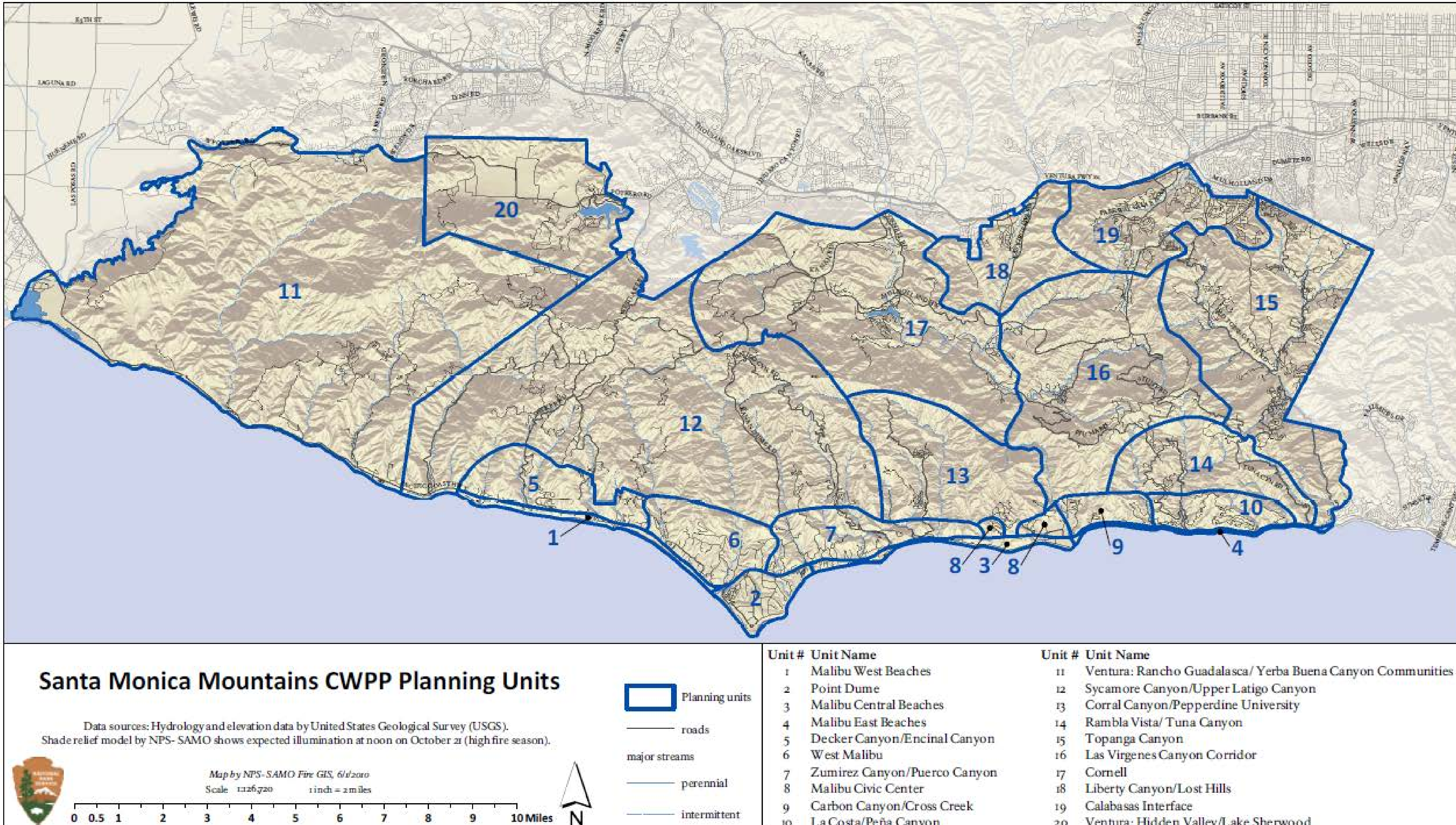
The Planning Area is divided into 20 Planning Units, which were formed based on existing population centers, governance jurisdictions, access routes, watersheds, and fire history. The Planning Units are listed in Table 1 and spatially displayed in Figure 1.

Table 1 CWPP Planning Units

PU #	Planning Unit Name	Human Development (Place names Included)
1	Malibu West Beaches	Broad Beach, Encinal Beach, and Encinal Bluffs
2	Point Dume	Paradise Cove, Point Dume, and Point Dume Club
3	Malibu Central Beaches	Bayshore, Malibu Road, Escondido Beach, Latigo Shores, Lower Ramirez Canyon, Malibu Beach, Malibu Bluffs, Malibu Colony, Malibu Cove Colony, and Tivoli Cove
4	Malibu East Beaches	Big Rock Beach, Carbon Beach, La Costa Beach, Las Flores Beach, Las Tunas Beach, and Topanga Beach

PU #	Planning Unit Name	Human Development (Place names Included)
5	Decker Canyon / Encinal Canyon	Bailard-Lunita, Decker-Edison Road, La Chusa Highlands, Lower Decker Canyon, Lower Encinal Canyon, and Steep Hill Canyon
6	West Malibu	Bonsall Canyon, Horizon Hills, Malibu Park, Malibu West, Trancas Canyon, and Zuma Canyon
7	Kanan Dume Road / Puerco Canyon	Escondido Canyon, Lower Latigo Canyon, Malibu Colony Ranch Estates, Paradise View, Puerco Canyon, Ramírez Mesa, Upper Ramírez Canyon, Sycamore Park, Winding Way Knolls, and Zumírez
8	Malibu Civic Center	Civic Center, Malibu Country Estates, and Malibu Knolls
9	Cross Creek / Carbon Canyon	Carbon Canyon, Cross Creek, Serra Retreat, Sweetwater Canyon, and Sweetwater Mesa
10	La Costa / Peña Canyon	Big Rock Mesa, La Costa, Las Flores Mesa, Lower Las Flores, Lower Rambla Pacifico, and Peña Canyon
11	Ventura: Rancho Guadalasca / Yerba Buena Canyon	The Colony, County Line, Deals Flat, Deer Creek Canyon, Laguna Peak, Naval Base Ventura County–Point Mugu, Rancho Guadalasca, West Carlisle, and Yerba Buena Canyon
12	Sycamore Canyon – Upper Latigo Canyon	Little Sycamore Canyon, Kanan Dume Road, Malibu Vista, Newton Canyon, Upper Decker Canyon, Upper Encinal Canyon, and Upper Latigo Canyon
13	Corral Canyon / Pepperdine University	Barrymore Road, Corral Canyon, El Nido, Malibu Bowl, Malibu Hills, and Pepperdine University
14	Rambla Vista / Tuna Canyon	Las Flores Canyon, Las Flores Heights, Piuma Road, Tuna Canyon Road, Sea View Estates, Upper Rambla Pacifico, and West Saddlepeak
15	Topanga Canyon	Arteique, East Saddle Peak, Entrado, Fernwood, Glenview, Greenleaf Canyon, Henry Ridge, Hillside, Old Topanga, Post Office Tract, Red Rock Canyon, Santa Maria Road, Sylvia Park, Top o'Topanga, Topanga Skyline, and Viewridge Estates
16	Las Virgenes Canyon Corridor	Cold Creek, Dry Canyon, Las Virgenes Canyon, Lower Saddle Peak Road, Monte Nido, Stokes Canyon, and Stunt Road
17	Cornell	Careful, Cornell, Lobo Canyon, Malibou Lake Mountain Club, Malibu Junction, Malibu Lakeside, Seminole Hot Springs, Triunfo Canyon, and Wagon Road
18	Liberty Canyon / Lost Hills	Brents Junction, Liberty Canyon, and Lost Hills
19	Calabasas Interface	Calabasas Highlands; City of Calabasas south of US 101 from The Oaks housing development, east to the intersection of Mulholland Highway and West Mulholland Drive; includes south Greater Mulwood
20	Ventura: Hidden Valley / Lake Sherwood	East Carlisle Canyon, Hidden Valley, and Lake Sherwood

Figure 1 CWPP Planning Area Units Map



1.3 Policy and Regulatory Framework

More than 70 different federal, state, local, private, public, and nonprofit entities share jurisdiction and management of the lands covered by this CWPP. Each entity has different mandates, areas of focus, and degrees of regulatory authority that can make planning and implementing any activity in the Planning Area very challenging.

Understanding all applicable local, state and federal policy and regulations relevant to implementing this CWPP is imperative. The knowledge of laws and regulations ensures compliance for the wildfire mitigation recommendations provided in this CWPP.

The following are the relevant federal, state, and local policies and regulations for the wildland urban interface (WUI) in the Santa Monica Mountains.

1.3.1 Federal Level Policy

Disaster Mitigation Act (2000–present)

Section 104 of the Disaster Mitigation Act of 2000 (Public Law 106-390) enacted Section 322, Mitigation Planning of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, which created incentives for state and local entities to coordinate mitigation planning and implementation efforts, and is an important source of funding for fuels mitigation efforts through hazard mitigation grants.

National Fire Plan (NFP) 2000

The summer of 2000 marked a historic milestone in wildland fire records for the United States. Dry conditions (primarily across the Western U.S.), led to destructive wildfire events on an estimated 7.2 million acres, nearly double the 10-year average. Costs in damages including fire suppression activities were approximately 2.1 billion dollars. Congressional direction called for substantial new appropriations for wildland fire management. This resulted in action plans, interagency strategies, and the Western Governor's Association's "A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment - A 10-Year Comprehensive Strategy - Implementation Plan", which collectively became known as the National Fire Plan. This plan places a priority on collaborative work within communities to reduce their risk from large-scale wildfires.

Healthy Forest Initiative (HFI) 2002 ⇨ Healthy Forest Restoration Act (HFRA) 2003

In August 2002, the Healthy Forests Initiative (HFI) was launched with the intent to reduce the risks severe wildfires pose to people, communities, and the environment. Congress then passed the Healthy Forests Restoration Act (HFRA) on December 3, 2003 to provide additional administrative tools needed to implement the HFI. The HFRA strengthened efforts to restore healthy forest conditions near communities by authorizing measures such as expedited environmental assessments for hazardous fuels projects on federal land. Congress affirmed the need to reduce the risk of wildfires to communities, municipal water supplies, forests, rangelands, and other important landscape components. This Act emphasized the need for federal agencies to work collaboratively with communities in developing hazardous fuel reduction projects and places priority on fuel treatments identified by communities themselves in their CWPPs.

Santa Monica Mountains National Recreation Area General Management Plan and Final EIS

The land management goals are to protect and enhance species and habitat diversity; protect and restore native plant species, plant communities, estuaries, and wetlands; reduce the extent of invasive plants and animals; manage fire in the recreation area to mimic natural fire regimes and reduce the threat of destructive wildfires; preserve the cultural history of the area; and maintain or improve water quality in riparian areas, estuaries, and coastal waters on National Park Service lands.

Santa Monica Mountains National Recreation Area Fire Management Plan and Final EIS

This plan guides management of wildland fire, prescribed fire, and hazard fuel reduction within the National Recreation Area while protecting natural and cultural resources.

1.3.2 State Level Policy and Regulations

California Environmental Quality Act (CEQA)

The 1970 CEQA has evolved into one of the most prominent components of community planning in California. It requires state and local agencies to follow a protocol of analysis and public disclosure of environmental impacts in proposed projects and to include feasible measures to mitigate those impacts. Any proposed hazard fuel treatment project recommended in this CWPP must comply with CEQA regulations, except those that occur exclusively on federally owned lands.

California Coastal Act of 1976 (CA Public Resources Code Sections 30000 et seq.)

This Act protects California's coast through state and local government implementation of policies that safeguard state interests in coastal resources including the provision of maximum public access and recreational opportunities to and along the shoreline.

California Strategic Fire Plan (updated 2010)

This statewide plan is a broad strategic document, which guides fire policy for much of California. It is an innovative plan aimed at reducing wildfire risk through pre-fire mitigation efforts tailored to local areas through assessments of fuels, hazards, and risks (Available at http://cdfdata.fire.ca.gov/pub/fireplan/fpupload/fpppdf668.pdf).

California State Multi-Hazard Mitigation Plan (updated 2010)

The purpose of the State Multi-Hazard Mitigation Plan (SHMP) is to significantly reduce deaths, injuries, and other disaster losses attributed to natural- and human-caused hazards in California. The SHMP provides guidance for hazard mitigation activities emphasizing partnerships among local, state, and federal agencies as well as the private sector (This plan is available at http://hazardmitigation.calema.ca.gov/docs/2010_SHMP_Final.pdf).

Public Resources Code Section 4290

This provision grants authority to State Board of Forestry and Fire Protection to develop and implement fire safety standards for defensible space on State Responsibility Area (SRA) lands. All construction of new developments on SRA lands approved after January 1, 1991 must follow these regulations. At a minimum, the regulations include road standards for fire equipment access; standards for street, road, and building identification signage; minimum levels for private water supply reserves that could be used for emergency fire use; and fuel breaks and greenbelts.

Public Resources Code Section 4291

A recent state law, effective in January 2005, extends the required defensible space clearance around homes and structures from 30 feet to 100 feet for wildfire protection. The code applies to all lands that have flammable vegetation. Los Angeles County Fire Department and Ventura County Fire Department enforce these codes in the Santa Monica Mountains CWPP Planning Area. They have the legal authority to require that California State landowners meet these minimum standards.

Public Resources Code 4102, 4125-4229 and 14 CCR 1220: State Responsibility Area (SRA)

These statutes and regulations established the locations where CAL FIRE has the financial responsibility for preventing and suppressing fires and establish locations where fire safe and defensible space laws or regulations apply. In both Los Angeles and Ventura counties, the county fire departments serve as the functional equivalent of CAL FIRE on SRA lands.

Public Resources Code 4251-4255 and 14 CCR 1200: Hazardous Fire Areas

These laws and regulations allow petitioners to the Board Forestry and Fire Protection or CAL FIRE to establish hazardous fire areas (HFA). The designation provides for area closures and other restrictions for fire prevention within the HFA.

Public Resources Code 4290 and 14 CCR 1270 et seq.: Fire Safety Standards

Public Resources Code (PRC) 4290 and regulations in 14 CCR 1270 cover the basics of roads, driveway width, clearance, turnouts, turnarounds, signing, and water regulations related to fire safety. 4290 is usually enacted by local ordinances at the county level that are certified by the BOF.

Public Resources Code 4292-4296 and 14 CCR 1256: Fire Prevention for Electrical Utilities

These statutes and regulations address the vegetation clearance standards for electrical utilities. They include the standards for clearing around energy lines and conductors such as power-line hardware and power poles. These laws and regulations are critical to wildland fire safety because of the substantial area of power lines in wildlands, the historic source of fire ignitions associated with power lines, and the extensive damage that results from power-line fires in severe wind conditions.

Government Code 51175: Very High Fire Hazard Severity Zones

This code defines Very High Fire Hazard Severity Zones and designates lands in the state that are considered by the State to be a very high fire hazard. Public officials can then identify measures that can retard the rate of spread, reduce the potential intensity of uncontrolled fires that threaten life safety and destroy human development and natural resources, and requires that those measures occur.

Government Code 51189: WUI Building Standards

This code directs the Office of the State Fire Marshal to create building standards for wildland fire resistance. The code includes measures that increase the likelihood of a structure withstanding intrusion by fire (such as building design and construction requirements that use fire-resistant building materials) and provides protection of structure projections (such as porches, decks, balconies and eaves), and structure openings (such as attics, eave vents, and windows).

Government Code 65302.5: General Plan Fire Safety Element Review

This statute requires the State Board of Forestry and Fire Protection to provide recommendations to a local jurisdiction's General Plan fire safety element at the time that the General Plan is being amended. While not a direct and binding fire prevention requirement for individuals, General Plans that adopt the Board's recommendations will include goals and policies that provide for contemporary fire prevention standards for the jurisdiction.

2010 California Fire Code

This code establishes regulations affecting or relating to structures, processes, premises and safeguards regarding residences and historic buildings. It includes: 1) hazards of fire and explosion arising from the storage, handling or use of structures, materials or devices; 2) conditions hazardous to life, property or public welfare in the occupancy of structures or premises; 3) fire hazards in the structure or on the premises from occupancy or operation; 4) matters related to the construction, extension, repair, alteration or removal of fire suppression or alarm systems; and 5) conditions affecting the safety of fire fighters and emergency responders during emergency operations.

1.3.3 Local and County Policy and Regulations

Los Angeles County and Ventura County Multi-Jurisdictional Hazard Mitigation Plans

These plans are tools for all stakeholders to increase public awareness of local natural and human-made hazards and risks, while providing information about options and resources available to reduce risks by hazard mitigation measures.

Los Angeles County: Clearance of Brush and Vegetative Growth

This code covers the basic regulations regarding fuel reduction around structures and power lines. It explains exceptions to the code, and the process to notice residents.

Los Angeles County Fire Department Strategic Plan

The Strategic Plan is intended to be used as a tool to measure effectiveness of the Department's ability to deliver prompt, skillful, and cost-effective fire protection and life safety services as well as an instrument to guide the Department in sound business practices.

Ventura County: Fire Hazard Abatement

Ventura County Fire Protection District, Ordinance 26, establishes minimum requirements in WUI areas that increases the ability of a building to resist the intrusion of flame or burning embers projected by a vegetation fire. It includes identification of hazardous fire areas that require applicable defensible space provisions and local fire-resistive building standards, defines Hazardous Fire Areas, and can require the preparation of a fire protection plan.

Los Angeles and Ventura Counties Coastal Plans

These plans contain land-use policies, zoning ordinances, and district maps for the coastal areas of each county. They guide the type, location, and intensity of land uses in the coastal zones and complies with the California Coastal Act.

Los Angeles County: Santa Monica Mountains North Area Plan

This is a component of the Los Angeles County General Plan and focuses on the unincorporated areas of the county west of the City of Los Angeles and north of the Coastal Zone boundary.

Los Angeles and Ventura Counties General Plans

These documents contain goals, policies, and programs for Resources, Hazards, Land Use, and Public Facilities and Services.

Lake Sherwood/Hidden Valley Area Plan

This is an integral part of the Ventura County General Plan that provides focused development guidelines for these communities.

Las Virgenes-Malibu Council of Governments Hazard Mitigation Plan

A joint effort by the cities of Agoura Hills, Calabasas, Hidden Hills, Malibu, and Westlake Village to engage in regional planning and coordination.

City of Malibu and City of Calabasas General and Coastal Plans (GP/CP)

These plans govern land use, physical development, safety elements, conservation elements, and housing elements within the geographic area of the incorporated city limits. The California Coastal Act policy is cited in conjunction with these GPs.

Local WUI Building Standards

Both Los Angeles and Ventura Counties have specific building standards for Moderate, High, and Very High Fire Danger/ Fire Severity Zones for the WUI areas in the unincorporated lands and contract cities of each county. The standards apply to all “Buildings or structures hereafter erected, constructed or moved within or into designated High Fire Hazard areas/Fire Severity Zones, including mobile homes” and require that all buildings must be one of the types of construction defined in the code and meet all requirements.

Two major cities in the Planning Area, Malibu and Calabasas, contract with Los Angeles County for fire safety and project review services. The building requirements for structures in the WUI areas inside the incorporated areas are equivalent to the County requirements.

1.4 Goals and Objectives

The goals and objectives for this CWPP were developed based on conditions of the Planning Area and incorporates questions, issues, and concerns collected from stakeholders during public meetings.

Goal 1: Minimize the wildfire threat to life safety in the Planning Area.

Objectives:

- Assess wildfire hazards and risks within and adjacent to homes, communities, and transportation routes.
- Identify and prioritize fuel mitigation projects that reduce the wildfire threat to life safety.
- Develop fuel treatment methods and strategies for property owners and agencies that provide guidance in adequate defensible space for structures and transportation routes in all types of wildland fuels.
- Identify vulnerable populations in consideration of special needs for pre-planning.

Goal 2: Reduce the wildfire threat to values at risk (including homes, neighborhoods, natural and cultural resources, critical infrastructure, businesses, historic resources, and recreation opportunities) in the Santa Monica Mountains.

Objectives:

- Identify values at risk from wildfire in the Planning Area.
- Utilize the wildfire hazard and risk assessments to develop mitigation strategies to reduce the wildfire threat to values.
- Identify and prioritize areas for hazardous fuel mitigation projects within the Santa Monica Mountains that enhance the protection of values from wildfire.
- Provide recommendations to reduce structure vulnerability for homeowners and communities.

Goal 3: Reduce wildfire ignitions.

Objectives:

- Identify areas with high probabilities of wildfire ignitions.
- Provide recommendations that focus wildfire prevention efforts to areas with heavy wildfire occurrence.
- Identify ongoing fire prevention efforts and programs by the local agencies in the Planning Area.
- Incorporate local fire agency fire danger prediction systems into public awareness.

Goal 4: Balance wildfire mitigation strategies with long-term sustainability of natural resources.

Objectives:

- Provide guidance on implementation of “Best Management Practices” during hazardous fuel mitigation strategies

- Develop sustainable fuel modification methods that reduce the need for annual multiple treatments while reducing the wildfire threat.
- Provide recommended literature for minimum impact tactics during implementation of wildfire mitigation treatments in sensitive habitat and natural resource areas.
- Collaborate with the various environmental resource specialists on hazard mitigation methods and strategies.

Goal 5: Provide for fire safe communities.

Objectives:

- Identify existing community preparedness programs and activities that provide community wildfire safety and planning.
- Promote wildfire awareness, understanding of fire behavior, structure assessments, and site assessments to homeowners and communities by educating property owners in fire safe practices and fire wise community practices.
- Identify communities where local FSCs currently don't exist and make recommendations on how these communities can form their own local FSCs.
- Provide a mechanism for communities to be added or removed from the Communities at Risk (CAR) list.
- Provide communities with the opportunity to compete for federal, state, and local grants.

1.5 CWPP Process

In the development of a CWPP, the more inclusive the group and the greater the diversity of interests involved, the more likely it is to be representative of the community as a whole and to find broadly acceptable, mutually agreeable solutions. The CWPP collaborative process effectively improves coordination and communication between emergency response agencies and the communities. Collaboration should stimulate or strengthen local efforts encouraging public education and action to reduce wildfire risk to life and property. Perhaps most importantly, collaborative processes help build trust and good working relationships among the participants.

The process used for this CWPP brought together diverse local interests to discuss their mutual concerns for life safety, values at risk, and natural resource sustainability. It provided a positive, solution-oriented environment in which to address challenges in the Planning Area. The process was designed to maximize opportunities for public education and participation. More than 20 community meetings were held throughout the Planning Area between October 2009 and January 2010 with approximately 250 people attending one or more of these meetings.

1.5.1 Community Outreach

Extensive outreach publicized community meetings and the development of this CWPP. Examples of outreach activities include:

- Personal contacts to agencies and organizations
- Posting of posters and banners in strategic places in local communities
- Creation of a website and a *Facebook* page to reach out to communities through social networking
- Media Releases to over 60 local radio stations, newspapers, and media outlets
- A series of articles appeared in the local newspapers and newsletters, such as the *Malibu Surfside News*, *Malibu Times*, *Topanga Messenger*, and *Ventura County Star*. All newspapers included upcoming community meetings in their calendar listings.

1.5.2 CWPP Planning Committee

A planning committee made up of federal, state, and local agencies and homeowner representatives oversaw development of this Plan to ensure it met the NFP/HFRA criteria of a CWPP, and ensure that it meets the needs of all jurisdictions in terms of fire safety and prevention.

Table 2 Planning Committee Members

Name	Affiliation	Title
Kate Dargan	Intterra, Inc	President
Brad Davis	City of Malibu	Emergency Services Coordinator
Mark Goss, Leslie Moss	Malibu West Fire Safe and Sustainability Council / HOA	Chair
Steve Hess	Las Virgenes Homeowners Federation	President
Tracy Katelman	ForEverGreen Forestry	Principal Author, Project Lead
Kathryn Kirkpatrick	National Park Service (NPS)	Fire Management Officer
J. Lopez	Los Angeles County Fire Department	Deputy Forester
Timothy Pershing	Office of Los Angeles County Supervisor Yaroslavsky	Field Deputy
Darrell Ralston	Ventura County Fire Department	Assistant Chief
Ron Shafer	CA Department of Parks & Recreation	Park Superintendent
Rorie Skei	Santa Monica Mountains Conservancy	Deputy Director

Chapter 2 - Santa Monica Mountains Overview

The Santa Monica Mountains (SMM) are a unique and desirable place to live and visit. The natural beauty of the scenic coastal shorelines, the sparkling Pacific Ocean, beautiful dense vegetation, rugged mountains, large open spaces, and abundant wildlife all contributes to make this a special place. However, this natural beauty has an inherent danger – the area is highly prone to large and destructive wildfires. The combination of a hot, dry Mediterranean climate, steep terrain, highly flammable vegetation, frequent fire ignitions, and human development creates significant potential for major disasters from wildfire.

2.1 Values at Risk

Values at risk are the intrinsic values threatened by wildfire that are important to the way of life of residents, businesses, and visitors in the Planning Area. Values include human development such as homes, outbuildings, infrastructure, businesses, and recreation facilities but values also include natural resources such as sensitive species, wildlife, cultural resources, air quality, and the resident's feelings about their community and the landscape around them. The challenge is to consider the level of mitigation that is required to protect one value without jeopardizing other values from wildfire.

Source: NPS/SMMNRA

As part of the scoping and outreach effort of this CWPP, community meetings were held throughout the Planning Area between October 2009 and January 2010 to identify community values and discuss wildfire protection efforts. These meetings provided an opportunity for residents to identify locales and structures of value to their community. Some of the key community values identified at these meetings included schools, churches, fire stations, hospitals, senior centers, neighborhoods, commercial districts, golf courses, and campgrounds (Detailed information for values at risk in each of the 20 planning units can be found in Appendix B).

Public outreach in the Planning Area communities emphasized the importance of the following values:

- Life safety, homes, neighborhoods
- Natural Resources
- Infrastructure
- Commercial properties
- Cultural and historic resources
- Recreational uses

2.1.1 Life Safety

People have been killed by fast moving wildfires in the SMM, most recently the 1993 Old Topanga Fire with three fatalities and the 1996 Calabasas Fire with one fatality. The protection of human life safety is the highest priority for all mitigation strategies in the Planning Area, followed by structures, property, and resources.

> Life safety considers both the life as well as the physical well-being of all people.

There are numerous life safety issues to consider during a wildfire including evacuation, high-density neighborhoods, sheltering in place, vulnerable populations, access/egress, defensible space, and structure vulnerability.

The ability to evacuate quickly and safely during a wildfire is a significant concern. The existing road systems in the Planning Area have very few primary and secondary access routes and these routes are marginally adequate even under normal conditions. During a fast moving wildfire, the combination of narrow winding roads and large numbers of people evacuating at the same time can put people at risk to injury and/or death.

Often during wildfires, residents will choose not to evacuate but stay and defend their homes or decide to shelter in place until the fire danger passes. Lacking firefighting knowledge and without fully understanding the implications of their decisions, residents' actions can put their life safety at risk as well as that of firefighters and law enforcement personnel. Individuals who delayed their evacuation intending to defend their homes, shelter in place, or were slow to leave their homes due to packing personal items have died while fleeing wildfires. Untimely and inadequate evacuation procedures have led to fatalities on fast moving wildfires in Southern California, such as the 2003 Cedar Fire in San Diego County.

Threats to life safety include inadequate defensible space around structures and/or ignitable structures (flammable exterior construction material and/or poor design features). Lack of adequate defensible space can expose residents and firefighters to extreme and potentially fatal temperatures. Structures that are vulnerable to easy ignition due to flammable exterior construction material and/or poor design can be indefensible during a wildfire.

In addition, vulnerable people have special needs that are critical to address well in advance of disasters such as wildfire. There are an unknown number of "vulnerable individuals" living within the Planning Area but these populations may be less likely to respond to, cope with and recover from wildfire, and are less likely to get involved in wildfire mitigation activities. (Ojerio, 2008). Age, physical and mental disabilities and can restrict mobility making it more difficult to evacuate in a disaster; lack of financial resources may hinder the ability for low-income populations to invest in emergency preparedness or mitigation measures or to recover from loss, and language may result in communication barriers to evacuation or support services (Bollig, Lynn, 2006). Visitors to the Planning Area who are unfamiliar with the wildfire threat and/or the extent of their exposure are

> In disaster preparedness and response, the terms "vulnerable" or "special needs" populations are often used to characterize groups whose needs are not fully addressed by traditional service providers. They include but are not limited to those who are physically or mentally disabled, limited or non-English speaking, culturally isolated, medically or chemically dependent, homeless, frail/elderly and children.

should also be planned for when considering vulnerable groups.

Pets and other domestic animals make up another vulnerable population. Many pets and large animals can face undue loss or suffering due to poor disaster preparedness by their human caretakers. During a wildfire, animals become frightened and more difficult to handle. This takes more time to evacuate them, even with a strong family disaster plan. Many emergency shelters and evacuation centers deny admission to pets for health and safety concerns. During a disaster, people risk their lives and the lives of others to save their pets, and frequently homeowners are unwilling to evacuate or enter a shelter without their animals, which places themselves and emergency responders at risk.

2.1.2 Structures, Businesses, and Infrastructure

Catastrophic WUI fires have historically caused significant property, economic, and infrastructure losses in the Planning Area. The 1993 Topanga Fire resulted in the loss of over 300 structures and is rated 16th in the top 20 wildfires, in terms of structures lost, in California (CAL FIRE, 2012). The financial and social costs of WUI wildfires demonstrate the need to reduce their impact on lives and property, as well as reduce the short and long-term economic consequences of large-scale fires.

Whether a structure is damaged or destroyed depends primarily on exterior construction material, a structure's design, housing density, placement relative to nearby homes, geographic location and whether the home has adequate defensible space. Defensible space considers anything near the structure that can burn, which includes native and ornamental vegetation and includes nearby structures.

The density of structures in the cities and communities within the Planning Area can range from high density where structures are tightly packed with little spacing between them to low density where there are large distances between structures. When the distance between structures is large, they are vulnerable to vegetation fires. Defensible space and structure integrity are effective in reducing the chance the structure will ignite unless its geographic location makes it highly vulnerable to the extreme fire behavior and convective heat so pronounced in canyons and steep slopes. When the distance between structures is small, strong winds or steep slopes can cause a wildfire to spread from structure to structure; similar to how a fire burns from shrub to shrub in wildlands fuels. Structure fires threaten nearby structures with their long duration extreme radiant and convective heat and production of firebrands that are transported in the air to other structures and fuels. In this case, the structures themselves have become the fuel for the wildfire.

Short and long-term losses to infrastructure and services can include the loss of day-to-day services from local communities and businesses, destroyed or damaged schools, damaged roads and bridges, communication towers and antennas, depleted water systems, damaged sewer systems and water treatment plants, and lack of power due to burned power poles and melted powerlines. In addition, there may be impacts to seasonal use facilities, organizational facilities, equine facilities, nursing and rehab facilities, correctional facilities, and municipal properties. It can take days, weeks, or months to repair critical infrastructure and restore services.

The SMM is an area of high property values. Malibu and Calabasas have populations of 12,575 and 23,123, respectively with a median household income that exceeds $102,000 per year. This is among the highest in the State and the Nation.

The primary commercial values in the Planning Area are located in the incorporated cities of Malibu and Calabasas. Malibu is known for its beaches and coastline, and there are a large number of tourist-oriented businesses in the City. Calabasas is the largest city in the Planning Area that includes shopping centers and many other commercial developments.

The largest employers in the Planning Area include HRL Laboratories LLC (formerly Hughes Research Laboratories), which employs approximately 450 people, and Pepperdine University with more than 7,000 students and about 1,800 employees. Losses or damages to businesses within the Planning Area can affect employment opportunities. Economic and financial losses can have long-term effects including:

- Loss of economic vitality because of destroyed businesses
- Loss of tax revenue
- Loss of revenue from tourism

2.1.3 Natural and Cultural Resources

The SMM are rich in natural resources, most of which are susceptible to adverse wildfire effects. The SMM are part of a global and national biodiversity “hotspot” of endemic and endangered species. The Santa Monica Mountains host 450 different species of vertebrates and 204 vegetation associations in 6 major habitat types including coastal vegetation, riparian woodlands or shrublands, oak savanna, oak woodlands and extensive stands of chaparral and coastal sage scrub shrublands. Important fish resources include the endangered steelhead trout, tidewater goby, and the lamprey eel. The Planning Area is an important stopover for migratory birds along the Pacific Flyway and migratory Monarch butterflies. Wildlife species depend on intact habitat for food sources, safe wildlife rest areas, and nesting sites. Human development has fragmented native habitat, the impacts of which are exacerbated by wildfires.

Cultural Resources include the archaeological and historic heritage of an area as well as the beliefs, arts, and institutions that help shape and define the character of an area's population. Cultural resources include prehistoric or archeological sites, historic buildings, and locations of current community importance such as parks, churches, and community centers. The Planning Area contains more than 1,500 archeological sites and over 1,300 locally important historic sites that include barns, ranches, homestead sites, and local works of renowned architects. There are two structures on the National Register of Historic Places (the Adamson House and Looff’s Hippodrome) and 15 structures on National Park Service land that are recorded in the SMMNRA’s List of Classified Structures.

Visual and Scenic Resources are areas identified to be of particular scenic beauty. Many areas in the SMM’s are designated as scenic resources areas. The California Coastal Act emphasizes the protection of scenic and visual resources, particularly as viewed from public places such as road right-of-way and park and open space areas. Wildfire impacts on scenic resources are generally transitory as the post-fire blackened landscape begins to regrow in the first spring after a wildfire. Impacts to viewsheds can occur when damage from fireline construction in which vegetation cannot recover and a permanent scar remains on the landscape. The range of responses of natural and cultural resources to wildfire can vary from no effect to temporarily altered to damaged or destroyed. Understanding the nature of the resource and the nature of the fire threat are essential for appropriate planning to minimize negative impacts on the resources.

2.1.4 Recreation and Lifestyle

Elements that attract people to the area include the temperate coastal climate, beautiful scenery, good schools, and small, close-knit communities. Undeveloped open space protects environmental resources and supports numerous recreational opportunities. Residents and visitors enjoy a variety of outdoor activities on a year-round basis. On any given day of the year, it is common to find families and individuals playing and visiting at the beach or at one of the parks and open spaces. People of all age groups engage in outdoor exercise or activities including horseback riding, bicycle riding, running, hiking, camping, walking, rollerblading, surfing, and swimming. Community infrastructure in the cities of the Planning Area supports this healthy lifestyle by investing in the upkeep of recreation facilities.

Wildfires potential impacts to recreational opportunities includes the temporary closure of hiking areas due to slope instability or post fire flooding, temporary degradation of scenic values, loss of picnic tables or loss of recreational facilities. Everyone who lives in the community or visits the area should be aware of the potential for a destructive wildfire to affect recreational opportunities.

2.2 Land Use and Ownership

Land uses in the Planning Area are primarily residential and recreational. The public lands within the SMM are managed by multiple state and federal agencies. These include the National Park Service (NPS), the State of California Department of Parks and Recreation (CDPR), the Santa Monica Mountains Conservancy (SMMC), the Mountains Recreation and Conservation Authority (MRCA), Los Angeles and Ventura counties, and the cities of Calabasas and Malibu. The Mountains Restoration Trust (MRT) and several other nonprofit land conservancies also manage land in the Planning Area. A large portion of the Planning Area (54%) is privately owned within this federally designated landscape. This complex pattern of land ownership makes the SMMNRA a challenging landscape to manage. Tables 3 displays a breakdown of land ownership with the responsible agency and Figure 2 displays a map of land ownership.

Table 3 Jurisdictions in the Planning Area

Agency / Owner	Number of Acres
Private	70,154
State of California Parkland	27,031
National Park Service	18,172
Mountains Recreation and Conservation Authority	6,264
Santa Monica Mountains Conservancy	1,738
Mountains Restoration Trust	1,651
County of Los Angeles	1,165

Agency / Owner	Number of Acres
Other Federal	846
Las Virgenes Municipal Water District	776
City of Malibu	515
City of Calabasas	275
City of Los Angeles	174
Private Park or Recreational Land	166
University of California Reserve	67
Miscellaneous Public	50
Other State	4.4
Conejo Open Space and Conservation Authority	0.03

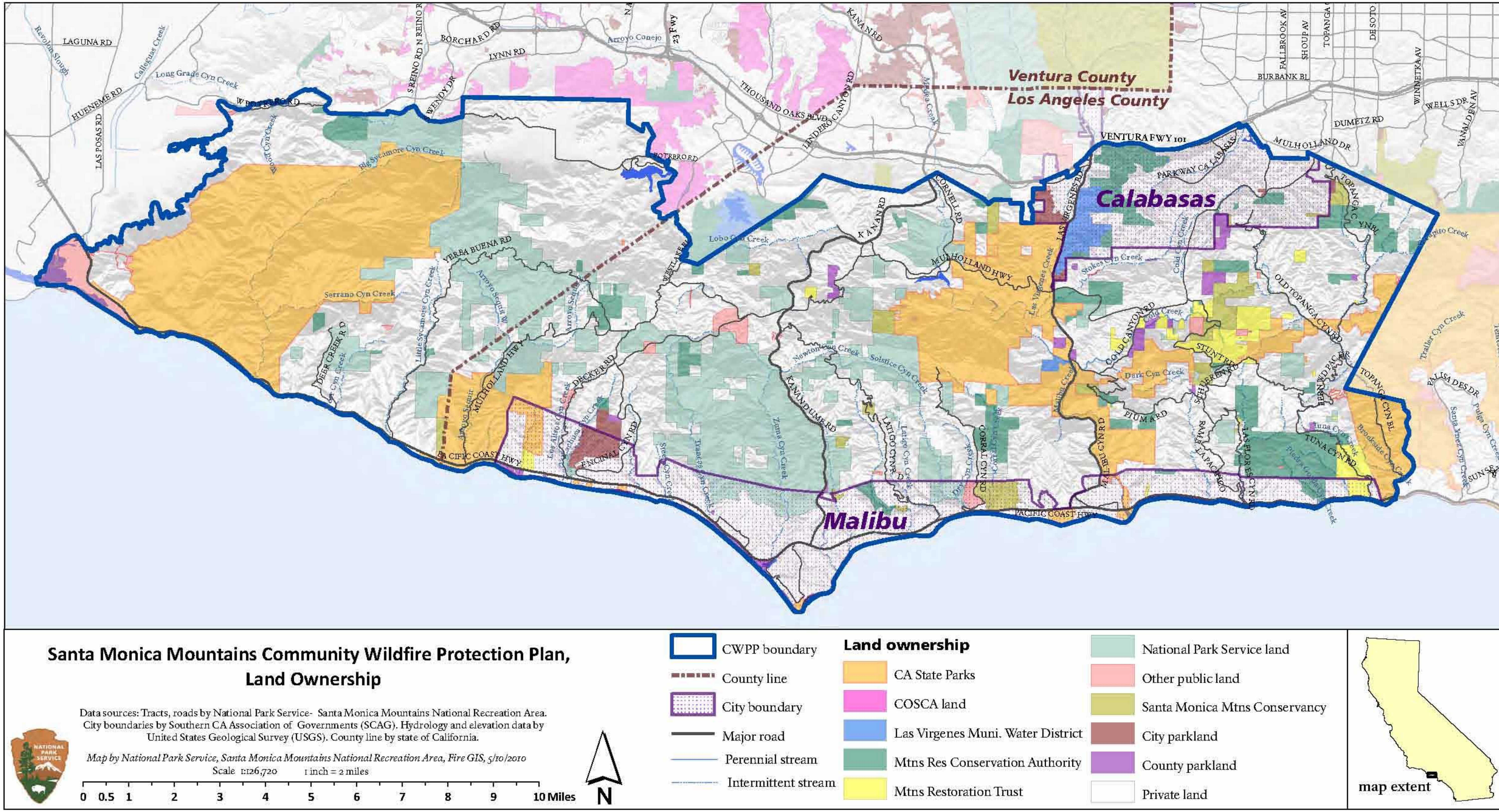
2.3 Fire Protection

The SMM are uniquely positioned to have large numbers of firefighting resources mobilized to a reported wildfire within very short period of time. Fire departments have standards for responding to incidents and are positioned and staffed to arrive in 5 - 12 minutes to provide Basic and Advanced Life Support. Ground and aerial firefighting resources have similar response standards for wildfires, but wildfires can be more difficult to access and arrival time will vary. Wildfire containment objectives are to keep 95% of wildfires to less than 10 acres. For the most part firefighters are successful in meeting this objective. Large wildfires actually make up a small portion of the numerous fires suppressed by firefighting agencies

Mutual aid agreements between Los Angeles County Fire, Los Angeles City Fire Department, Ventura County Fire Department, and the Federal wildland fire departments make it easier to provide fire equipment and firefighters during initial attack phase of a wildfire. These fire agencies work together to send the closest available resources to emergencies regardless of land ownership or jurisdiction. The local fire departments have immediate response policies to access agency owned and leased aerial firefighting equipment, even at night. This is a unique characteristic of the Planning Area. Nevertheless, even with a large and rapid pre-planned response, successful fire suppression still generally requires good access to structures, an adequate supply of water with good water pressure, defensible space around buildings, structure integrity, and timely evacuations by local residents. Factors including the construction characteristics and age of developments, road conditions, and access to water sources greatly influence the outcome of all firefighting efforts.

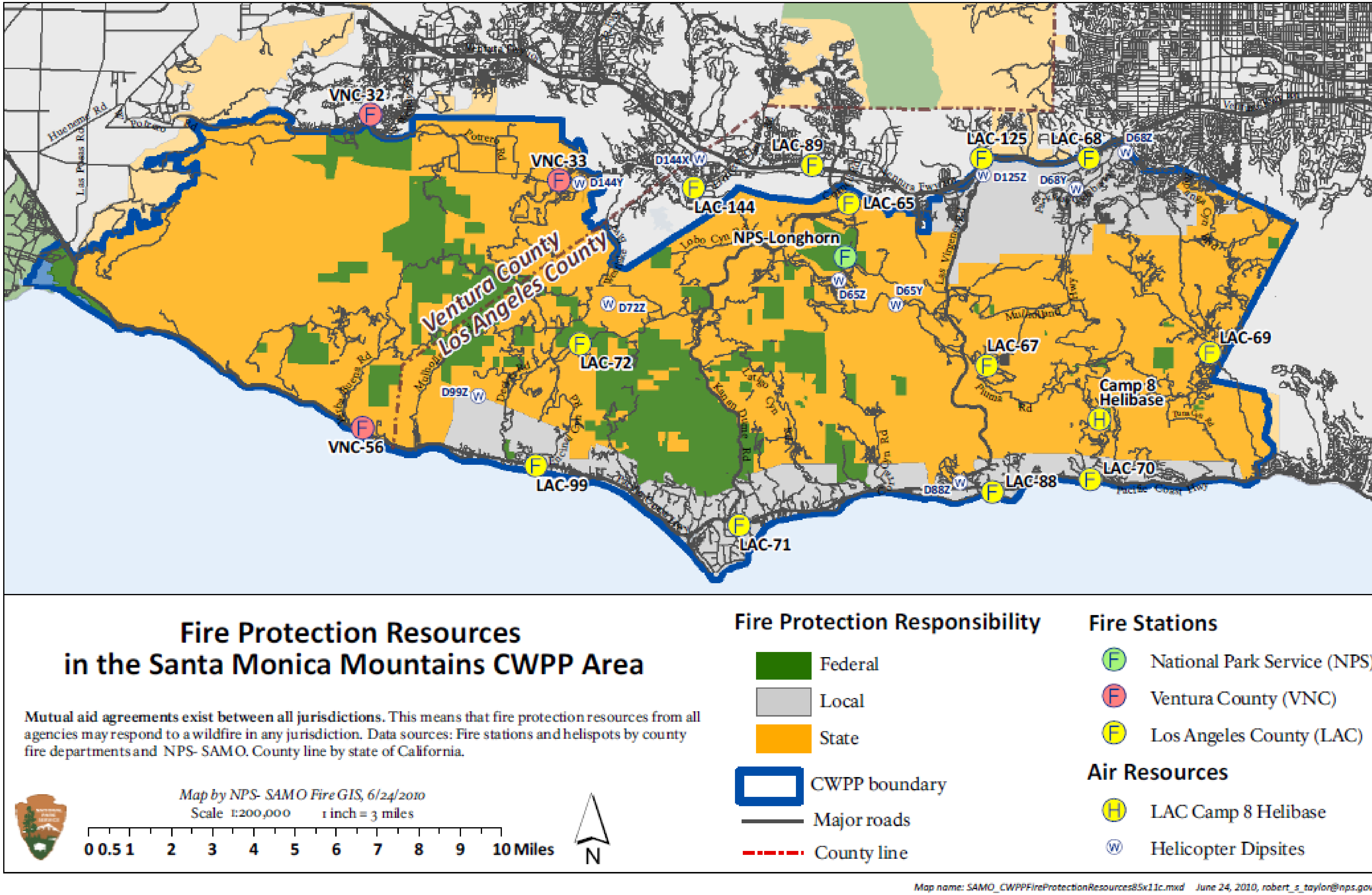
The fire protection agencies are dispatched based on jurisdictional boundaries and agreements with other agencies. The California Fire Master Mutual Aid Agreement requires each county to have a mutual aid plan. Mutual aid agreements are agreements between agencies, organizations, and jurisdictions that provide a mechanism to quickly obtain emergency assistance in the form of personnel, equipment, materials, and other associated services. The primary objective is to facilitate rapid, short-term deployment of emergency support prior to, during, and after an incident (See Figure 3 for responsibility areas, locations of fire stations, and other fire protection resources).

Figure 2 Land Ownership Map



Map name: SAMO CWPP IntroMap11x17.mxd May 10, 2010 robert s taylor@nps.gov

Figure 3 Planning Area Fire Protection Map



Chapter 3 – Defining the Wildfire Problem

Wildfire has historically been part of the SMM, although fire frequency due to human caused fires has increased as population has increased. Throughout the WUI of the SMM, fire poses an ongoing threat to human property and life safety, while high fire frequency threatens the integrity of local wildlands. When wildfires encroach on people and human development they can become disastrous. Two fires of historic significance include the Dayton Fire of 1982 that burned more than 40,000 acres and destroyed over 97 homes, and the 1993 Old Topanga Fire that burned more than 16,000 acres and destroying over 300 homes killing three people (CompleteMalibu.com, accessed 2011).

A wildfire becomes a WUI fire when the fire burns in areas where wildland fuels and urban fuels combine, i.e. structures, wood decks, flammable landscaping, or other improvements. The probability of a catastrophic wildfire occurring at any particular location within or adjacent to the Planning Area is dependent on a chain of events that includes fire ignition, fire weather, topography, fire behavior, and fire suppression actions taken. Fire professionals consider the probability of large-scale WUI fires occurring within the Planning Area to be high, given the nature of the local fuels, the likelihood of Santa Ana weather events, population density, and the volume of historical ignitions.

A unique set of factors within the Planning Area increase the likelihood that a wildfire will ignite. Factors include:

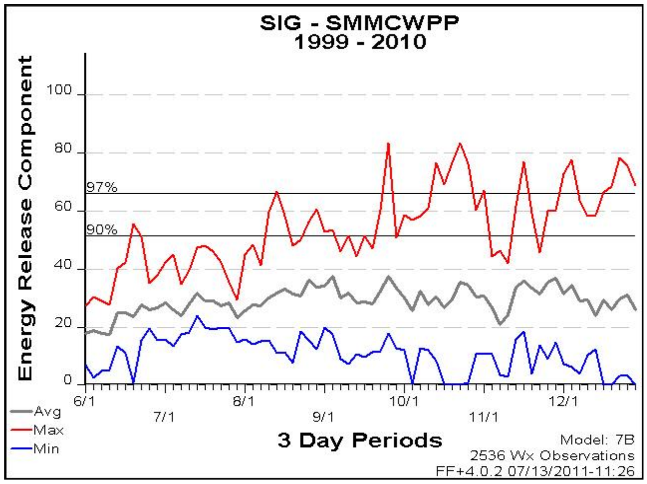
- major transportation corridors (Topanga Canyon Blvd., Malibu Canyon Road, Kanan Road) through areas of dense wildland fuels
- arcing power lines during Santa Ana wind events
- large numbers of recreational users on the public lands
- homeowner, agriculture, and ranching activities that can include chainsaws, weed whackers, welding and heavy equipment use in and adjacent to wildland fuels

While the SMM have a year round wildfire season, the majority of the fires burn between June and December. The coastal slopes of the Planning Area are affected by low clouds and fog into early summer. This weather pattern normally delays the drying of the fuels required to spread a wildfire until later into the calendar year. The valley-influenced slopes south of US Highway 101, receive less marine influence, therefore the fuels become available to support wildfire as soon as the annual herbaceous vegetation has cured. This is often as early as mid-May.

The critical wildfire season for the Planning Area begins with the development of a weather patterns supporting Santa Ana winds. This pattern generally establishes itself beginning in early September, with offshore wind events becoming stronger and more frequent through the fall. The critical fire season continues until enough rainfall occurs to allow for “green-up” of the herbaceous fuels. This rainfall can occur as late as December.

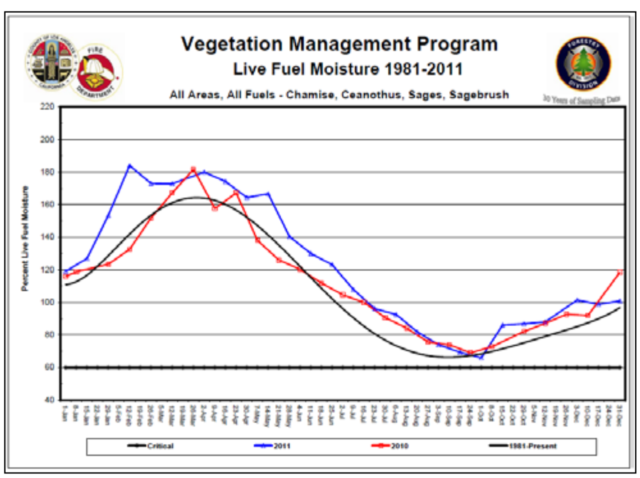
This trend in increasing fire danger is depicted in the Figure 4, Energy Release Component (ERC) chart, for a Special Interest Group, (SIG) of remote automated weather stations (RAWS) associated with the Planning Area. The weather stations used to define this SIG are Malibu Canyon, Leo Carrillo and Cheeseboro. ERC is a number related to the available energy within the flaming front of a fire. Since ERC represents the potential "heat release" per unit area in the flaming zone, it can provide guidance to potential fire activity (Schlobohm and Brain, 2002).

Figure 4 Energy Release Component for SMM SIG



The fuel moisture of the live fuels is a second component of an escalating fall fire season. Through the course of the year, live vegetation dries to a point where the fire behavior characteristics generated from burning this live vegetation approaches that of the dead fuel within the fuel complex. This live fuel moisture content, where live fuels burn an intensity approaching that of dead fuel is referred to as the "Critical Live Fuel Moisture". The moisture level where fuel is deemed "critically dry" by Los Angeles County Fire Department is 60%. Based on historic fuel sample records from Los Angeles County Fire, live fuels historically approach this level in September/October (Figure 5).

Figure 5 Malibu Live Fuel Moistures, 1981 - 2011



A recent study found that fire behavior (and the potential for large fires) in the SMM increases dramatically when live fuel moisture reaches 71-77% (Dennison, P. E., Moritz, M. A., and R. S.

Taylor. 2008). This is broadly consistent with other published studies, and suggests that the 60% standard for "Critical Live Fuel Moisture" may be an overly conservative assessment of fire hazard in the Study Area.

Even with a fire environment where fuel, weather and terrain sometimes can combine to support major wildfires, firefighters are successful in containing most fires to less than one acre. The historic success of firefighters is a direct result of favorable environmental conditions at the same time of the fires, early fire reporting and a large fire suppression response. However, when an ignition occurs during unfavorable weather or fuel conditions, fires can burn with high intensity and spread rapidly, often destroying structures, infrastructure, watersheds, cultural or historic sites, and natural habitats in their path.

3.1 Fire Ecology

Fire ecology is the science of fire's role in an ecosystem. Since climates and ecosystems change over time, fire ecology also includes the study of fire history and evolutionary change in response to fire.

3.1.1 Fire Regimes Condition Class

Information collected and analyzed by CAL FIRE, show that some of the riparian forests and upland tree types of the SMM probably have a natural historic fire return interval between 35 and 100 years of mixed-severity fires (Fire Regime III). There is probably a natural historic 35- to 100-year return interval of high-severity fire (Fire Regime IV) for the chaparral and coastal sage scrub vegetation in the Planning Area.

Based on a natural fire regime of III and IV, and a fire history interval of 35 to 100 years, all three condition classes (1, 2, and 3) exist in the SMM. According to CAL FIRE, many areas in the SMM are either moderately or significantly altered from their historical fire regime range since more fires are occurring are burning at short fire return intervals.

In many areas of the Planning Area, the shorter fire return intervals are causing a conversion from one vegetation type (i.e. native shrublands) to another (i.e. weedy exotic grasslands). This type conversion creates significant problems, such as an increase in weedy grasslands that are more prone to dry season fire and to wet season slope failure than the native shrublands.

The natural fire regime of the SMM is one of infrequent, high-intensity fires that consume most or all of the aboveground vegetation. The local patterns of summer drought and fall Santa Ana winds occur as a result of large-scale weather patterns that have existed for millennia. Although infrequent high-intensity wildfire is part of the ecology of the SMM, the Planning Area experiences significantly more human-caused fires than ever before (See Figure 6).

3.1.2 Vegetation

There are 107,862 acres (approximately 84%) of natural vegetation in the Planning Area, including chaparral, coastal sage scrub, grasslands, upland tree types, and riparian woodlands (See Table 4). The remaining area (approximately 16%) is agricultural, developed, or disturbed). Additionally, a significant portion of what used to be natural vegetation has been converted into urban and heavily disturbed habitat. Figure 7 displays the spatial distribution of vegetation across the Planning Area.

Figure 6 Planning Area Fire Regime Condition Class

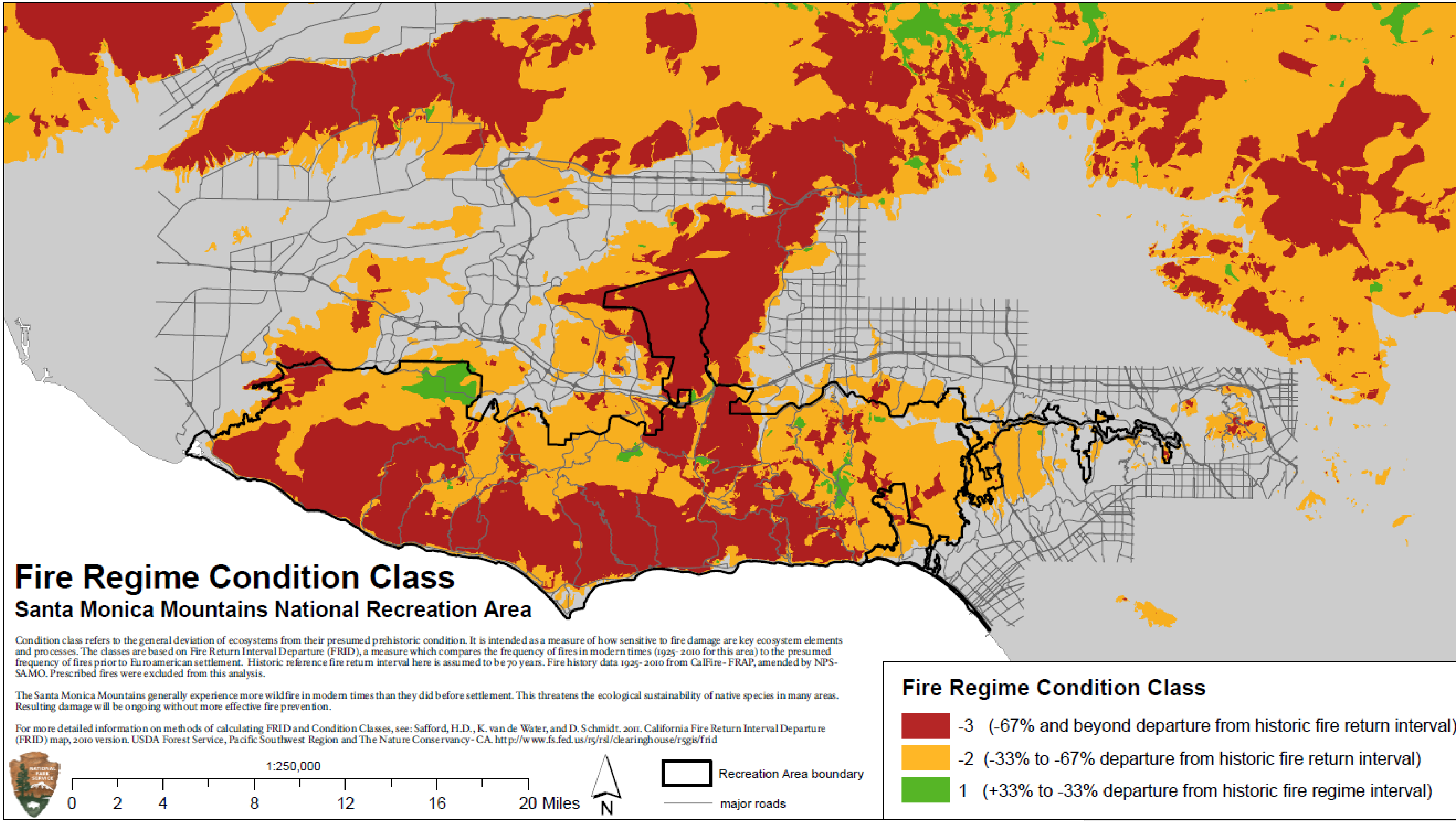
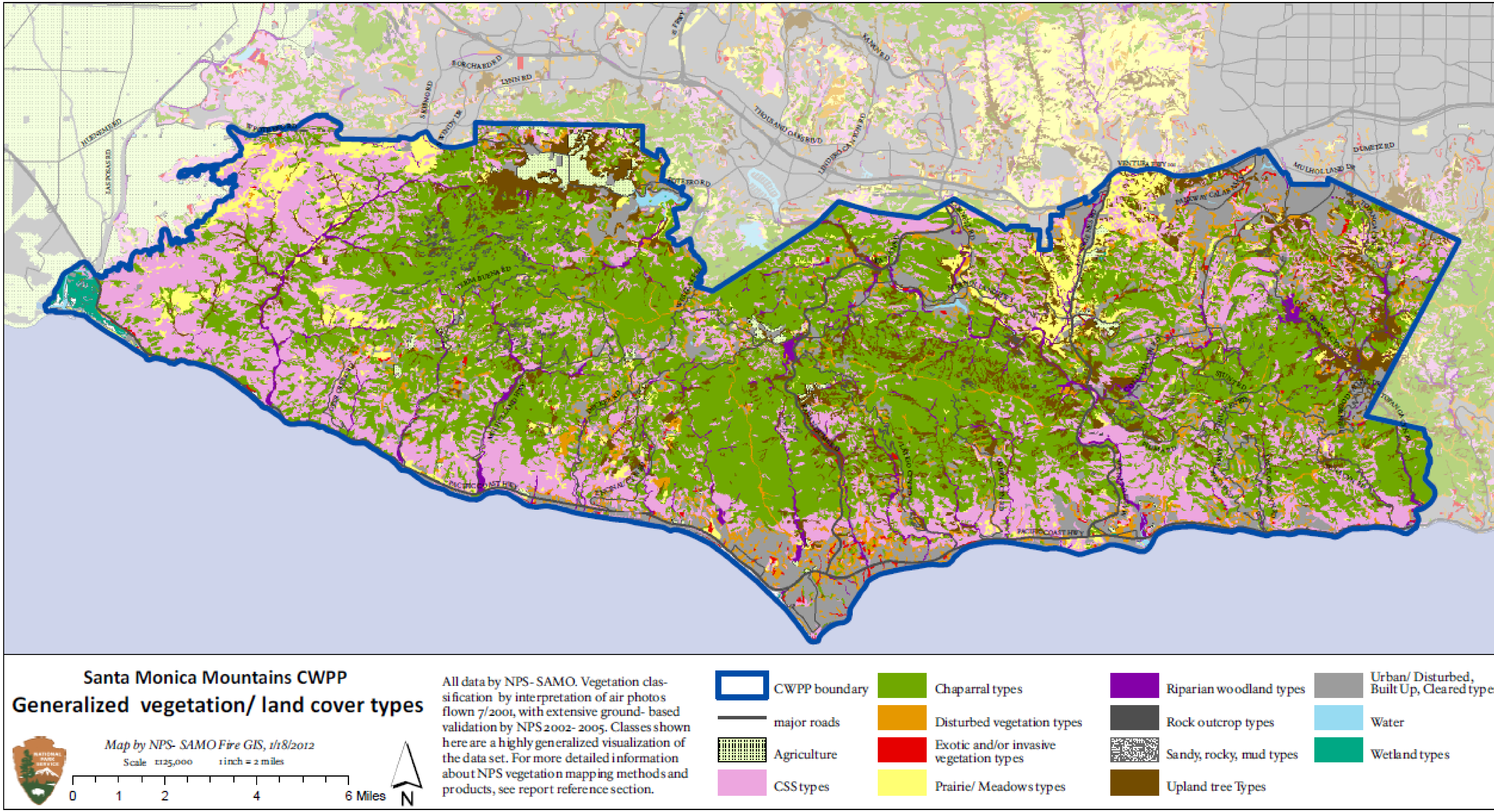


Figure 7 Planning Area Vegetation Map



Map name: SAMO_CWPPvegetation11x17c.mxd Jan 18, 2012, robert_s_taylor@nps.gov

Table 4 Generalized Vegetation with Acres for CWPP Planning Area

Generalized Vegetation/Land Cover Types	Estimated Acres
Chaparral types	54,782
Coastal sage scrub types	32,050
Urban/disturbed types*	18,547
Upland tree types	10,217
Prairie/meadow types (grasslands)	5,906
Riparian woodland types	2,973
Agriculture	1,531
Rock outcrop/sandy/muc	1,533
Exotic and/or invasive	707
Wetland types	401
Water	319
TOTAL	**128,966**
** This "disturbed" vegetation typing includes landslides, cleared areas such as firebreaks, roadside cut banks, and vegetated urban areas.*	

Grasslands

Native grasslands comprise a small portion of the vegetation in the SMM. This vegetation type is interspersed with shrubland vegetation or open woodlands in a patchy and fragmented distribution. Native grassland is most abundant in valleys and other shallow-sloped areas with clay soils that discourage the growth of chaparral or sage scrub.

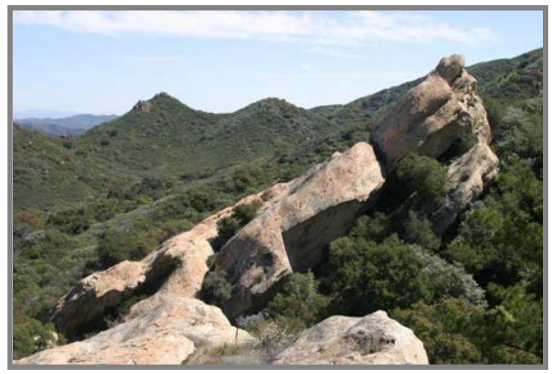
Annual non-native grasslands may be either type converted shrublands or native grasslands type converted to annual grasslands dominated by non-native species. Many of the valley bottoms that are large, relatively level areas were severely grazed or converted to dryland farming beginning in the mid to late 19th century. These actions greatly exacerbated the degradation of native grasslands. The majority of grasslands and former agricultural lands in the Planning Area are dominated by exotic annual grass species and forbs. Exotic grasslands exhibit different ecological characteristics than native grasslands, including altered patterns of soil water availability, nutrient cycling, species composition and species diversity.

Grassland Plant Adaptations to Fire

Native grasslands are resilient to occasional wildfires, with most species able to recover biomass in burned areas within the first or second year post-fire. Bunchgrasses are generally successful in surviving wildfires except when fire follows a severe drought year and causes significant mortality. The grass bunches will resprout from the underground rootstock, and produce an abundance of flowers and seeds in the first year post-fire. Within a few years after wildfire, native perennial grasses successfully reestablish in burned areas except where fires recur in short succession or there is competition from a large pool of invasive exotic species.

Many perennial herbs experience minimal wildfire impact despite increasing fire frequency because they enter dormancy before late summer and early fall when most wildfires occur, and living plant parts are protected below ground. However, early season fires that burn native perennials while they are still actively growing may kill the plants and deplete the seed bank over time. Because grass fires burn quickly over an area, the heat rarely penetrates deeply into the soil, leaving the seed bank viable.

Chaparral



Chaparral is the dominant vegetation type of the SMM. Chaparral vegetation can be extremely dense, and many of the dominant species feature small leathery leaves. At lower elevations, chaparral occurs together with coastal sage scrub and grasslands, often-occupying topographic aspects with moderate soil moisture. Chaparral vegetation becomes more dominant as elevation increases, forming extensive contiguous stands on sites of all aspects. Chaparral includes a diversity of shrub species such as toyon (*Heteromeles arbutifolia*), manzanita (*Arctostaphylus spp.*), several species of Ceanothus, scrub oak (*Quercus berberidifolia*), hollyleaf redberry (*Rhamnus ilicifolia*), two species of sumac (*Rhus spp*.), mountain mahogany (*Cercocarpus betuloides*), and chamise (*Adenostoma fasciculatum*).

Chaparral and the Role of Fire

Chaparral recovery after fire has been termed “autosuccessional” because the plant community regenerates from endogenous seeds and resprouting rootstocks that are already present in the soil. Shrub species that are able to reproduce by seeds and also by resprouting are called facultative sprouters. Other shrub species either reproduce exclusively from seeds (obligate seeders) or from sprouting rootstocks (obligate sprouters). In the first two years after fire, in addition to regenerating shrubs, there is an abundance of herbaceous species, some of which are specialized "fire followers". These herbaceous plant seeds remain dormant in the soil until germination is triggered directly or indirectly by fire. Soil seed banks are therefore a significant source of plant diversity in chaparral systems.

Because of the apparent resilience and the vigorous regrowth after wildfire, chaparral has falsely been considered to be one of the classic examples of a fire adapted plant community that required frequent fire. The coastal chaparral of the SMM is in fact adapted to a fire regime of large, intense, infrequent, wildfires. The coastal chaparral can be damaged by short fire return intervals and high fire frequencies. Slow growing obligate seeder species (i.e. some *Ceanothus* and *Arctostaphylos* species) can be eliminated by a short fire return interval between fires because the second fire kills the young plants before they have had time to replenish their soil seed bank (Fross, and Wilken, 2006; Jacobsen et al. 2004).

Facultative sprouters usually suffer some degree of mortality after fire and are therefore susceptible to population declines from repeated fires. While obligate sprouter species experience the least post-fire mortality, there are differences among species and the more sensitive of these can also experience some population declines from repeated fires.

Coastal Sage Scrub

Coastal sage scrub (CSS) is most abundant on the lower slopes of the Planning Area. This vegetation type often occurs in a mosaic pattern with chaparral vegetation at lower to mid elevations where it can survive drier sites with shallow or rocky soils or on south-facing slopes. This vegetation type shares many of the annual and perennial herbaceous plant species found in chaparral. Commonly found species in this plant community include California sagebrush (*Artemisia californica*), several species of sage (*Salvia mellifera, Salvia leucophylla,* and *Salvia apiana*), ashyleaf buckwheat (*Eriogonum cinereum*), California buckwheat (*E. fasciculatum*), chaparral yucca (*Hesperoyucca whipplei*), coyote brush (*Baccharis pilularis*), laurel sumac (*Malosma laurina*), and lemonadeberry (*Rhus integrifolia*).

Coastal Sage Scrub Recovery after Fire

Compared to chaparral, coastal sage scrub vegetation contains large amounts of fine fuel and can exhibit intense and rapid moving fire behavior earlier in the season than chaparral. The live fuel component of CSS changes much more rapidly than that of chaparral so that it reaches a critical threshold earlier and recovers from seasonal drought sooner than chaparral.

Coastal sage scrub species exhibit a range of post-fire responses from obligate seeders to obligate sprouters with the exception of the large evergreen species such as laurel sumac (*Malosama laurina*) and Lemonadeberry (*Rhus intergrifolia*), these plants are weakly woody subshrubs (i.e. *Salvias*) and suffrutescents (i.e. *Lotus, Mimulus aurianticus*). Fire intensity and increasing age of plants both adversely affect post-fire recovery. CSS species are much more variable in their post-fire survivorship and seedling recruitment than chaparral species and it is much more difficult to predict the post-fire trajectory of CSS composition following fire. Several small sites with CSS have been observed to be extirpated following small fires (Witter, pers.obs.) Unlike most chaparral species, CSS resprouts often produce large amounts of seed that contribute to abundant seedling recruitment in the second year following a fire.

Coastal Sage Scrub Plant Adaptations to Fire

Many species found within the coastal sage scrub vegetation type are also found within chaparral. For these species, many of the sage scrub plant adaptations to fire fit the description given for chaparral. A major difference between chaparral and coastal sage scrub is the relatively minimal presence of obligate seeders in coastal sage scrub and the greater dominance of non-woody species. Although the majority of the shrub species found are considered facultative seeders/sprouters, many of the perennial herbs are obligate resprouters. As in chaparral, coastal sage scrub has a diverse community of herbaceous flora that grows in the first several years following a fire.

Upland Tree Types

Three distinct plant communities comprise this vegetation type: coast live oak, valley oak savanna, and walnut woodlands. Of these, coast live oak is the most widespread. Coast live oak (*Quercus agrifolia*) is found on moderately moist north slopes or in shaded ravines and canyons. Structure of coast live oak woodlands vary from closed-canopy stands on wetter sites to open-canopy stands on drier sites, where trees can be found in association with chaparral, CSS or grassland vegetation types.

Valley oak (*Quercus lobata*) savanna occurs primarily on deep alluvial soils in valley bottoms and low-elevation foothills, where the oaks are widely interspersed in grasslands. It is believed that historically, valley oak savannas consisted of native perennial bunchgrasses, but today non-native annuals are dominant.

Native California walnut (*Juglans californica*) woodlands have a very restricted distribution in Southern California; in the SMM they are mostly limited to small patches on the western slopes of the mountains above the interior valleys with deep clay soils. The associated understory can include grasslands, coastal sage scrub, or chaparral.

Upland Tree Types and their Response to Fire

Due in part to its very thick bark, coast live oak is the most fire-resistant of the California oaks. In addition to root sprouting, coast live oak trees have the ability to resprout directly from the central trunk or from the main branches. Coast live oaks are able to resprout, even from heavily charred trunks, to recover normal branch architecture and crown within approximately five years (Dagit 2002, NPS, 2005). Mature valley oaks are also quite fire-resistant and are capable of resprouting from rootstock or from branches and the main trunk following wildfire. While larger valley and coast live oak trees usually survive wildfires, depending on fire severity, growth in surviving trees may be diminished for one to several years following fire (NPS, 2005). Fire normally top kills oak tree seedlings and smaller saplings, but many of these will resprout.

Walnuts have thin bark, and aboveground portions of the tree are easily top killed by fire. Older walnut trees have a sub-soil woody root platform that protects much of the belowground parts of the tree from severe wildfire effects. As a result, mature walnuts survive even severe fires and regenerate by resprouting. The multi-stemmed trunks of many walnuts in the SMM's attest to their past fire history.

Riparian Woodlands

Riparian woodlands occur along canyon and valley bottoms with perennial or intermittent streams in nutrient-rich soils, or at the bottom of steep drainages. The riparian community contains the greatest species diversity of all the plant communities in the SMM (Rundel, 1998). The most common species are coast live oak (*Quercus agrifolia*), sycamore (*Platanus racemosa*), arroyo willow (*Salix lasiolepsis*), black willow (*Salix laevigata*), alder (*Alnus rhombifolia*), California black walnut (*Juglans californica*), Mexican elderberry (*Sambucus mexicana*), California bay laurel (*Umbellularia californica*), and mule fat (*Baccharis salicifolia*).

Riparian Woodlands and Recovery from Fire

Fire severity is often much lower in the shaded, cool, and moist conditions of riparian areas than on the surrounding shrub covered slopes and ridges. Most commonly, riparian plants are scorched or the outermost portion of the tree canopies burned. Oak, sycamore and willows are all strong resprouters and if fire severity is low, the structure of the riparian canopy can quickly recover after fire. In rare cases, entire trees can be consumed. While these can recover by resprouting, years are required to restore the pre-fire woodland canopy cover. Alders, in comparison to the other riparian species, are very fire sensitive and often display delayed mortality, falling in the first several years after fire.

3.2 Climate

The Köppen-Geiger Climate Classification System (http://koeppen-geiger.vu-wien.ac.at/index.htm) classifies the SMM as "Mediterranean". The Coastal area is more specifically classified as "Mediterranean cool summer" with fog (Köppen-Geiger system defines these areas as having more than 30 days per year of dense fog) and the area inland from the coastal fog belt is classified as "Mediterranean warm summer" where the average temperature of the warmest month exceeds 71.6° F (22° C).

The majority of rainfall occurs in occasional multi-day events from November through April with the greatest amounts usually occurring in January and February. The Planning Area also experiences annual dry seasons that can range from six- to eight-months. These long dry seasons, typical of the Mediterranean climate, are conducive to a prolonged fire season every year.

3.2.1 Climate Change

Climate change is already affecting California with an increase in average temperatures, fewer cold nights, lengthening of the growing season, shifts in the water cycle with less winter precipitation falling as snow. Early season runoff (both snowmelt and rainwater) and drought conditions may become more frequent and persistent over the 21st century. With California getting warmer, an increase in the frequency, intensity, and duration of heat waves and more extreme hot days are expected. The intensity of extreme weather events, such as heat waves and droughts, create situations where wildfires are likely one of the earliest climate impacts that we may experience in the future (State of California SHMP, 2010). These changes will certainly affect current water sources, the frequency and behavior of wildfires, and the timing and length of fire season throughout California including this Planning Area.

3.3 Fire History

Fire history provides context for the characteristics (frequency, cause, size, seasonality) of future fires. Fire history can help identify ignition patterns that can be targeted for enhanced fire prevention efforts. For example, if there is a history of frequent fires along a well-traveled route, roadside management practices can be re-evaluated. Databases of fire occurrence, such as those maintained by the National Park Service and the California Department of Forestry and Fire Protection (CAL FIRE) are resources to assist in fire management efforts to evaluate the way fires have changed over time.

Table 5 below shows that a majority of wildfire activity is human-caused with 97% of fire starts and greater than 99% of the annual area burned in the SMM linked directly to human activity. Of the acres burned by known ignition sources, 72% are due to arson and 19% due to arcing power lines (NPS, 2005). These wildfires tend to occur during the hot, dry winds of the fall when the area is most vulnerable to large fires.

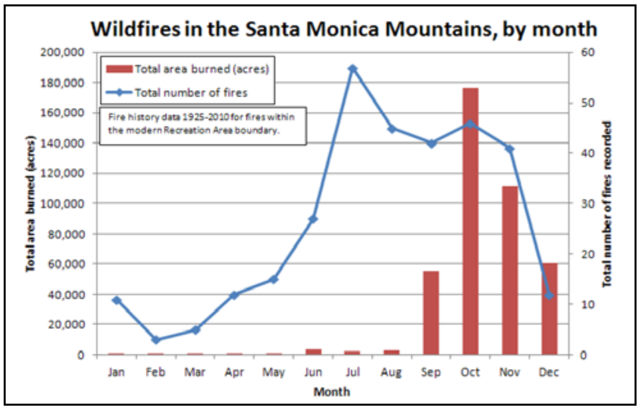
Table 5 Burned Area in the Planning Area by Cause Since 1925

Cause	Number of Fires	Total Acres
Arson	14	78,118.6
Power Line	16	20,467.7
Other/Unknown	69	6,377.9
Warming Fire	1	4,707.0
Smoking	6	809.6
Lightning	6	602.5
Fireworks	4	281.1
Playing with Matches	7	148.1
Cooking Fire	9	69.6
Land Clearing	4	54.4
Trash Burning	2	54.3
Burning Building	2	51.2
Burning Vehicle	15	40.4
Aircraft	2	31.1
Exhaust – Power Saw	5	19.0
Burning Dump	3	0.4
Exhaust – other	1	0.2
Burning Brush Pile	1	0.1
Total	**190**	**115,956.0**

Current patterns of wildfire activity show a trend of increasing annual area burned. Figure 7 shows total number of reported fires and total area burned by decade in the Santa Monica Mountains National Recreation Area. The number of fires has increased steadily over the last 70 years, increasing as human population increases. The total area burned has been highly variable from decade to decade, but the long term trend has been fairly constant. The statistics on total area burned are strongly influenced by the very largest fires, which occur only once every few years or even decades. Large fires are more likely to occur during or in the years immediately following droughts.

It is important to recognize the numerous mechanisms of human caused fires. Fires recorded with "unknown" causes are human caused ignitions. Most of those occurred along roadsides or near other human infrastructure. Any fire start can result in a large fire when aligned with adverse fire conditions. The graph below shows the SMM's correlation between ignitions, fire size, and fire season.

Figure 8 Wildfires in Planning Area by Month



The SMM has a history of large and destructive wildfires (See Appendix C for full list). Since 1925 to the present, the following are the 20 largest wildfires in the Planning Area:

Table 6 20 Largest Wildfires in the Planning Area

Fire Name	Date	Total Area (acres)	Cause
Clampitt	09/25/1970	115,537	Power line
Dayton Canyon	10/09/1982	43,096	Arson
Green Meadow	10/26/1993	38,478	Arson
Sherwood/ Zuma	12/28/1956	35,169	Unknown
Wright	09/25/1970	28,202	Unknown
Malibu	10/23/1935	28,195	Unknown
Kanan	10/23/1978	25,588	Arson
Topanga	09/28/2005	23,396	Arson
Devonshire-Parker	10/15/1967	23,093	Unknown
Simi Hills	10/31/1949	20,578	Unknown
Potrero # 42	11/00/1930	20,391	Unknown
(unnamed)	12/02/1958	18,119	Unknown
Old Topanga	11/02/1993	16,202	Arson/Power line
Woodland Hills # 65	11/06/1943	14,919	Unknown
Topanga # 50	11/23/1938	14,532	Hot Coals Dumped
Ventu Park	11/07/1955	13,956	Unknown
Potrero	09/06/1973	12,297	Unknown
Calabasas	10/21/1996	12,189	Power line
Hill Canyon	10/28/1980	11,975	Unknown
Santa Ynez	11/06/1961	7,847	Unknown

Figures 9 and 10 on the following pages show the spatial distribution of wildfires by decade beginning in 1925.

Figure 9   Planning Area Wildfires 1970-2008 Map

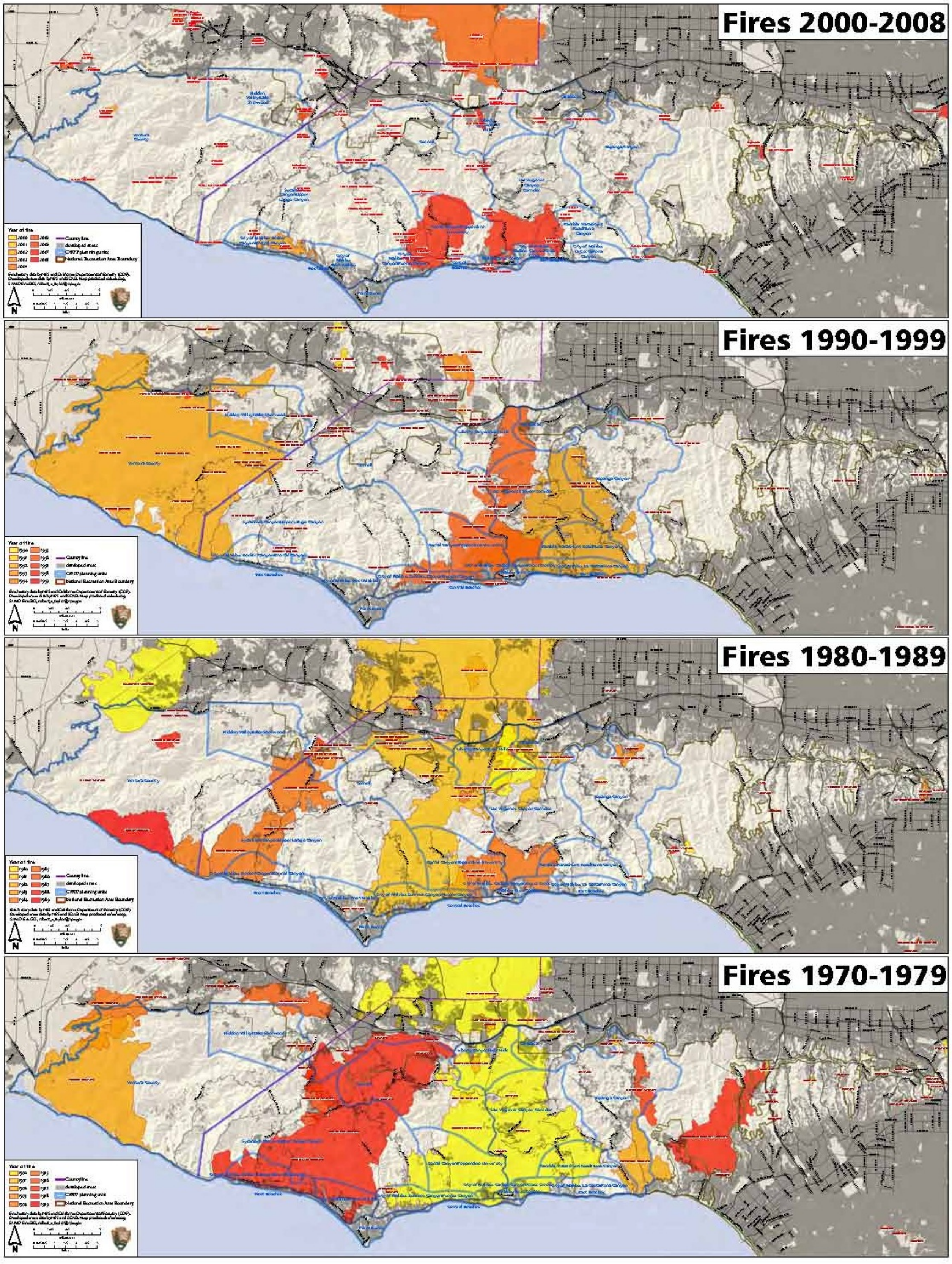
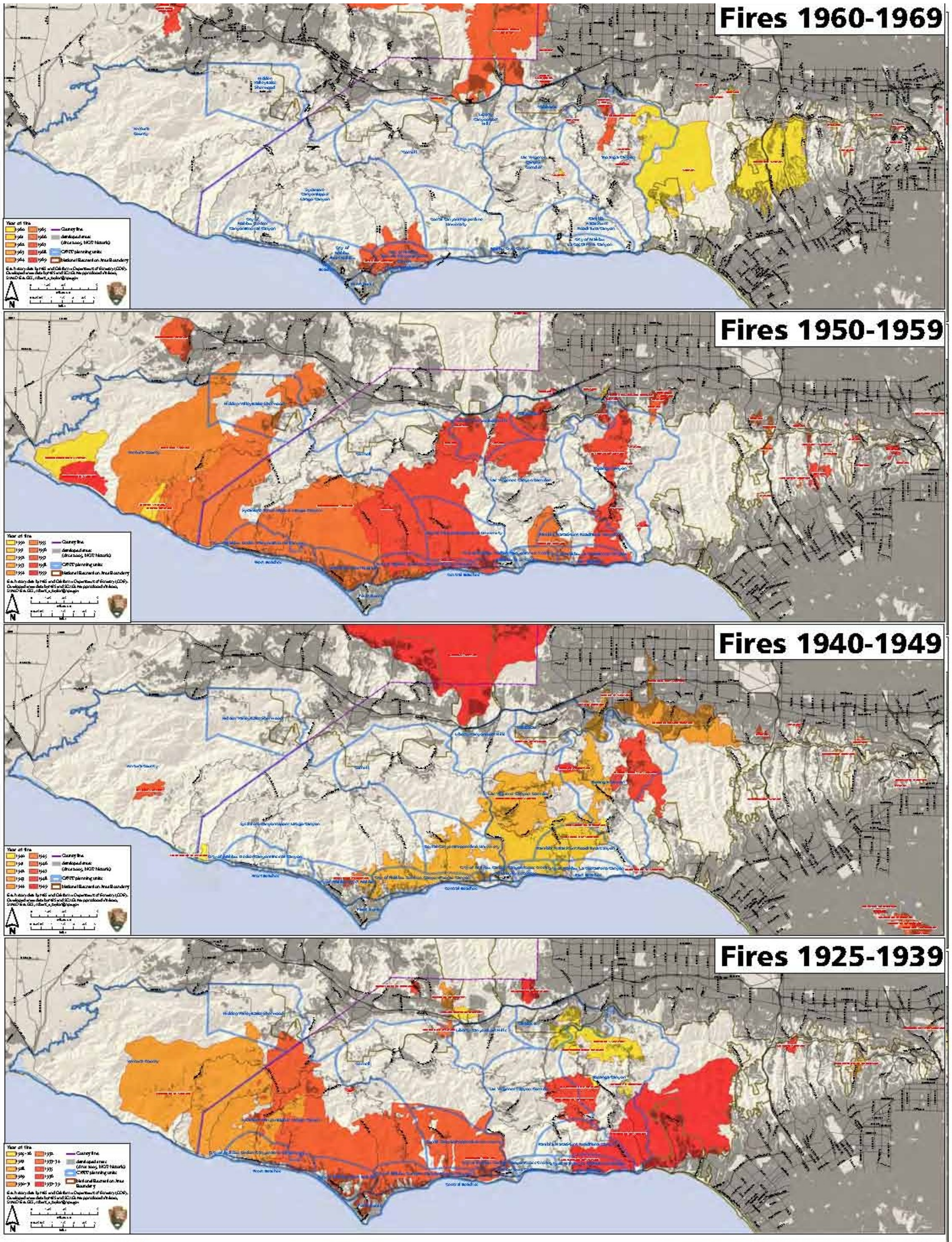


Figure 10 Planning Area Wildfires 1925-1969 Map



3.4 Wildland Fire Environment

The interaction of fuel, topography, weather, and the fire itself, affect the likelihood of a wildfire starting, the speed and direction at which a wildfire will travel, the intensity at which a wildfire burns, and a firefighter's ability to control or extinguish it. This section will describe the wildland fire environment in the Planning Area

3.4.1 Fuel

Firefighters are trained to assess vegetation in terms of its fuel properties, i.e. its potential to burn. The NWCG Glossary of Wildland Fire Terminology defines a fuel complex as: "fuel volume, type, condition, arrangement, and location that determines the degree of ease of ignition and of resistance to control". To plan effectively for fire safety, it is useful to learn some of what firefighters know about fuel.

Source: NPS

Wildland vegetation is the primary fuel source for wildfires and is the most important factor in determining fire hazard in wildlands. In the wildland urban interface and urban landscapes of our communities, both wildland vegetation and many kinds of urban fuel present the hazard. Human-created sources of fuel or urban fuel such as structures (i.e. homes, commercial businesses, outbuildings, etc), ornamental vegetation used for landscaping, vehicles, fuel tanks, decks, fences, and anything else that can burn contribute to the fire environment, significantly affecting fire behavior and the overall hazard level of an area. Current fire models are not capable of modeling the hazards of urban fuel. This section only addresses wildland vegetation as the fuel source.

3.4.1.1 Fuel Characteristics

The principal characteristics of fuel that affect fire behavior include fuel type, fuel moisture, amount of fuel or "fuel loading", chemical properties, horizontal continuity, and vertical arrangement. Each of these characteristics contributes to one or more fire behavior processes. More than forty years of ongoing research on fire behavior modeling at U. S. Forest Service Fire Labs has produced a suite of standard tools and methods that are widely used by wildland fire fighters and fire scientists to model wildland fire hazard. Methods of treating fuels to modify potential fire behavior and mitigate fire hazard have also been devised, implemented, and assessed for effectiveness on actual fires. Understanding the fire behavior characteristics of wildland vegetation facilitates effective fuel treatment strategies.

3.4.1.1.1 Fuel Types

Fuel types within and adjacent to the Planning Area include grasses, shrubs/brush, woodlands, litter, and understory. Fuel types naturally change slowly over time; however, the potential for fire behavior can change drastically when fire is burning from one fuel type to another.

3.4.1.1.2 Fuel Moisture

Fuel moisture is a very dynamic variable controlled by seasonal, daily, and immediate weather changes. The moisture of living and dead fuel is a critical component for influencing wildland fire behavior. Vegetation is more flammable when fuel moisture levels are low and less flammable when fuel moisture levels are high. The amount of moisture in a fuel will largely determine whether it will burn or not.

Dead fuels act very much like a sponge absorbing moisture from the air. The more moisture in the air, the more moisture is absorbed by the dead fuels. Conversely the drier the air, the drier the dead fuel. Timelag is the time it takes for the dead fuel moisture content to reach 63% of its Equilibrium Moisture Content with the surrounding environment. Timelag is expressed as a rate usually in hours (See Table 7).

Table 7 Dead Fuel Moisture & Timelag Relationship to Fuel Size

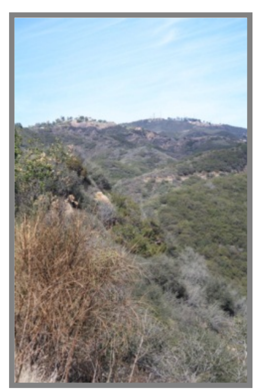
Timelag	Diameter of Fuel (inches)	Examples
1-hour	Less than ¼	Annual dead grasses
10-hour	¼ to 1	Dead and down small branches and twigs
100-hour	1 to 3	Dead and down branches, logging slash
1,000-hour	3 to 8	Dead and down branches, logs, standing dead timber

Live fuel moisture is the moisture in living vegetation. In the Planning Area, live fuel moistures is lowest in the late summer and fall then rises with the winter rains, generally peaking in March or April. Eighty-percent live fuel moisture in chamise has a threshold value below which the probability of large wildfires increases (Dennison, Moritz, 2009). Fire professionals consider a critical live fuel moisture threshold in chamise of 60% at which live fuels burn as if they are dead fuels.

3.4.1.1.3 Fuel Loading

Fuel loading is the weight of dry fuel per unit area (tons per acre, for example). Fuel loading varies greatly by fuel types. Generally, grassland areas may produce fuel loadings of 1 to 5 tons per acre, while brush species such as chaparral may produce 20 to 50 tons per acre.

For all fuel types, greater fuel loading means fire will produce more heat per unit area. Fireline intensity is a function of the fuel loading times the fire rate of spread. Different fuel types burn with different rates of spread under the same fuel moisture and weather conditions. Various heavily loaded shrub fuel types are well known for producing extreme fire behavior when they burn. However, it’s important not to underestimate the potential for extreme fire behavior in lightly loaded fuel types. When pushed by wind and/or burning upslope, fire can spread through lightly loaded grass and grass/shrub fuel types much faster than it spreads through heavily loaded shrub and forest fuel types.



3.4.1.1.4 Chemical Properties

Chemical properties include the presence of volatile substances such as oils, resins, wax, and pitch in the fuel, especially in chaparral. Fuels high in volatile compounds may have a higher heat content (produce more heat per pound) than other fuels. As the summer progresses, an increase in ether extractives, oils, ash, or mineral content occurs resulting in increasing combustibility in various plant species (Philpot, Mutch, 1971). Ether extractives in many species can rise from 8.3 to 15% during the summer, making foliage more easily ignited (Philpot, 1969). An extractive content over 10% indicates high crowning potential (Philpot, Mutch, 1971).

3.4.1.1.5 Horizontal Continuity

The horizontal continuity of fuel describes the uniformity or patchiness of fuels across the landscape, and affects the ability of fire to spread. Where continuous fuels exist, surface fire can spread unimpeded. The fuelbed in the Planning Area is mostly continuous allowing fire to spread very quickly. In areas where the fuelbed is patchy, surface fire spread may be interrupted but fire can still spread wherever burning embers from a wildfire can be carried through the air by a smoke column and/or wind then dropped on to a receptive fuelbed elsewhere on the landscape.

3.4.1.1.6 Vertical Arrangement

Vertically arranged fuels are those that can carry fire from the ground layer up into the canopy of trees. The vertical structure that allows fire to transition from a surface fire to a crown fire is referred to as "ladder" fuel. Examples of ladder fuels in the SMM's are grasses that are not mown, low shrubs, vines, and taller shrubs. Crown fire models predict that surface fire can begin making the transition to a crown fire in a forest wherever surface fire flame lengths exceed about one-half the height to the base of the canopy. Many fuel modification projects are based on removing ladder fuels and increasing the height of the canopy base to keep surface fires from becoming crown fires.

3.4.1.2 Wildland Fuel Models

Fuel properties for many common kinds of vegetation have been collected and generalized into sets of standard wildland fuel models for predicting fire behavior. A wildland fuel model is a standardized simulated vegetative fuel complex that specifies all fuel descriptors required for the solution of a mathematical fire spread model. Fuel models characterize distinct distributions of fuel loading found among surface fuel components, size classes, and fuel types. Criteria for choosing a fuel model considers that fire burns in the fuel stratum best conditioned to support fire. This means situations can occur where one fuel model represents rate of spread more accurately and another best depicts fire intensity. All commonly used modern fire behavior models are based on a mathematical model for fire spread developed by U. S. Forest Service fire scientist R. C. Rothermel (1972), which requires measurements of the following several fuel properties as input:

- Fuel load by category (live and dead) and size class (0-0.25", 0.25-1.0", and 1.0-3.0" in diameter).
- Surface-area-to-volume (SAV) ratio by category and size class
- Heat content by category (amount of heat produced per unit weight of fuel burned)

- Fuelbed depth (a measure of the vertical arrangement of fuels)
- Dead fuel moisture of extinction (moisture content level at which a fire stops burning)

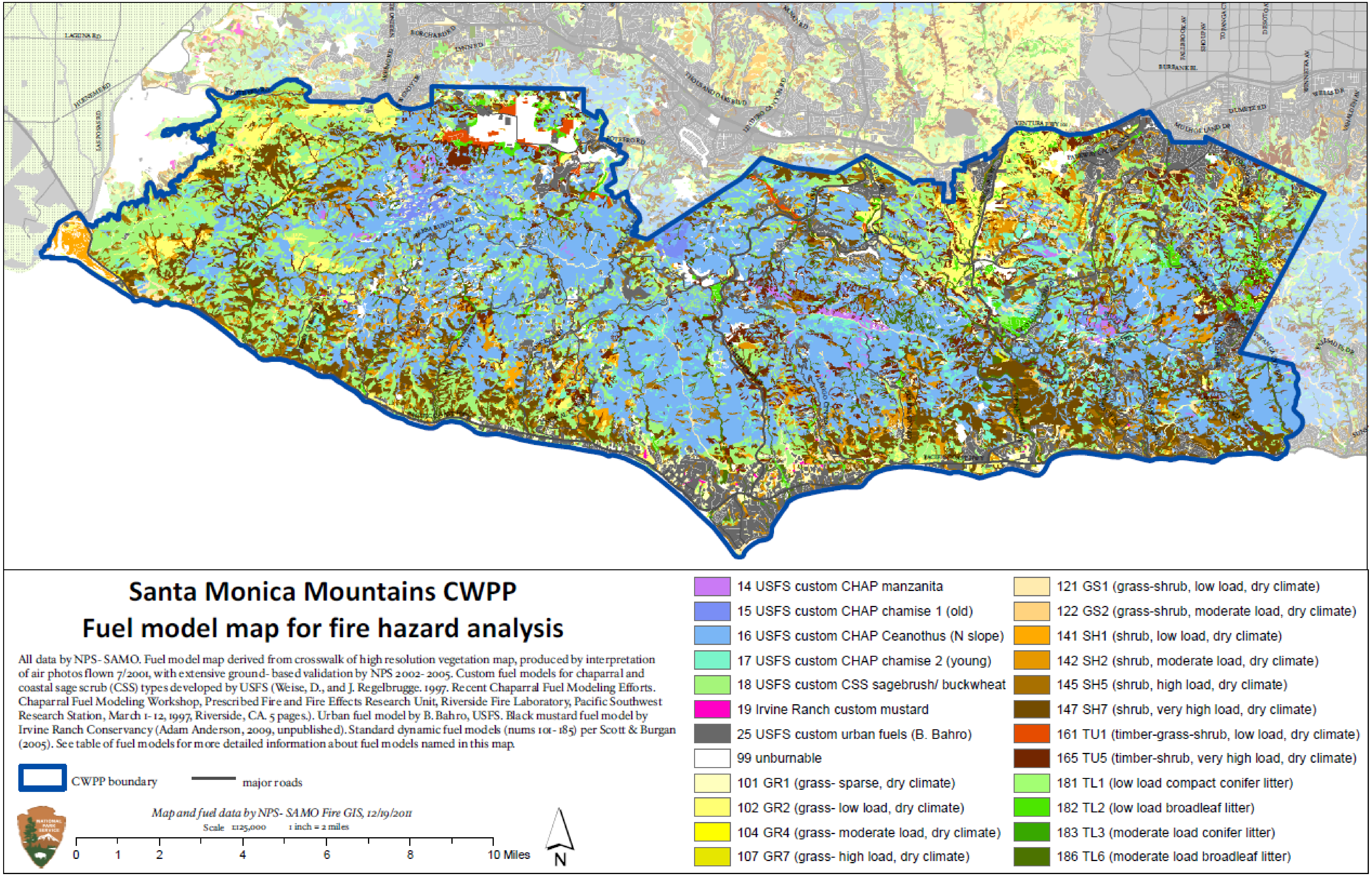
Behavior of the initial flaming front of a wildfire is determined almost entirely by properties of the fine fuels (the smaller size classes), which ignite easily and burn rapidly (often releasing most of their heat in less than one minute). Progressively larger fuel classes generally burn only if the finer fuel classes make enough sustained heat to ignite them and if they are dry enough to keep burning. Mid-sized fuels (especially dead fuels) can produce large numbers of embers and increase potential for spot fires. The largest size classes of fuel (a large downed log, for example) may continue to burn steadily for many hours after the initial flaming front has passed, creating local hotspots that are lingering potential sources of embers. Larger fuels also increase the amount of cumulative soil heating that occurs right where they burn, which can affect survival of seeds.

The fire behavior modeling associated with this CWPP analysis utilized Joe Scott and Robert Burgan's Standardized Fire Behavior Models (2005) and customized fuel models that better represent the fuels and expected fire behavior within the Planning Area. See Table 8 and Figure 11 Planning Area fuel models used in the analysis (Appendix D provides a more detailed description of fuel models).

Table 8 Planning Area Fuel Models

Fuel Model	Description
14	Chaparral, Manzanita *(Arctostaphylos* sp.)
15	Chaparral, Chamise 1- year old *(Adenostoma fasciculatum)*
16	Chaparral, north slope (*Ceanothus sp).*
17	Chaparral, chamise 2-young *(Adenostoma fasciculatum)*
18	Coastal Sage Scrub (*Artemisia californica*, *Eriogonum* sp.)
19	Black mustard *(Brassica nigra), dense*
101	GR1 (grass- sparse, dry climate)
102	GR2 (grass- low load, dry climate)
104	GR4 (grass- moderate load, dry climate)
107	GR7 (grass- high load, dry climate)
121	GS1 (grass-shrub, low load, dry climate)
122	GS2 (grass-shrub, moderate load, dry climate)
141	SH1 (shrub, low load, dry climate)
142	SH2 (shrub, moderate load, dry climate)
145	SH5 (shrub, high load, dry climate)
147	SH7 (shrub, very high load, dry climate)
161	TU1 (timber understory-grass-shrub, low load, dry climate)
165	TU5 (timber understory-shrub, very high load, dry climate)
181	TL1 (timber litter, low load compact conifer)
182	TL2 (timber litter, low load broadleaf)
183	TL3 (timber litter, moderate load conifer)

Figure 11 Planning Area Fuel Model Map



Map name: SAMO_CWPPfuel11x17.mxd   Dec 19, 2011, robert_s_taylor@nps.gov

3.5 Weather

Weather is the most variable element in the wildland fire environment and the least predictable. The components of weather, or more specifically fire weather, are temperature, relative humidity, precipitation, wind, and atmospheric stability that influence fire ignition, fire behavior, fire danger, and fire suppression.

Weather can be dramatically different between the coastal and inland areas (approximately 3 – 4 miles from the coast) within the Planning Area. Along the coast, both winter and summer temperature extremes are moderated but the interior canyons and valleys become hotter in summer and cooler in winter.

Average high temperatures for the immediate Coastal areas can range from the 60s to low 70s with temperatures sometimes reaching over 100 in the late summer and fall during Santa Ana wind events. Historically, September is the warmest month and January is the coolest. During the day winds are generally light ranging from 3-9 miles per hour predominately from the sea in an onshore flow from the west to west-southwest (29% of the time) (Leo Carillo RAWS, 2012). At night, airflow patterns reverse and travel towards the sea in an offshore flow.

Inland area high temperature averages range from the high 60s to the mid 90s with temperatures exceeding 110 degrees. The average coolest month is December and the warmest month is August. The relative humidity can range from the single digits to 100%.

Average relative humidity can range from mid 30 to lower 60% across the Planning Area. During the summer, a marine layer of fog is common along the coast during the morning hours, but dissipates by early afternoon. Early in the morning, inland valleys may be blanketed in fog, but as temperatures increase, the fog dissipates until it crests the mountains and is vaporized or pushed out to sea. Rainfall can range from 4 - 43 inches, averaging around 15-inches a year. For the most part, there is no significant rainfall from June through August. Fog occurs fairly frequently in the area with the summer and fall having the highest number of days with fog.

Source: City of Malibu

Santa Ana winds are a significant fire weather influence. During the fall and early winter, high pressure over the Great Basin area creates winds on the southern side of the high that blow east towards the Pacific Ocean and areas of lower air pressure offshore. The easterly winds push dry air from the inland deserts of California and the Southwest over the mountains between coastal California and the deserts. As the air descends from mountains it is compressed, temperatures increase and relative humidity can drop into the single digits. These hot and dry winds dry out live and dead vegetation supporting rapid ignition and fire spread.

Many canyons in the Planning Area are oriented north to northeasterly, which is parallel with the Santa Ana winds. These canyons channel the winds, increasing the wind speeds. A study determined that an average of 20 Santa Ana Wind events occur each season, each lasting approximately 1.5 days (Raphael, 2003).

Santa Ana winds commonly occur between October and February with December having the highest frequency of these wind events. Wind speeds are typically 25 knots (29 miles per hour) below passes and canyons with gusts to 50 knots (58 mph). Stronger Santa Ana winds can have gusts greater than 60 knots (70 mph) over open areas with gusts greater than 100 knots (116 mph) below passes and canyons. The strongest winds frequently occur during the night and morning hours due to the absence of the onshore flow, or sea breeze, from the Pacific Ocean. The sea breeze, which typically blows onshore daily, can moderate the Santa Ana winds during the late morning and afternoon hours.

The combination of high temperatures, low relative humidities, and high winds that occur in the area can create explosive wildland fire burning conditions. It is important to note that fire weather can occur at any time of the year in a Mediterranean Climate; therefore, wildfires can and do occur at any time of the year in the Planning Area. But on average, any given piece of land is very much more likely to burn in the fall during a Santa Ana wind event than at any other time. Although at least a few acres have burned in every month of the year, only about 3 percent of the total area burned in the Santa Monica Mountains in recorded history burned outside the months of September through December.

3.6 Topography

Topography is the configuration of the earth's surface including its relief and the position of its natural and human-made features. It is the most stable of the elements in the fire environment and plays an important role in how a fire will burn. Topography modifies general weather by channeling wind direction, induces slope and valley winds, creates thermal belts, and contributes to the acceleration of Santa Ana Winds. Factors of topography that affect fire behavior include slope, aspect, terrain or land features, and elevation. Of all of the topographic features, the steepness of slope is among the most influential on fire behavior.

The SMM are the westernmost part of the Transverse Ranges of Southern California. They extend from sea level to 3,111 feet at Sandstone Peak, with an average elevation around 1,000 feet. Steep canyons lead north and south from the crest of the east-west running mountain range, forming a rugged landscape of alternating ridges and canyons.

Slopes in the Planning Area range from flat canyon bottoms to extremely steep hillsides. These steep slopes influences the way a wildland fire burns. The steeper a slope, the faster a fire moves uphill. As fire moves uphill, flames "lean" closer to the fuel and radiant heat preheats the vegetation much faster, resulting in ignition and significant growth much sooner than on level ground. Over 75% of the SMM have slopes greater than 20% and over 33% of the slopes are greater than 50%.

The Planning Area includes more area with a south or southwest aspect than with a northerly aspect. The south aspect is usually drier than a north aspect because it experiences longer periods of sunshine with higher temperatures and, lower relative humidities.

3.7 Fire Behavior Characteristics

Fire behavior characteristics describe how a fire will burn, where it burns, how fast it moves, how much heat it releases, and how much fuel it consumes. The diversity of fuel, topography, and weather patterns in the Planning Area creates a fire environment that supports a broad spectrum of fire behavior. Despite a history of severe wildfires with large property losses, most fires within the SMM are successfully suppressed by initial attack firefighters and never develop into a *problem fire* with the associated impacts on residents, recreational users, property and natural resources.

When wildfire starts under moderate burning conditions, such as light winds, higher humidities, and higher fuel moistures, wildfires have a high probability of spreading as a surface fire, which can be easily contained by the available firefighting resources of Los Angeles and Ventura Counties.

Source: NPS

The fires of most concern to residents and firefighters are the fall wildfires driven by Santa Ana winds. When all elements of the fire environment align, extreme wildfire behavior can occur. Fire behavior observed during these conditions include over 70-foot flame lengths, fires spreading on the surface and in the crowns of shrubs with fire spread in excess of 2-miles per hour and spotting distances of up to 1 mile ahead of the flame front. These fire conditions have resulted in loss of life, loss of structures, loss of infrastructure, and impacts to critical habitat.

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Chapter 4 - Communities at Risk

The 2000 National Fire Plan included a key component that outlined a comprehensive fire management strategy with a commitment to fund a continued level of hazardous fuel reduction and new funding to support community assistance and community protection initiatives. An essential step to implement the new initiative was to identify communities at high risk of damage or destruction from wildfire. Congress directed the Secretaries of Agriculture and Interior to work with states and tribal governments to identify communities within the vicinity of federal lands that are at high risk from wildfire.

In the State of California, the California Department of Forestry and Fire Protection (CAL FIRE) undertook the task to develop a list of "communities at risk" (CAR) and identify the level of fire threat to these communities for the State of California. CAL FIRE used three main factors to determine which communities were at risk and their level of fire threat, these factors include: 1) high fuel hazard, 2) probability of a fire, and 3) proximity of intermingled wildland fuels and urban environments that are near wildfire threats.

The State Forester (CAL FIRE Director) has assigned the task of managing the list to the California Fire Alliance. The California Fire Alliance is a cooperative membership dedicated to the support of pre-fire principles and activities. Partnering agencies include the Bureau of Land Management; Cal Fire; USDA Forest Service; California Fire Safety Council; Bureau of Indian Affairs; Cal Emergency Management Agency; Los Angeles County Fire Department; National Park Service; and US Fish and Wildlife Service. More information is available at the California Fire Alliance website at www.cafirealliance.org.

4.1 Santa Monica Mountains Wildland Urban Interface

The "wildland urban interface" or WUI is a general term describing the area where human development (such as homes and businesses) meets wildland vegetation. It also has a federal definition as the "line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuel as defined in the Federal Register." Within the WUI, specific federal management actions take place in order to reduce fuel risks based on guidelines established by the Healthy Forests Restoration Act (HFRA).

> In 1974, C.P. Butler, a senior physicist at the Stanford Research Institute, coined the term "urban-wildland interface" and described the fire problem as follows: "In its simplest terms, the fire interface is any point where the fuel feeding a wildfire changes from natural (wildland) fuel to man-made (urban) fuel. ...For this to happen, wildland fire must be close enough for its flying brands or flames to contact the flammable parts of the structure (p.3)."

There are three categories of WUI:

Interface Communities – there is a clear line of demarcation between neighborhoods, businesses, public structures and wildland fuels. The wildland fuels do not generally continue into the developed area. It consists of usually three or more structures per acre with shared municipal services.

Intermix Communities – there is no clear line of demarcation. Wildland fuel is continuous outside of and within the developed area. The development density ranges from structures very close together to one structure per 40 acres.

Occluded Communities – generally exists where structures abut an island of wildland fuel (i.e. undeveloped open space). There is a line of clear demarcation between structures and wildland fuels. The development density for an occluded community is usually similar to those found in an interface community but the occluded area is usually less than 1,000 acres in size.

The combination of highly flammable fuel, topography, local weather conditions, and structure ignitability all contribute to put structures, neighborhoods, infrastructure, and commercial businesses in the Planning Area at risk of significant losses due to wildfire. The entire Planning Area is considered WUI.

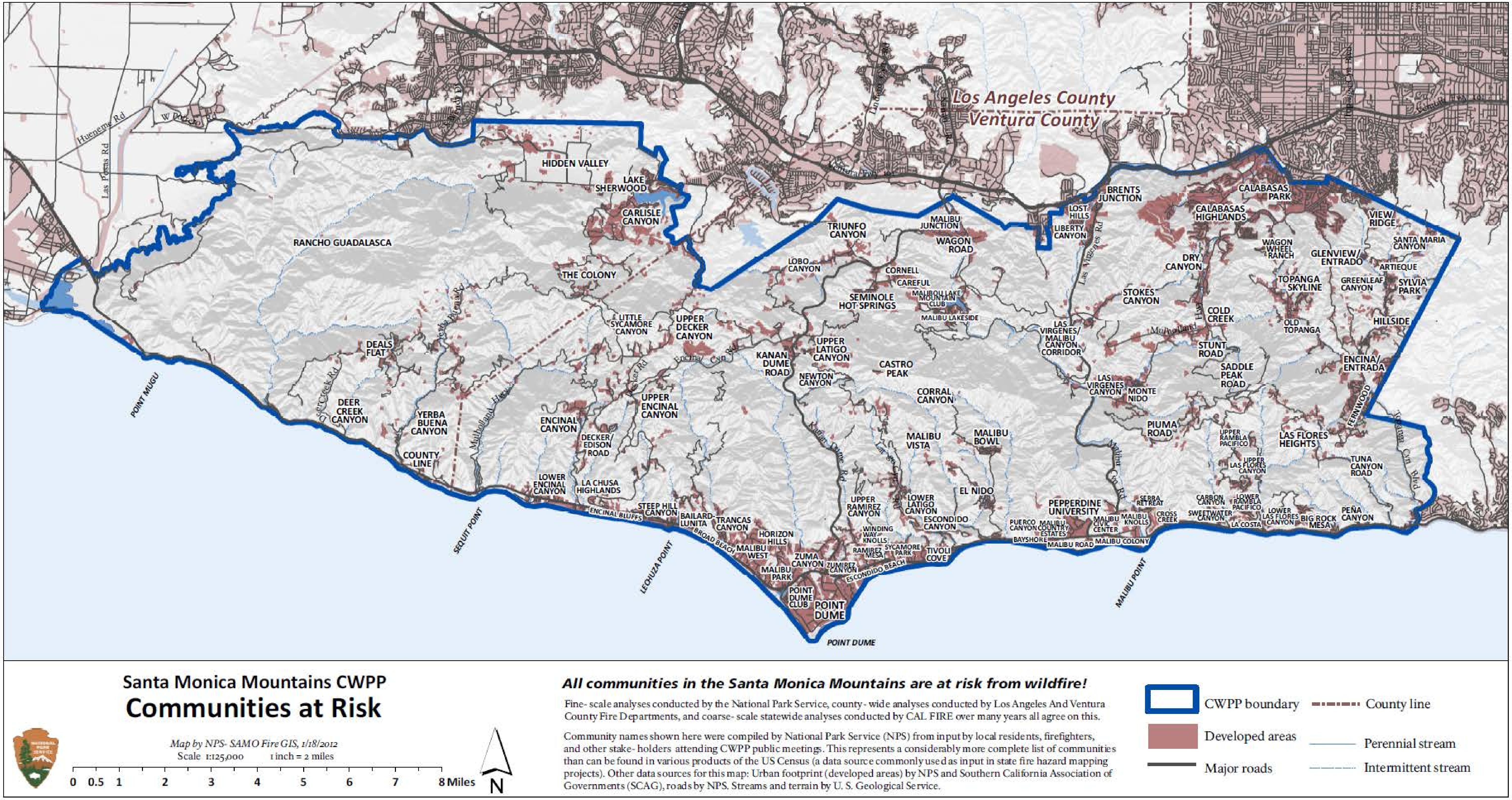
4.2 Designation as a Community at Risk

Fourteen communities in the Planning Area are designated as a "community at risk", all of which are in Los Angeles County including (See Figure 12 for the Planning Area Communities at Risk Map):

- Calabasas
- Cornell
- El Nido
- Fernwood
- Glenview
- Malibu
- Malibu Bowl
- Malibu Vista
- Monte Nido
- Seminole Springs
- Point Dume
- Sylvia Park
- Topanga
- Topanga Park

Any community within the Planning Area that is located in Los Angeles or Ventura Counties not listed on the official CAR list can work with their local fire department to be added to the statewide list. The California Fire Alliance has a process for adding new communities to this list, which is available on their website: www.cafirealliance.org.

Figure 12 Planning Area Communities at Risk Map



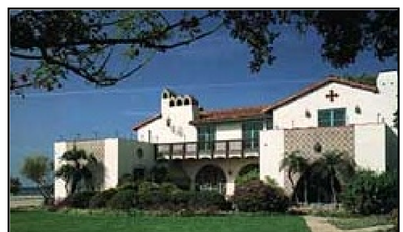
4.3 Natural and Cultural Resource Concerns

Source: NPS/ LA Times

Although infrequent, high-intensity wildfire is part of the natural ecology of the Planning Area. Short fire-return intervals are causing an ongoing process of conversion from one vegetation type (native shrublands) to another (weedy exotic grasslands). Type conversion is a significant problem for several reasons. The weedy grasslands are more prone to wildfire than the native shrublands, are more likely to experience landslides, slope failures, and degrading water quality and are of less value than native ecosystems as habitat for wildlife and threatened and endangered species, as well as a recreational or scenic resource.

Visual and scenic values are a significant natural resource valued by many that live in or visit the Planning Area. The longevity of the natural areas depends on community member's ability to provide for their protection over time. Since wildfire frequently occurs in the chaparral-covered mountains of the Planning Area, it is imperative that residents and visitors take precautionary measures to protect the area's natural resource. In many cases, their current condition is conducive to severe wildfire.

The losses to Area's pre-historic or archeological and historic resources are also a concern. In the Planning Area, archaeological sites are attributed to two Native American groups, the Chumash and the Gabrieliño/Tongva. There are more than 1,500 sites where artifacts have been found in the SMM including nine historic village sites dating from as far back as 5000 BC.[22]



Adamson House, Courtesy: www.adamsonhouse.org/

Hundreds of historic sites in the Planning Area have local importance, including barns, ranches, homestead sites (nearly 1,300 recorded), and local works of renowned architects. Two structures are on the National Register of Historic Places (the Adamson House and Looff's Hippodrome) and fifteen structures on National Park Service land.

These resources are especially susceptible when high intensity fire burns through archaeological sites and unprotected historic sites (usually not designed to withstand wildfire and/or constructed with flammable exterior construction material). The condition or lack of maintenance of historic structures can make them especially vulnerable to damage and destruction in a wildfire.

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Chapter 5 – Hazard and Risk Assessments

A detailed analysis of "Hazard and Risk" was conducted for the CWPP using a combination of fire behavior and wind modeling, and an analysis of historic fire weather data collected from four Remote Automated Weather Stations (RAWS) located within the Planning Area.

For the purposes of this Plan, "Hazard" is defined as the wildland fire intensity output from the fire behavior model FlamMap for site-specific locations within the CWPP Planning Area. FlamMap is a fire behavior mapping and analysis program that computes potential fire behavior characteristics (spread rate, flame length, fireline intensity.) over a GIS landscape for constant weather and fuel moisture conditions (www.firemodels.org, December 2011). The model output of flame length is used in this plan as the indicator of wildfire intensity.

This Plan defines, "Risk" as the probability of fire occurring for lands within the Planning Area. Fire history records for the Planning Area were analyzed to determine the length of time between when a location within the Planning Area burns in a wildfire and when that same land burns a second time. This fire return interval is then converted in the annual probability of a portion of the Planning Area burning. Areas within the Planning Area, which have been burned multiple times during the analysis period are presumed to be at "greater risk" of burning again given historic wildfire burn patterns. For the purposes of the CWPP, areas with fewer wildfire returns are evaluated as being at "lower risk".

Additionally "Risk" identifies areas where wildfire ignitions have occurred and areas where ignitions are likely to occur. Although all homes in the path of a large wildfire are at risk, homes and people located close to ignitions of large fires are at risk due to the sudden onslaught of fire and time it takes for firefighting resources to safely defend structures. Recent fires, the Topanga (2005), Canyon and Corrral (2007) are examples where most of the structures damaged occurred in the initial onset of the fire.

Hazard and risk were examined to establish areas of highest priority for wildfire hazard mitigation treatments, including structure hardening (detailed in Chapter 6).

5.1 Hazard Assessment

Fire hazard is an expression of how intensely a wildfire would burn at a particular location, if it were to burn under specified fuel, wind, and weather conditions. For the CWPP, fire hazard (local expected intensity of wildfire) was modeled using FlamMap 3.0 to calculate local values for expected flame length and other fire behavior characteristics on a realistic terrain model under moderately (but not extremely) dry and windy conditions determined by statistical analysis of local historic weather station data.

Fuels and Topography: The NPS recently completed a detailed vegetation map of the greater SMM and Simi Hills area with a minimum mapping unit of 0.5 hectares. NPS used descriptions of vegetation classes and fuel models to develop a crosswalk between vegetation classes and several different standard and custom fuel model systems with associated estimates of canopy cover, canopy height, and canopy base height for all classes. For the current planning effort, NPS represented fuels using a combination of 16 standard dynamic fuel models (Scott and Burgan, 2005) plus 7 custom fuel models developed by U.S. Forest Service vegetation/fuels specialists (Conrad and Regelbrugge, 1994). The wildland custom fuel models were derived from field data collected in stands of the most common types of coastal sage scrub and chaparral in the SMM. All fuel attributes and terrain data are represented as 30m grids. The grids were combined with text files of wind, weather, and fuel moisture data in a FlamMap “landscape file” for input into the fire model.

The Digital Elevation Model (DEM) of the Planning Area provided by the US Geologic Survey was used without modification in the fire behavior analysis.

Winds and Weather: Data on fuel moisture , daily maximum and minimum temperature, relative humidity, wind speed and direction were derived using FireFamily Plus 4 (a software program used for analysis of weather data and calculation of fire danger indices) and Excel spreadsheets to calculate 90th percentile worst fire weather observed at 4 local permanent remote automated weather stations (RAWS) during the annual fire season (defined as June 1 to November 30) during the years 1982-2009. Ninetieth-percentile weather represents conditions for the worse 10% of weather and fire danger conditions. The resulting model inputs represent conditions of moderately dry (but not extreme) fuel moisture and weather, and mild Santa Ana winds. Conditions like this commonly occur in autumn of almost every year (Appendix D).

To more realistically model local variations in typical fire weather, weather station data was divided into two Special Interest Groups (SIGs). Weather on the coastal side of the crest of the Santa Monica Mountains was represented by a statistical combination of data from two coastal stations (Leo Carrillo and Malibu Hills/Camp 8 = “Coastal SIG”). Weather on the inland side of the crest was represented by a statistical combination of data from two inland weather stations (Cheeseboro and Malibu Canyon = “Inland SIG”).

Wind data obtained from the RAWS and used in the analysis was modified to reflect the effects of topography and diurnal heating on wind speed and direction through the use of Wind Ninja 2.0, a software program that computes spatially varying wind fields. These wind fields or “gridded winds” are inputs into the fire behavior model and the hazard assessment.

All fire behavior modeling was conducted in paired FlamMap runs with coastal and inland weather inputs. FlamMap output was combined into mosaics of coastal and inland SIGs using ArcGIS, with results blended along a 150m (= 5 pixel wide) band where the coastal and inland SIGs meet.

5.2 Values at Risk

The SMM encompass a large number of natural resources, cultural resources and human-based values. The property value of the residence and commercial developments within the Planning Area are valued in the hundreds-of-millions-of-dollars.

Values not easily assigned a dollar value are also widespread through the Planning Area. As the ancestral home of the Chumash and Tongva tribes, the Planning Area hosts cultural treasures ranging from pictographs to lithic scatters. At least 73 archeological sites, historic structures, cultural landscapes, and traditional cultural properties in the SMM are potentially eligible for listing on the National Register of Historic Places (National Park Service, Statement of National Significance, 2003).

The undeveloped native habitats within the SMM are considered Environmentally Sensitive Habitat Areas (ESHAs) because of their role in the Mediterranean ecosystem. These habitats provide the critical mosaic required by many species of birds, mammals and other groups of wildlife to flourish, while also providing the opportunity for unrestricted wildlife movement among habitats, supporting populations of rare species, and preventing the erosion of steep slopes and thereby protecting riparian corridors, streams and, ultimately, shallow marine waters (California Coastal Commission, 2003).

The nature and extent of the human and natural values associated with the Planning Area is a prominent reason for adopting the strategy of "working from the structure out" when addressing the mitigation of wildfire hazards. The implementation of large-scale wildfire hazard reduction projects in this sensitive setting is problematic and in many cases not effective.

5.3 Fire Hazard Severity

Fire hazard is a measure of the potential wildfire burning characteristics (i.e. intensity, rate of spread, flame length) produced from a specific set of environmental conditions.

As part of a statewide approach to fire hazard severity, CAL FIRE identified "fire hazard severity zones" throughout the State for the purpose of establishing and requiring adherence to WUI building codes and reducing structure loss from wildfire. These fire hazard severity zones are areas that have similar burn probabilities and fire behavior characteristics (available at County of Ventura: www.fire.ca.gov/fire_prevention/fhsz_maps/fhsz_maps_ventura.php and County of Los Angeles: www.fire.ca.gov/fire_prevention/fhsz_maps/fhsz_maps_losangeles.php.

Under this analysis, the entire Planning Area is classified by CALFIRE as a *"Very High Fire Hazard Severity Zone"*. However, this approach alone does not provide the level of detail required for making decisions on where and how to establish priorities for fire hazard mitigation work within the Planning Area. Therefore, for this CWPP, detailed outputs from fire behavior modeling are used to establish levels of severity within the Planning Area.

The flame length output from FlamMap is selected as the metric from which fire hazard severity can be established at the local level across all areas covered by the CWPP. Since the resolution of the model inputs described earlier are 30 x 30 meters, flame length as an output from the model is also evaluated at this resolution.

Five classes of fire hazard severity are established based on the outputs from FlamMap (See Figure 13). These classes are:

- Flames lengths in excess of 20'
- Flame lengths from 11' to 20'
- Flame lengths 8' to 11'
- Flame lengths below 4' to 8'
- Flame lengths 4' and less

The "*Fire Behavior Characteristic Chart"* (Andrews and Rothermel, 1982), indicates that ground based firefighters without mechanical means of support (engines, dozers) can only be successful suppressing the flaming front of a fire with flames up to 4-feet. When mechanical equipment is available, firefighters can be successful suppressing the flaming front of a fire with flames lengths up to 8-feet.

Once flame lengths exceed 8-feet aircraft are generally required to successfully suppress a fire, but as flame lengths exceed 11-feet, firefighting efforts at the flaming front of a fire are generally unsuccessful.

Approximately 80% of the Planning Area modeled has flame lengths in excess of 8-feet under 90th percentile weather conditions. As weather conditions deteriorate, such as during a Santa Ana event, this percentage rapidly increases, placing more residences at risk.

5.4 Risk of Wildfire Occurrence

"Risk of wildfire occurrence" refers to the possibility of a wildfire occurring. For the purposes of this Plan, the annual historic probability of wildfire occurring is used to evaluate wildfire risk. Historic wildfire records maintained by the NPS were analyzed for the time period 1925 through 2010. Burn probability was determined from these records by dividing the number of fires burning in a specific location by the period of record, 85 years. This methodology creates an annual "burn probability" for the Planning Area.

Figure 13 shows the wildfire risk based annual historic probability of wildfire occurring throughout the Planning Area during the period of 1925 – 2010. It shows that some areas within the Planning Area are much more likely to burn than others. Areas with no recorded history of wildfire since 1925 have a relatively low (but NOT ZERO) risk of burning in the near future.

Local burn probability is calculated from the NPS SMM fire history database as the fire frequency (= number of recorded fires at a given location) divided by the period of recordkeeping (=85 years for this map). Historic fire patterns are useful general predictors of future patterns, because the geography of our fire regime is determined by ongoing patterns of ignitions, fire weather (especially Santa Ana winds), terrain, and vegetation.

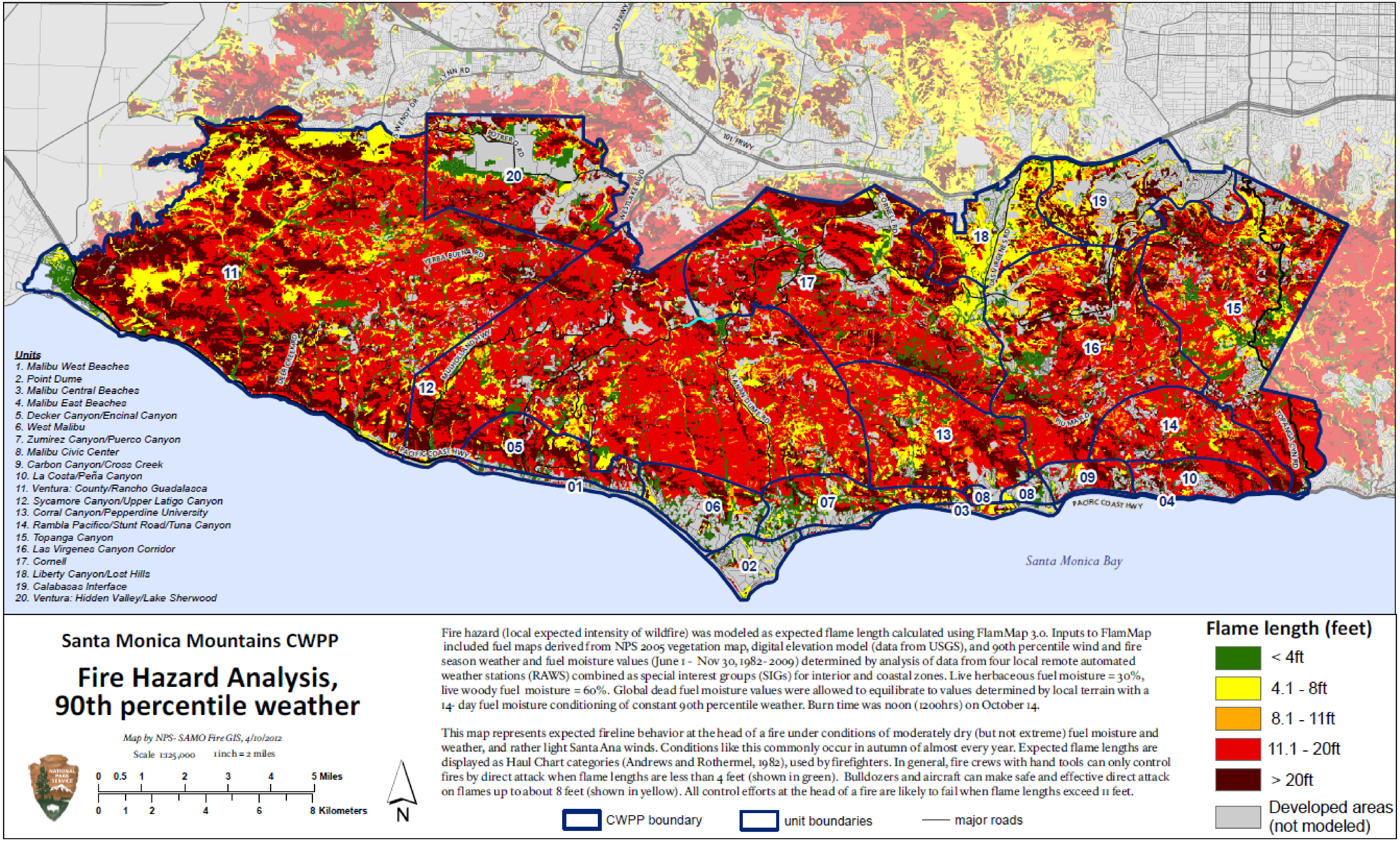
The coastal slopes between approximately Kanan Dume Road and Piuma Road are especially likely to burn (See Figure 14). Areas near Pacific Coast Highway along Corral Canyon and Latigo Canyon Roads have burned more frequently than anywhere else in the Santa Monica Mountains, most recently during the 2007 Canyon and Corral Fires (the 11th time since 1925).

Figure 15 shows historic fire ignition locations recorded by the National Park Service between 1982 and 2010. It also shows estimated fire ignition probabilities across the landscape generated by a spatial statistical analysis of that dataset. A number of spatial patterns are easy to see. Fire ignition points tend to occur near roads and trails, near development (especially in areas where local human population is of intermediate density), and near large amounts of WUI. Fire starts were also found to be spatially correlated with biophysical factors like slope, vegetation type, and minimum January temperature (the latter factors are thought to affect fire starts through their effect on fuel moisture). Las Virgenes Canyon Road and Kanan Dume Road are notable hotspots.

Fire scientists used a general-purpose machine learning technique called Maximum Entropy Modeling (MaxEnt) to calculate correlations between the spatial patterns of observed historic ignition points and the spatial patterns of landscape features. Then they used those spatial correlations and the spatial patterns of the landscape features to estimate relative probability of future fire ignitions across the entire landscape (Syphard, A. D. 2011. Previously unpublished results).

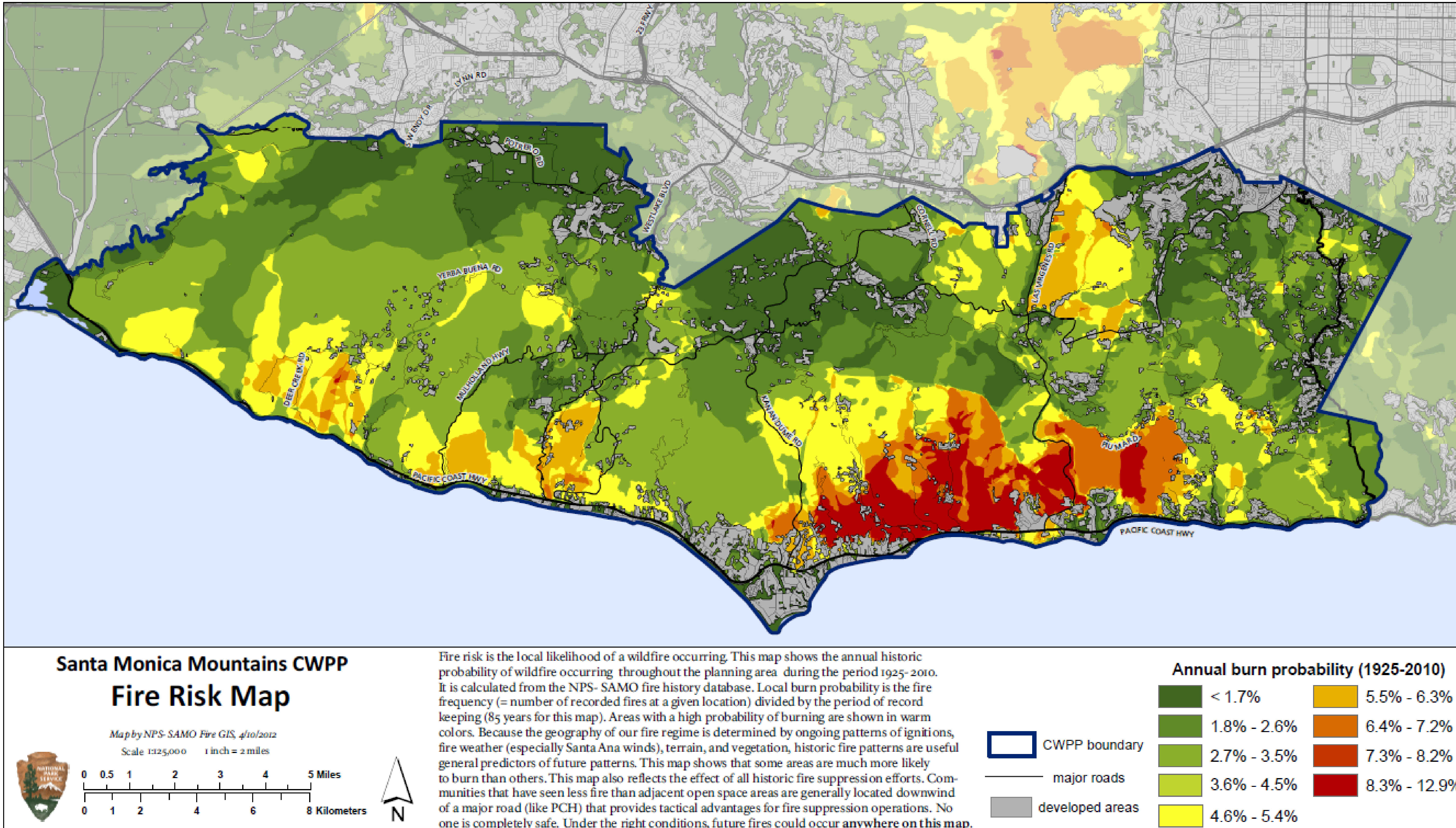
Patterns of past fire ignition points are reasonably good predictors of future ignition patterns because fires are started almost exclusively by people, in the places where people live and work, while engaged in a number of specific kinds of activities (like driving cars, and operating powered cutting tools) that people will generally continue doing for the foreseeable future. This ignition probability information can be used in a number of ways by local and federal fire protection agencies to improve the effectiveness of future fire prevention programs. An analysis of this kind would be useful to any community engaged in fire prevention and safety planning.

Figure 13 Planning Area Fire Hazard Analysis Map



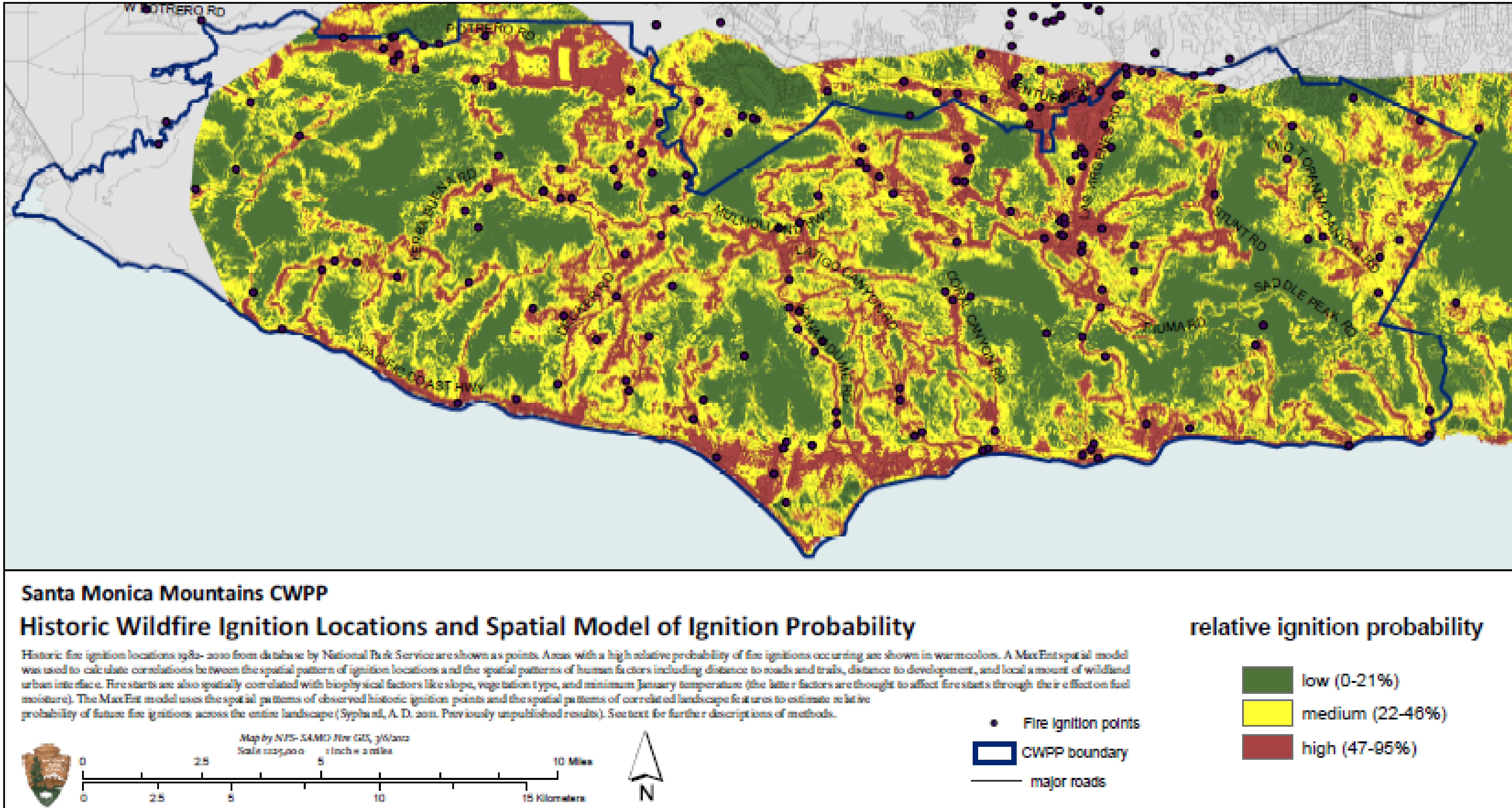
Map name: SAMO_CWPP_FireHazard90pctweatherCoastInlandBlend11x17l.mxd, April 10, 2012 robert_s_taylor@nps.gov

Figure 14 Planning Area Wildfire Risk Map



Map name: SAMO_CWPP_FireRisk_Map11x17e.mxd, Apr 10, 2012 robert_s_taylor@nps.gov

Figure 15 Planning Area Wildfire Ignition Probability Map



5.5 Fire Protection Support

The SMM are uniquely positioned to have large numbers of firefighting resources mobilized to a reported wildfire within very shorts periods of time. Mutual aid agreements between Los Angeles County Fire, Los Angeles City Fire, Ventura County Fire and the federal wildland fire departments serve to enhance the ability to provide fire equipment during initial attack phases of a wildfire. The local fire departments also have immediate response policies to access agency-owned and leased aerial firefighting equipment, even at night. This is a unique characteristic of the Planning Area. However, even with a large and rapid pre-planned response available, fire suppression success is large influenced by the accessibility of fire equipment to structures, an adequate water supply and water pressure, defensible space around buildings, and timely evacuations by local residents. Factors including the construction characteristics and age of developments, road conditions, and access to water sources greatly influence the success of the firefighting efforts.

5.6 Structure Assessment

While the hazard and risk assessments presented in this Plan are detailed, they address only issues related to wildland and urban fuels burning during wildfires. A more detailed home-by-home assessment is required to address risks found at individual residences or other values at risk. Residents can assess their own risk based on a qualitative analysis of issues listed below or by visiting http://firecenter.berkeley.edu/homeassessment/home_assess_intro.html or http://ucanr.org/sites/Wildfire. Additional help is available by contacting their local fire department. Components recommended for this assessment include:

- Hardened structures: local building materials, construction, and age of structures
- Community values at risk
- Urban fuels: home landscaping and defensible space
- Hazardous trees
- Topography and location in the landscape
- Santa Ana winds and Red Flag conditions
- Community education and awareness
- Community emergency preparedness
- Community preparedness plans provided to public safety agencies
- Sources of local ignitions
- Environmentally-sound ingress and egress routes
- Water sources
- Existing fuel reduction
- Impact of surrounding wildlands/vegetation
- Post-fire effects (e.g. erosion, invasive species, etc.)

5.7 Structure Vulnerability

In 1990, the Painted Cave Fire in Santa Barbara, California destroyed 440 homes, 28 apartments, 30 miscellaneous structures, and damaged an additional 66 structures in Santa Barbara, California. This fire was one of the first WUI fires studied for causes of structure loss. The detailed analysis was part of the "Defensible Space Factor Study", which revealed that houses with wood roofs had only a 20% survival rate, while those with non-wood roofing materials had a 70% survival rate (Foote, 1991). Apart from the effect of roofing material, structures that had at least 30 feet of vegetation clearance and readily available defensible space where defensive action occurred saw a 99% survival rate. There was a 90% survival rate even when defensive action by firefighters did not occur (Foote, 1991).

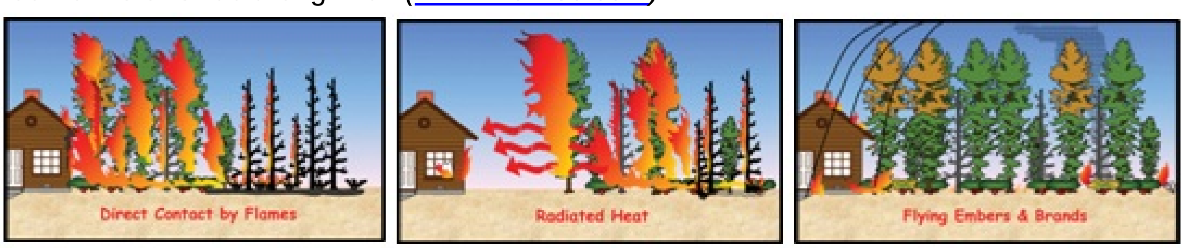
As stated in Chapter 3, structures and communities within the Planning Area have experienced numerous destructive wildfires. Figures 16 and 17 are a few examples of wildfires that have ignited near human development, burned into communities, and destroyed vulnerable structures.

Research has shown repeatedly that the primary reason for structure loss is the ignitability of the structure itself. In some situations, a low intensity fire can destroy structures that are highly ignitable while structures with low ignitibility can survive high intensity fires (Cohen, 2000). A structure's characteristics (exterior construction material and design) and the heat sources within 100-200 feet dictate whether a structure will survive a wildfire, even a high intensity crown fire (Cohen 2004; Cohen 2000; Cohen 1995; Cohen, J., Butler, B., 1998).

The risk of a structure's ignition is a direct result of exposure by wildfire from radiation, convection, and/or burning embers and the vulnerability or ignitability of the structure. Structures ignite in three ways:

1. Convection: The transfer of energy within fluids such as air. Convective heat rises vertically – visually observed as flames and smoke columns. Flames can overwhelm a structure by direct flame impingement, which is a result of no defensible space.
2. Radiation: Works much in the same way as a radiator heating a room in the wintertime. Flammable objects within 100-feet get so hot that they provide sufficient heat for a structure to ignite. The potential for ignition is greatly reduced as space between wildland and urban fuels is increased.
3. Burning Embers: Burning material (i.e. wood shingles, tree bark, leaves, etc) that detach from the main fire front during strong convection drafts and/or winds in the burning zone. Hundreds to thousands of burning embers can be carried long distances by winds associated with the wildfire then landing on receptive fuels.

Three Forms of Structure Ignition *(www.firewise.com)*:



Defensible space is the space between a structure and the wildland area or neighboring structures that typically creates a sufficient buffer to slow or halt the spread of a wildfire to a structure. Defensible space protects a structure from direct flame impingement, radiant heat, and some burning embers - and is essential for structure survivability during wildfires. It also provides a safer operational space for firefighters protecting structures.

The most vulnerable parts of a structure that can lead to loss or damage in a wildfire include:

- Roofing - This has been the key factor in most fires. It's not just the type of roofing material, but also some of the construction details, the condition of the material, and whether the roof is clear of burnable material (such as pine needles and other debris)
- Garages - They are typically not well sealed so gaps at the top, bottom and edges of doors can allow burning embers to enter, often times garages contain flammable materials. Garages usually have vents at various locations, especially if they contain gas furnaces or hot water heaters. These vents are easy entry points for embers.
- Siding - Flammable siding can provide a pathway for flames to reach vulnerable portions of a structure such as the eaves or windows. Siding needs a source of ignition, which in many cases includes vegetation in close proximity to a structure, wood decks and/or fences, or stacked firewood or other flammable material.
- Vents - Soffit vents in the eaves are an easy entry point for wind-driven embers during a fire. These fires often start in an attic fire, which is not easy to detect from the outside. Structures have been lost when fire personnel have left the scene unaware that a fire is burning within the attic.
- Windows - Unprotected and inadequate windows can be another major entry point for fire. Windows can be broken by airborne materials or cracked by thermal expansion during a wildfire and igniting materials in the structure through radiation, convection, and/or burning embers entering a structure.
- Nooks and crannies - Little grooves, inside corners, and roof valleys all become areas where flammable debris (such as pine needles and bird's nests) have collected over time and burning embers can land igniting the debris.
- Crawlspace Vents - These areas, not just under a structure, but under decks and other attachments, are difficult to protect if they are not adequately screened. Much like vents in the attic burning embers can be carried to flammable material underneath a structure.
- Wood Fences – Firefighters have observed that wood fences, when ignited; act as a fuel source that carries fire closer to a structure. Many fences are either attached to home or close enough to present a problem.
- Wood Decks - Act as a source of fuel that is attached or directly adjacent to structures. When ignited by wildfire the radiant and convective heat output can ignite structures. In addition, most decks are adjacent to large windows or glass sliders. The heat from the deck fire can cause the glass to fail allowing the wildfire to enter a structure.
- Flammable landscape vegetation and/or items such as wood or flammable debris piled in close proximity to the house. As a result, structures are exposed to significant radiant and convective heat and burning embers making structures more susceptible to ignition.

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Figure 16 2007 Canyon and Corral Fires

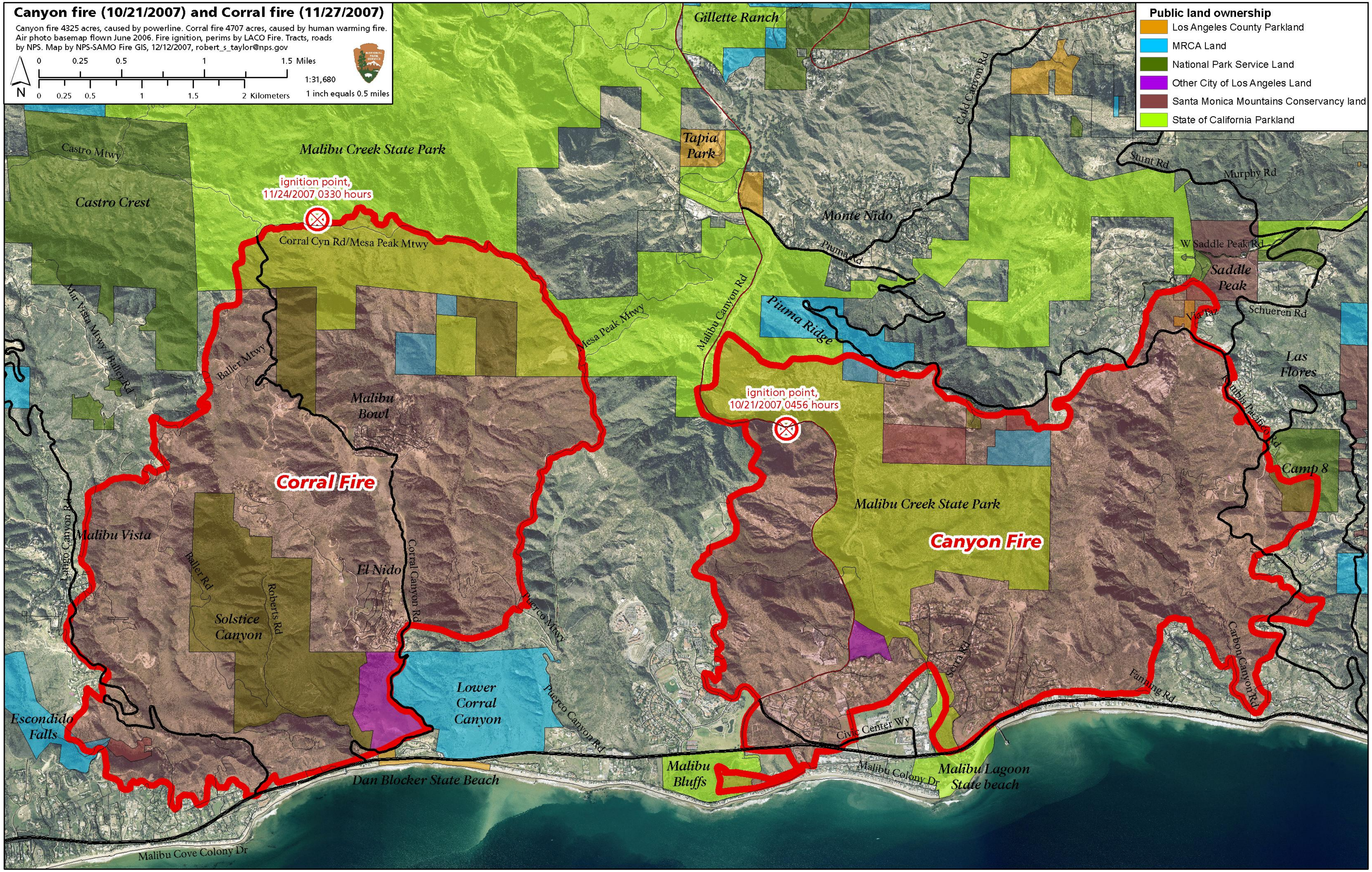
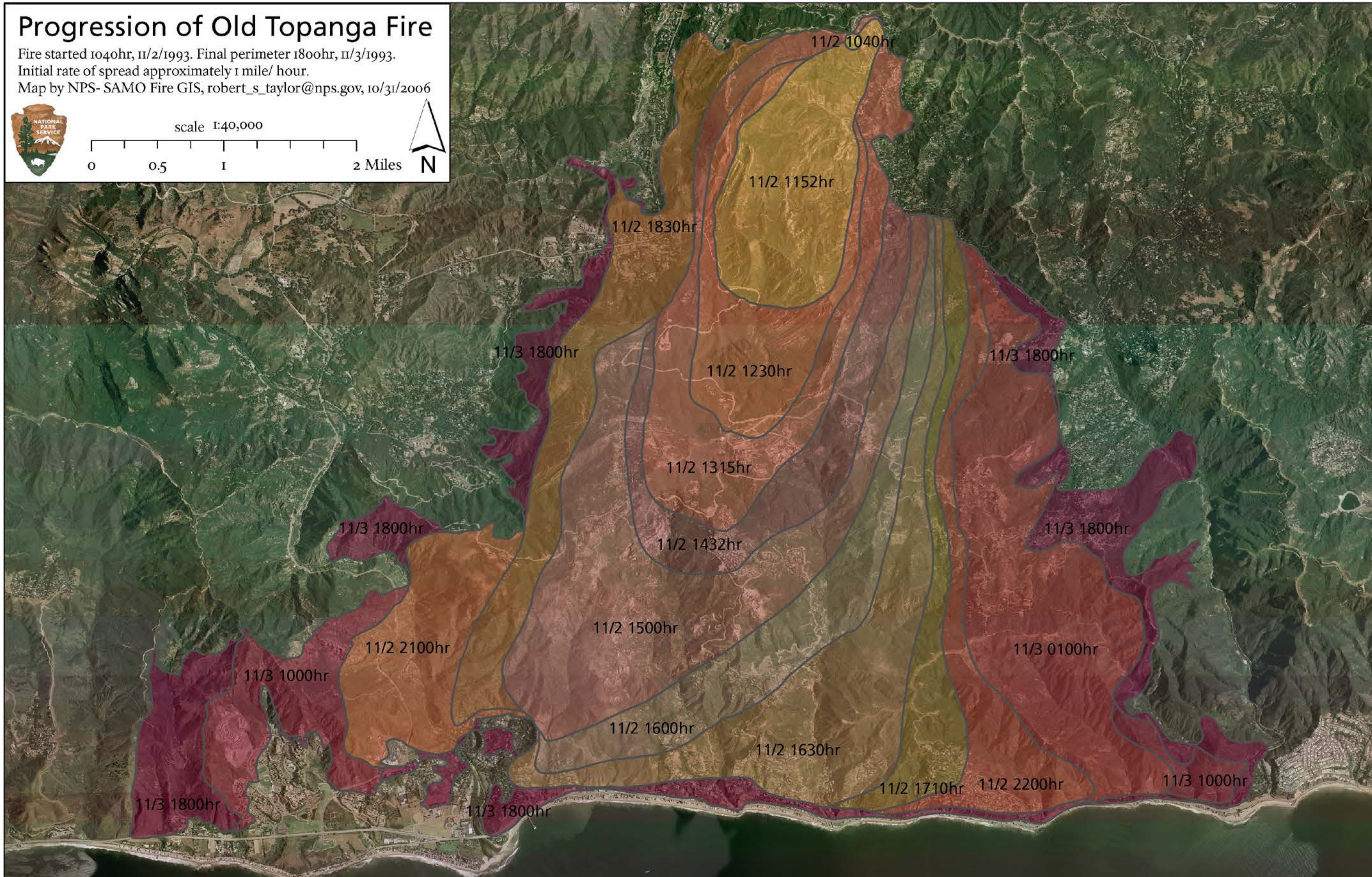


Figure 17 1993 Old Topanga Fire



Chapter 6 - Action Plan

Many residents in the Planning Area are aware of the wildfire danger. In general, the longer people have lived in the area, the better they understand the risks and how to deal with them. However, there is always a significant turnover in the population and therefore some residents who do not fully understand the wildfire hazard. In addition, there are elements of the built environment that will create risk in a wildfire if not adequately prepared for in advance (e.g. access, structure location).

Living with wildfire in this area requires good situational awareness and coordination with neighbors and emergency response personnel. Since the question is not "if' but "when" wildfires will occur, a strategy to understand and reduce the wildfire risks to the Planning Area's values is necessary.

Development of appropriate actions to mitigate the threat from wildfire is an objective of this CWPP.

6.1 Community Preparedness

Community preparedness is the ability of communities to prepare for, withstand, and recover from wildfire. Current land use planning, zoning regulations, and municipal codes adopted by State of California, Los Angeles and Ventura Counties, and local governments have provided policy and regulatory basis for preparedness. These alone will not protect the Planning Area's values and some policies have exacerbated the problem by allowing development without fire safe considerations.

Community preparedness begins with homeowners, landowners, and business owners who must take personal responsibility to protect themselves, their families or employees, emergency responders, and their property. Structures must be prepared well in advance of a wildfire to enhance life safety. In addition, during a major wildfire, there are not enough fire suppression personnel and equipment to defend every structure so the structure must be prepared to stand on its own.

6.1.1 Local Fire Safe Councils

Local FSCs and related community-based organizations in the Planning Area are critical to creating and implementing "fire safe" communities. FSCs serve as a mechanism to focus community based concerns regarding wildland fire and seek to develop mitigations to identified risks by leveraging political influence with jurisdictional agencies and by obtaining funding to implement hazard mitigation work through grants facilitated by the California Fire Alliance. In Los Angeles County, there currently are seven recognized FCSs in the Planning Area. There are no recognized FSCs within the Ventura County portion of the Planning Area; however, several groups are at different stages of organization similar to that of a FSC.

The Malibu West Fire Safe and Sustainability Council (MWFSSC), located east of Trancas Canyon in the City of Malibu, covers the residential parcels represented by the Malibu West Homeowners Association. MWFSSC acquired formal 501(c)3 non-profit status in 2010. They have received two California Fire Safe Council (CFSC) Clearinghouse grants, both of which have been implemented. One project is hazard tree and vegetation removal and thinning while the second grant sponsored the first draft of the SMM CWPP.

The Horizon Hills FSC is located west of Kanan Dume Road in the City of Malibu. It was formed in 2000 and has completed two projects since then. The first project was implemented from 2005 to 2007 and addressed the removal and thinning of approximately 150 hazardous trees and shrubs near dwellings. The second project, from 2008 to 2009, involved the removal and thinning of heavy fuels along the steeper slopes of Horizon Hills, covering an area of approximately 4 acres. It also included removal and thinning of 50 more trees in landscaped areas. In addition, goats revisited the peripheral land to remove new weed growth. In the spring of 2009, the FSC removed an additional 10 acres of fuels in the peripheral shrub area. The group is currently working to reduce the vulnerability of the homes in their community against ember ignition. The leaders attended a home assessment course and have plans for a home assessment survey in the summer of 2012.

Big Rock Mesa FSC is located inland from the Pacific Coast Highway (PCH) on the east side of the City of Malibu. This group used a grant from the Sacramento Regional Foundation for fuel reduction by goats, consisting of a buffer of 25 acres around the community, a CFSC-funded fuel-reduction consisting of a 20-acre mastication (thinning) project, and a 33-acre hand cleared buffer around the community. They have applied for grants through the CFSC Clearinghouse for hazard-tree removal; they are also raising funds from homeowners to maintain the buffer.

The Corral Canyon Fire Safety Alliance (CCFSA) is located on the inland side of Pacific Coast Highway (PCH) in Malibu. It was formed in January 2008, becoming a nonprofit corporation in May 2009. CCFSA has 9 board members and 300 active members. The group collaborated with County of Los Angeles Fire Department (LACFD) and their County Supervisor to educate residents on fire prevention, firefighting procedures, and how to maintain their road access. Partnering with the Sheriff, they established an Arson Watch and increased law enforcement patrols. They worked with Los Angeles County to educate residents and visitors regarding access to the top of the canyon during Red Flag conditions. CCFSA created a community website—http://corralcanyon.org/ccfsa.html—and is starting a volunteer firefighter program with LACFD. In addition, the community has purchased two pumper trucks and four water trucks. As of the spring of 2010, this FSA had hosted 12 community fire safety meetings, established an annual award event, and distributes a community newsletter. They were awarded a CFSC Clearinghouse grant for Hazardous Fuels Reduction and Fire Safe Education in 2011. This project will address hazardous fuels distributed through the neighborhoods and their access/egress routes. The funding was provided by a NFP grant from the NPS.

The Topanga Citizens Fire Safe Committee was formed in 1997 when citizens expressed concerns about the Los Angeles County Fire Department's proposed fuel reduction requirements for ornamental vegetation. The committee developed best management practices to mitigate hazardous vegetation. In 2004, the group also offered a popular chipping program in Topanga. This committee has been inactive for several years.

Topanga Coalition for Emergency Preparedness (T-CEP) was formed in 1993. It is a nonprofit volunteer organization that collaborates with fire, law enforcement, and local government officials to help the Topanga community prepare for and cope with disasters such as wildfires, floods, and earthquakes. One of the largest undertakings to date by T-CEP is the "Topanga Disaster Survival Guide", published in 2005 by the Topanga Emergency Management Planning steering committee in cooperation with the Supervisor's office.

Topanga's West Hillside FSC received supplemental funding in 2008 from the National Park Service to work with LACFD on hazardous fuel reduction. The project was similar to the one in Horizon Hills in that the agencies provided wildfire education to help the community design a fire-safety improvement project. Agency partners guided the neighborhood through an evaluation to prioritize removal of vegetation threatening homes and key access routes. The community augmented this project by using its own resources to remove vegetation adjacent to homes. They then took a further step to improve the fire safety of the homes themselves (hardening them). An additional CFSC grant was awarded in 2009 to continue the project. The West Hillside FSC has joined with other Topanga neighborhoods to form the North Topanga Canyon FSC.

In the Topanga area, there currently are three FSCs in the process of organizing:

- North Topanga—from Top o' Topanga to Pine Tree Circle
- West Topanga—from Wagon Wheel Ranch along Old Topanga Canyon Road to Topanga Canyon Boulevard
- South Topanga—from Fernwood to the ocean

North Topanga FSC has accomplished fire safety meetings to educate property owners to fire safe practices in Topanga Canyon. They have collaborated with Los Angeles County Forestry to plan a wildfire safety project that improves the emergency access/egress on Topanga Canyon Boulevard. The FCS plans to facilitate the work through a liaison and fire education for the myriad of owners of property and easements on the community's major transportation route in an emergency. The North FSC project was approved for a 2012 grant from the California FSC and will provide for the effort and augment the hazardous fuels removal where needed.

Various local FSCs are in the formative stages in other areas of the Planning Area. One is in Monte Nido, located south of Mulholland Highway and east of Malibu Canyon Road in the Las Virgenes Corridor. Another is in Malibu Lake, which includes the homeowners in Malibu Lake Mountain Club and Malibu Lakeside.

6.1.2 SMM Fire Prevention/Education Strategy

Many small fires start each year in the SMM. Most of the fires are suppressed at 1 acre or less. However, if conditions are right (i.e. Santa Ana winds, high temperatures, low relative humidity and low fuel moistures) these small starts have the potential to grow into large devastating fires. The majority of fire starts in the Planning Area are the result of human activity, whether it is intentional or accidental.

Some examples of fire prevention and education activities that address the issue of fire starts caused by equipment use include:

- Providing homeowners with fire safety material
  - Educate the public on the safe use of equipment when being used to complete their defensible space weed abatement (see guidelines and safe practices document for working and recreating outdoors)
  - Educate the public on the risks of using spark emitting equipment outdoors near dry vegetation (see guidelines and safe practices document for working and recreating outdoors)
- Educate public on fire danger, red flag conditions/warnings, and avoidance of activities that cause wildfire ignitions (see websites mentioned below and the guidelines and safe practices for working and recreating outdoors in Table 9.)
- Conduct fire safety programs with HOAs and FSCs
- Conduct fire safety programs with contractors who provide weed abatement services
- Create fire prevention media items (i.e. pamphlets, CDs, website links) for businesses that use spark causing equipment
  - Participate in educational programs to maintain high visibility of the fire prevention effort
  - Involvement in local fairs and community events
  - Take the opportunity to speak with school groups who visit the park about the importance of being fire safe
- Develop a regular dialog with public radio giving them fire danger levels and introduce fire danger info as common as traffic reports in the summer
- Create employee education for all kinds of employers to provide their employees

Current fire prevention and information programs in place:

- Arson watch
- Regular patrols throughout the mountains during fire season by fire staff
- "Ready, Set, Go" programs are in place for both Los Angeles County Fire Department and Ventura County Fire Department
  - Los Angeles County Fire Department website: www.fire.lacounty.gov/FirePrevention/FirePrevention.asp
  - Ventura County Fire Department website: http://fire.countyofventura.org/Prevention/tabid/56/Default.aspx
- The NPS SMMNRA website has information on the current fire danger level and information about the NPS Fire Management Program in general
  - SMMNRA website (homepage): www.nps.gov/samo/index.htm
  - SMMNRA Fire Management webpage: www.nps.gov/samo/parkmgmt/firemanagement.htm
- Local fire danger level signs (Smokey Bear) are in place at the following locations:
  - The Malibu Forestry Unit
  - LACO FD Stations 71, 72, 99

Table 9 Guidelines and Safe Practices for Activities*

Fire Danger Rating and Color Code	FIRE BEHAVIOR DESCRIPTION	GUIDELINES AND SAFE PRACTICES FOR WORKING AND RECREATING OUTDOORS DURING VARIOUS FIRE DANGER LEVELS
Low (L) **Dark Green**	Fuels do not ignite readily from small firebrands although a more intense heat source, such as lightning, may start fires in duff or punky wood. Fires in open cured grasslands may bum freely a few hours after rain, but woods fires spread slowly by creeping or smoldering, and burn in irregular fingers. There is little danger of spotting.	• Use general safety precautions when working and recreating outdoors. • Use caution when pulling off roadways; do not park over vegetation.
Moderate (M) **Blue**	Fires can start from most accidental causes, but with the exception of lightning fires in some areas, the number of starts is generally low. Fires in open cured grasslands will burn briskly and spread rapidly on windy days. Timber fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel, especially draped fuel, may burn hot. Short-distance spotting may occur, but is not persistent. Fires are not likely to become serious and control is relatively easy.	• Use general safety precautions when working and recreating outdoors. • Use caution when pulling off roadways; do not park over vegetation. • Use caution when using spark emitting equipment anywhere near vegetation.
High (H) **Yellow**	All fine dead fuels ignite readily and fires start easily from most causes. Unattended brush and campfires are likely to escape. Fires spread rapidly and short-distance spotting is common. High-intensity burning may develop on slopes or in concentrations of fine fuels. Fires may become serious and their control difficult unless they are attacked successfully while small.	**THE FOLLOWING ACTIVITIES ARE NOT RECOMMENDED AFTER 1:00PM:** • Any spark emitting equipment near vegetation • Metal blade weed whacking • Welding or cutting of metal near any vegetation • Mowing of vegetation other than irrigated lawns
Very High (VH) **Orange**	Fires start easily from all causes and, immediately after ignition, spread rapidly and increase quickly in intensity. Spot fires are a constant danger. Fires burning in light fuels may quickly develop high intensity characteristics such as long-distance spotting and fire whirlwinds when they burn into heavier fuels.	**THE FOLLOWING ACTIVITIES ARE NOT RECOMMENDED DURING ALL HOURS:** • Any spark emitting equipment near vegetation • Weed whacking in dry vegetation • Welding or cutting of metal near any vegetation • Mowing of vegetation other than irrigated lawns
Extreme (E) **Red**	Fires start quickly, spread furiously, and burn intensely. All fires are potentially serious. Development into high intensity burning will usually be faster and occur from smaller fires than in the very high fire danger class. Direct attack is rarely possible and may be dangerous except immediately after ignition. Fires that develop headway in heavy slash or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions, the only effective and safe control action is on the flanks until the weather changes or the fuel supply lessens.	**ALL ACTIVITIES MENTIONED IN HIGH AND VERY HIGH CATEGORIES ARE NOT RECOMMENDED IN ADDITION TO:** • Use extreme caution when pulling off roadways, do not park vehicles over vegetation • Be very aware of your surroundings (if you see or smell smoke report it to the proper authorities and move to a safe location) • Try to limit hikes, bike rides, etc… to shorter lengths and carry plenty of water
***This table describes how the SMM Fire Danger signs can be applied for public activities.**		

6.1.3 Community Outreach Promoting Emergency Preparedness

The Community Outreach Promoting Emergency Preparedness (COPE Preparedness) was founded in 2003, initially as an ad-hoc committee of area Neighborhood Councils and later incorporated as a non-profit in 2006.

They promote emergency preparedness through proactive community outreach. COPE Preparedness achieved the Federal Emergency Management Agency (FEMA) Citizen Corps Council designation for the Los Angeles harbor area. Citizen Corps is FEMA's grassroots strategy to bring together government and community leaders to involve citizens in all-hazards emergency preparedness and resilience.

COPE Preparedness organized the Emergency Preparedness Initiative "Community Continuity", Phase I "Opening the Dialogue" conducted on April 4th, 2009. This summit brought together over 120 community leaders and identified community issues that resulted in consensus of future goals. Community Continuity is a collaborative effort of the COPE Board of Directors in partnership with the City of Los Angeles Emergency Management Department.

Map Your Neighborhood (MYN). COPE Preparedness is conducting MYN preparedness training programs within the community. MYN is a FEMA endorsed program that is utilized in 22 states. Its basis is a 9-Step block-by-block preparedness program. COPE Preparedness is conducting 2 ½-hour FREE training programs for volunteers so they can implement MYN in their neighborhoods.

COPE Preparedness is a voting member of the Los Angeles Emergency Network (ENLA), which identifies COPE within the structure of FEMA as a VOLAG (voluntary agency whose mission is related to emergency management). COPE Preparedness promotes its mission of preparedness at numerous community meetings and maintains a database of thousands of community members. COPE continues to promote the message of preparedness and distributes pertinent information through email notifications, newsletters and presentations.

COPE Preparedness provides:

- Emergency preparedness forums and presentations
- Consulting on Business Continuity Plans
- Discounts on and information about emergency supplies
- Neighborhood mapping in the Harbor Area

6.1.4 Community Emergency Response Teams

Community Emergency Response Teams (CERT) are "an organization of volunteer emergency workers who have received specific training in basic disaster response skills, and who agree to supplement existing emergency responders in the event of a major disaster." CERT training builds disaster response skills in fire safety, search and rescue, team organizing, and medical operations pertaining to disasters. Such skills become extremely valuable in situations where professional responders cannot act immediately. All four local governments (Los Angeles and Ventura Counties and the cities of Malibu and Calabasas) offer CERT trainings. CERT teams are in place throughout the Planning Area.

6.1.5 Arson Watch

A Community Arson Watch Program started in the SMM in 1982. Currently, there are six teams in place throughout the area. During community meetings, seven working groups identified the creation or enhancement of an arson watch program as an action item for their Planning Unit. More information regarding the development of an arson watch program can be found at www.arsonwatch.com or call 310-455-4244.

6.1.6 Emergency Notification and Communications

Mass notification systems are available for all residents in the SMM. Law enforcement, fire departments, and related agencies have a well-rehearsed process for communication among first responders. This is a service provided by local governments to call residents in the case of an emergency in their community. Further information on how to enroll in this program can be found at the following:

- Unincorporated Los Angeles County—www.alert.lacounty.gov
- Unincorporated Ventura County—http://portal.countyofventura.org/portal/page/portal/cov/emergencies/reverse911/reverse911register
- City of Malibu—www.ci.malibu.ca.us/index.cfm/fuseaction/DetailGroup/navid/471/cid/11670
- City of Calabasas—www.cityofcalabasas.com/departments/PublicSafety/AEN.html

Limited cellular service occurs in some portions of the Planning Area is an ongoing issue in Corral Canyon, lower Mulholland Drive, Decker Canyon Road, Encinal Canyon Road, Yerba Buena and Mipoloma Roads, and upper Rambla. The ability to communicate emergency information to local citizens may be effected in these “communication dead zones”.

6.2 Protecting Values

During a WUI fire, the protection of life safety for both firefighters and civilians is the first priority, followed by property (i.e. homes, businesses, historic sites, infrastructure, etc) and resource values.

The SMM have numerous agencies tasked with protecting values. They have different missions and prioritize their protection priorities accordingly. Protection of life is everyone’s first priority. The different agencies combine their talents to protect values during an emergency.

6.2.1 Life Safety

Many residents incorrectly assume that there will be a fire truck available to protect their individual homes or structures during a WUI fire; however, with the thousands of structures in the Planning Area there are simply not enough fire personnel or fire equipment to defend each structure or value. Often in extreme wildfire situations, such as Santa Ana wind events, it is extremely unsafe and impossible for firefighters or citizens to make an effective defensive stand, so structures and values must be able to survive on their own. The fire department policy for wildfire in the Planning Area is “Ready, Set, Go”. People need to prepare their homes beforehand and leave when requested. Structures can withstand exposure to severe wildfires if fire safe practices such as structure hardening and adequate defensible space are implemented. People cannot survive these severe conditions.

Firefighters must consider whether the defensible space provided by property owners is large enough during a wildfire to provide a safe operational space based on the fire behavior they observe. Depending on fire behavior, 100 feet of defensible space may not be sufficient for safety in defending structures and other values. Safety zone guidelines cite safe operational space for firefighters protecting structures. Firefighters require minimum distances of approximately 4 times the height from observed or anticipated flame lengths (Butler, B., Cohen, J.D, 2000); however, these distances are a minimum and can require greater distances if the fire behavior dictates it. The safety zone guidelines do not factor in wind and convective heat from slope, wind, and/or terrain influences. Areas with these influences will need greater distances than those recommended by Butler and Cohen to provide for firefighter safety. Historical SMM wildfires have shown that flame lengths exceeding 70-feet occur during wildfires in the Planning Area, so depending on the slope and/or wind components, defensible space distances greater than 100 feet may be needed for life safety.

An onsite consultation with the local fire department is recommended to determine whether the clearance around a structure or value is sufficient to provide the safe working environment required for firefighter and citizen's life safety. Unless a property is very large, it is rare to create a true safety zone at a structure in the Planning Area due to the rugged terrain. Adherence to local codes should prevail when establishing defensible space. Where individual property owners wish to expand defensible space on private property the best management practices found in Appendix D, should be applied, while remembering that hardening a structure against wildfire may prove a more sound investment of money and time.

6.2.1.1 Evacuation

Evacuation is the responsibility of the Los Angeles County Sheriff's, Ventura County Sheriff's and jurisdictional law enforcement entities from State and Federal agencies. During an emergency, the jurisdictional authority will order all people to evacuate from defined areas because of a threatening wildfire. The evacuation order will identify the preferred evacuation routes and evacuation centers if any are established. The need for evacuation can occur with little notice during rapidly evolving fires, with the public receiving little lead-time to execute the evacuation order.

In order to provide the local citizenry as much lead time as possible in the event of an evacuation order, mass emergency notification programs for all residents in the SMM have been established. This notification program commonly referred to as "Reverse 9-1-1", enables local governments to call residents in the case of an emergency in their community. Residents are strongly encouraged to register both their home and cellular phone numbers with their specific Reverse 9-1-1 provider.

In order to facilitate an orderly evacuation, home disaster kits and preparedness plans are also recommended for residents of the SMM. By having established kits and plans, much of the stress associated with a pending or ordered evacuation can be alleviated. Information on preparedness planning is available at the following links:

- http://fire.lacounty.gov/SafetyPreparedness/PDFs/Operation%20Evacuation.pdf
- http://redcrossla.org/news/red-cross-offers-wildfire-evacuation-tips

Both Los Angeles and Ventura Counties have adopted the Ready–Set–Go strategy to prepared residents for the possibility of an evacuation. Ready–Set–Go involves three steps; making homes resistant to wildfires, getting families ready to leave when an evacuation order is issued and finally, leaving a home, timely and safely, using safe travel routes to designated evacuation centers or other personal options outside of the evacuation area. While law enforcement cannot force a resident from their private property, law enforcement can preclude a resident from entering a designated evacuation area. Anyone on public lands may be compelled to leave in the event of an evacuation order.

Both county fire departments offer publications to help residence plan for the need to evacuate. These publications are available on the department's web site:

- www.fire.lacounty.gov/safetypreparedness/readysetgo/pdf/Ready%20Set%20Go%2009.pdf
- http://fire.countyofventura.org/LinkClick.aspx?fileticket=9hQO1rR%2Fezw%3D&tabid=56

6.2.1.2 Vulnerable Populations

It is imperative that individuals and caregivers with special needs have a preparedness plan for evacuation and proper care during a wildfire. Preparedness plans should include information on:

- Needs for medications, equipment or special dietary needs.
- Documentation about insurance and medical conditions should also accompany the person.
- The need for caregivers and special vehicles moving into the area to help with evacuation may further complicate evacuation or emergency vehicle access and/or place additional people at risk without the proper education or training in what to do during a wildfire.
- Transportation available to the general public during an emergency evacuation may not be suitable for family members with special needs.
- Many special needs populations are easily upset and stressed by sudden and frightening changes. Plans should ensure that a caregiver or trusted family member is able to stay with them at all times during an evacuation.
- Pre-plan safe sites for these individuals for short and potential long-term stays.

6.2.1.3 Pets

As pet's become more widely accepted as part of the extended family, the development of preparedness plans for pet's life safety should be considered by residents of the SMM. Items to consider:

- Plan to take animals and do not turn them loose.
- Make sure dogs and cats wear properly fitted collars with identification, vaccination, microchip and license tags.

- Pet evacuation plans should include routes, transportation needs and host sites. Share this plan with trusted neighbors.
- Exchange veterinary information with neighbors and file a permission slip with the veterinarian authorizing emergency care for animals.
- Make sure all vehicles and pet carriers needed for evacuation are serviced and ready to be used.
- Assemble a pet to-go bag with a supply of food, non-spill food and water bowls, cat litter and box and a restraint (chain, leash or harness). Additional items to include are newspaper and paper towels, plastic bags, permanent marker, bleach/disinfectant solution and water buckets.
- Evacuation shelters rarely accept pets, so plan ahead to make sure families and pets will have a safe place to take refuge before a disaster strikes. If there is a no-pet policy, always ask if this can be waived in the event of an emergency. For a listing of these shelters, please visit www.petswelcome.com. For the potential for long term stays, compile a list of boarding facilities.

Additional information, such as A Pet Disaster Safety Checklist, is available from the American Red Cross to assist in planning needs for a pet during emergency situations. The checklist is available at www.redcross.org/www-files/Documents/pdf/Preparedness/checklists/PetSafety.pdf.

6.2.1.4 Livestock

There are a large number of horse properties and equine facilities within the Planning Area. The evacuation of large animals, commonly horses, present unique challenges to the owners, law enforcement and first responders. A key for residents is to allow sufficient time to execute the evacuation. Planning ahead is critical when moving large animals. Where possible, allow for extra time to secure trailers, load the stock and then safely transport the animals out of the evacuation area. The Humane Society of the United States provides information on disaster planning for horses on their website at www.humanesociety.org/issues/animal_rescue/tips/disaster_preparedness_for.html.

Two local facilities have historically been used as evacuation centers for large animals during wildfires in and adjacent to the Planning Area. These locations are Pierce College, 6201 Winnetka Ave. Woodland Hills and the Griffith Park Equestrian Center, 480 West Riverside Drive, Burbank.

6.2.2 Structures

The ability of firefighters to protect values at risk depends on many factors. Firefighters arriving on scene will perform a quick triage to determine whether a structure is defendable. They look for access/egress issues, whether a structure has characteristics of vulnerability, hazardous material issues, adequate water sources, adequate defensible space, and whether the defensible space provides them safe operational space. The defensible space includes both wildland vegetation as well as ornamental vegetation used in landscaping.

The ability of structures and infrastructure to survive wildfire depends on construction materials, their condition, and the quality of the defensible space surrounding them. Burning embers from a wildfire will find the weak link in a structure and ignite it. However, there are measures that can be taken to safeguard structures from wildfire. A structure's vulnerability to ignition can be mitigated. The exterior construction material, structure design, maintenance of the material, and defensible space will contribute to whether a structure will survive or not. Actions to reduce the ignition potential of a structure are associated with the structure itself and area directly adjacent to the structure in the home ignition zone. Under some circumstances reducing fire intensity, and therefore the structure ignition risk, may involve modifying the size of the home ignition zone to account for steepness of slope and typical fire weather wind events (i.e. Santa Ana winds).

6.2.2.1 Reducing Structure Ignitibility

Research indicates that the potential for structure ignitions during wildfires, including high intensity fires, depend on a structure's "fuel characteristics" and a heat sources within 0-120' feet adjacent to a home (Cohen 2004; Cohen 2000; Cohen 1995; Cohen, J,. and Butler, B., 1998). Heat sources within the first 30'adjacent to a home is the very most important. Concepts for reducing structure ignitibility are found in Section 6.6.2.1.2 of this plan.

6.2.2.1.1 Building Codes

The Los Angeles and Ventura County Fire Codes require fire safe construction for all new building, rebuilding, and additions for structures in Very High Fire Hazard Severity Zones. These building standards are required by state law and are part of the California Building and Fire Codes to which all jurisdictions must adhere. The building standards are updated every three years. For information on local building standards, please visit the following websites:

- Los Angeles County: http://fire.lacounty.gov/FirePrevention/wildfire_Rebuild_Guid.asp
- Ventura County: www.ventura.org/RMA/build_safe/pdf/building_code/2007_Ventura_County_Building_Code.pdf

6.2.2.1.2 Home Ignition Zone

The condition of the home ignition zone (this can include any structure) principally determines the potential for structure ignitions during a wildfire. A structure burns because of its interrelationship with everything in its surrounding home ignition zone. To avoid a structure ignition, the property owner must eliminate a wildfire's potential to ignite anything on or near the structure. This plan recognizes three zones surrounding the structure that should be addressed by residents in order to reduce the overall vulnerability of their home. The three zones that make up the Home Ignition Zone include:

Zone 1 *(this area includes structures and immediate surroundings)*

Fire Hardened Structures

This term means that a home is less vulnerable to burning embers and direct flame impingement from fire. Fire hardened structures provide protection at a structure's vulnerable area using proven building materials and/or techniques to resist ignition from heat and flame, as well as the ember storm that accompanies large wildfires.

Application of the following structure hardening actions will enhance the survivability of structures and the life safety of citizens and firefighters:

Roofs

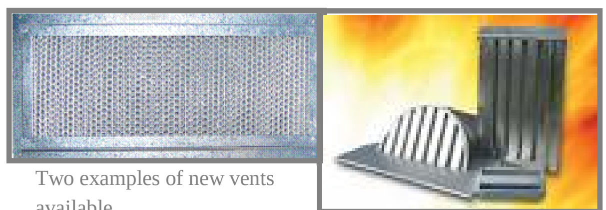
Los Angeles and Ventura Counties prohibit all wood roofs in Very High Fire Hazard Severity Zones. All new roofs need to be Class A, which means non-combustible coverings like tile, metal, or concrete with proper underlayment and sealing below. Openings in roofing materials, such as the open ends of barrel tiles, should be plugged to prevent ember entry and debris accumulation. Regardless of the type of roof, keep it free of bird's nests, fallen leaves, needles and branches.

Eaves

Residents should be extra vigilant about keeping all flammable materials at least 10 feet away from the home. Minimize any potential heat or flame that can work its way up a wall and get trapped under the eaves. Changes to the code in 2010 allow for some flexibility in homes where attics have sprinklers installed, and where the vents are more than 12 feet off the ground.

Vents

Building codes require that vents prevent flames and embers from entering a building. There are several products coming onto the market that address this need and are very good candidates for retrofitting a structure. They combine a back-up system (such as baffles or honeycombs) in addition to the required screening.



Two examples of new vents available.

The WUI Building Standards state that vents must resist the intrusion of embers and flames, or shall be protected by corrosion-resistant noncombustible (no plastic components) wire mesh screen with 1/4-inch openings. 1/8-inch mesh is also allowed. Use a design that incorporates two sets of through-roof vents, one set for inlet air located near the roof edge and another for outlet air located near the ridge. Do not permanently cover vents, as they play a critical role in preventing wood rot.

Exterior Walls and Siding

Exterior walls need to resist heat and flames as well as embers. Non-combustible material like stucco, concrete, and tile obviously resist flames but may not always resist heat and embers. Ensure that there is a sheet rock barrier underneath the finishing material and that any gaps along the bottom or top edges have been sealed or caulked.

Windows, Skylights, Doors

Installing windows that are at least double-glazed and utilize tempered glass for the exterior pane is recommended. The type of window frame (wood, aluminum or vinyl) is not as critical; however, vinyl frames can melt in extreme heat and should have metal reinforcements. Keep skylights free of leaves and other debris, and remove overhanging branches. If skylights are to be placed on steep pitched roofs that face large amounts of nearby fuels (a mature pine tree or another house), consider using flat ones constructed of double-pane glass. Embers can enter gaps in doors, including garage doors, so have solid-closing doors made of noncombustible material or heavy, solid wood. If there is a pet door, be sure to have a way to completely close it to keep it from opening during a wildfire allowing embers a pathway into a structure.

Balconies and Decks

To harden a home's deck and balconies (or any cantilevered addition) enclose the projection all the way to the ground and keep it ember-resistant by sealing cracks and joints. Heavy wood decking (with adequate defensible space) may be allowed, but a better choice might be fire-retardant treated wood or composite decking. Do not allow vegetation or flammable items to accumulate under decks and balconies.

Rain Gutters

Keep rain gutters free of bird's nests, leaves, needles, and other debris. Check and clean them several times during the year, more often in fire season.

Addressing

Throughout the Planning Area, firefighters and other emergency personnel are faced with the challenge of finding homes quickly and safely during an emergency. Minimum letter/number height of 3" for residential properties and minimum of 6" for commercial properties is required with additional posting for longer access routes.

Gates

Gates can pose a serious obstacle to safe and effective evacuation. Automatic gates that do not open during power outages are especially dangerous, and may be illegal. Ventura County requires battery backup for gates serving five or more homes, and recommends it for gates serving one to four homes.

Retrofitting a Structure

While it is easier to construct a new structure to a "fire-hardened" standard, it is also possible to improve an existing structure's resistance to wildfire. Hardened structure features are mandatory for new construction, yet these same suggestions apply for remodeling or improving a home's fire safety. Three very effective locations to target are a roof, vents, and decks. Retrofitting a structure with ignition-resistant materials in these three areas and rigorously maintaining defensible space will significantly enhance a structure's protection.

6.2.2.1.3 Defensible Space

Zone 1

Defensible space is the area directly adjacent to a structure out 30-feet. This area is where the greatest vegetation modification will occur. Within this zone, plant nothing within 3 to 5 feet of the structure, particularly if the building is sided with wood, logs or other flammable materials. This is a good idea for walkways and rocks but not flammable mulch. A non-flammable surface acts as an ember tray, allowing embers to fall to the surface and go out.

Zone 2

Zone 2 is an area of fuel reduction and is a transitional area between Zones 1 and 3. This zone requires thinning out and removing vegetation for an additional 70-feet for a total of

100-feet from a structure. An inspecting officer may require additional thinning or removal due to high fire hazard. The size of this zone depends on the slope of the ground where the structure is built. Trees and large shrubs should be thinned so there are at least 10-feet between crowns. Crown separation is measured from the furthest branch of one tree to the nearest branch on the next tree. On steep slopes, allow more space between tree crowns. Remove all ladder fuels from under the remaining trees. Carefully prune trees to a height of 10 feet.

Locate propane tanks at least 30-feet from any structures, preferably on the same elevation as the house. Flammable vegetation should be cleared within 10-feet of these tanks. Under no circumstances should propane tanks be screened with shrubs or vegetation. Dispose of limbs, branches and other woody debris removed from trees and shrubs through hauling material to an appropriate disposal site, or chipping.

Zone 3

Zone 3 is the area of existing vegetation from the edge of Zone 2 out an additional 100 feet. Not all property owners are required to perform fuels modification to a 200-foot standard. Residents should check with their local fire station to receive specific guidance on the need to remove vegetation from this zone. Should local fire code require that hazard mitigation work be completed in this zone, target dead, diseased and damaged trees and shrubs first, before considering removing additional native vegetation. This zone should not be cleared of all vegetation due to degradation from erosion, landslides, and the need to preserve habitat. Follow recommendations and employ best management practices. This zone should modify the fire behavior by breaking up the fuel load, shading, and biomass reduction. Remove dead material, prune vegetation above the soil, and reduce the grassy and weedy vegetation to ground level.

For additional information on defensible space requirements, please visit the following websites:

- Los Angeles County:
  www.fire.lacounty.gov/safetypreparedness/ready%20set%20go%2009.pdf
- Ventura County:
  http://fire.countyofventura.org/LinkClick.aspx?fileticket=hUPrD10Xryw%3D&tabid=58

6.2.3 Mitigation in the Planning Area

The use of prescribed fire and mechanical vegetation removal techniques are common forms of fuel reduction in many areas of the United States. Because the SMM are at risk of resource degradation and vegetation type conversion from frequent burning, prescribed fire is not planned as a treatment. Hazardous fuels mitigation in the Planning Area is best achieved by focusing treatments from a structure's foundation outward to its legally mandated defensible space requirements in the home ignition zone. Property owners are encouraged to apply this concept to all the structures and follow recommendations for home hardening.

Communities need to analyze the neighborhood as a whole, focusing on actions that will prevent a wildfire from spreading from structure to structure. Maintaining fire safe conditions at each home is integral to the safety of the other homes in the community.

Access and egress routes for evacuation and incoming resources need to be free of vegetation that will compromise transportation along these routes during a wildfire. Communities can work with jurisdictional agencies to improve or enhance fuel treatments for publicly owned lands on their borders or along transportation routes.

6.2.3.1 Existing Fuel Reduction Projects

The SMMC and the MRCA have accomplished several hazardous fuel reduction projects, including:

Table 10 Existing Fuel Treatments in the Planning Area

Project Area	Project Description	Method of Treatment
Ramirez Canyon Park (MRCA)	Hazard tree removal or pruning; maintain defensible space	Mechanical
King Gillette Ranch (MRCA)	Hazard tree removal or pruning; maintain defensible space	Mechanical
Upper Las Virgenes Canyon Open Space Reserve (MRCA)	Hazard tree removal or pruning; maintain defensible space; exotic weed treatment	Mechanical, Pre- and Post-emergents
Las Virgenes Road (NPS)	Reduction of vegetation to change from fuel model 3 to fuel model 1 to provide landscape level fire behavior reduction, safer egress in emergency and opportunity for control along major transportation corridor.	Mechanical, noxious weed treatment
Reagan Ranch (NPS)	Reduction of vegetation to change from fuel model 3 to fuel model 1 to provide landscape level fire behavior reduction and opportunity for control.	Mechanical, noxious weed treatment
Paramount Ranch (NPS)	Reduction of vegetation to change from fuel model 3 to fuel model 1 to provide landscape level fire behavior reduction, safer egress in emergency, valid safe area, defensible space for homes and opportunity for control.	Mechanical, noxious weed treatment
Rancho Sierra Vista	Reduction of vegetation to change from fuel model 3 to fuel model 1 to provide landscape level fire behavior reduction, safer egress in emergency, valid safe area, defensible space for homes and opportunity for control.	Mechanical, noxious weed treatment
Other Agency-owned or Managed Lands	Defensible space	Mechanical, Pre- and Post-Emergents

6.2.4 Proposed Projects

As previously stated, CALFIRE classifies the entire Planning Area as a "Very High Fire Hazard Zone". This statewide approach to classifying the Planning Area does not lend itself to identifying the locations, which may have the greatest need for immediate fire hazard mitigation efforts. In order to provide the detail required for decision makers and the public, an analysis of modeled fire behavior and fire return interval developed specifically for this Plan establishes priority locations for hazardous fuels treatment work.

6.2.4.1 Project Prioritization

As presented in Chapter 3, fire hazard was determined for the Planning Area by modeling anticipated flame length from a wildfire burning under 90th percentile weather conditions. Fire risk is categorized as the frequency with which wildfire burns within the Planning Area. Even though this analysis was performed for the entire CWPP Planning Area, the focus of the hazard mitigation efforts are in areas within 100 to 200-feet of an occupied resident and/or along travel routes. As science and fire history demonstrates, reducing the vulnerability of structures and enhancing fire safety along travel routes are the only viable methods to reduce the wildfire threat. Implementing hazard mitigation work away from structures or important travel corridors does little to enhance public or firefighter safety or reduce the threat to structures, and does not meet the purpose of this CWPP.

In addition to the analysis that identifies priority treatment locations within the Planning Area, input on proposed projects was received from the public during the series of workshops that were held to support this Plan. The list of potential projects was broad and not all projects proposed by the public are appropriate for inclusion in a CWPP. Projects deemed operationally viable and which met the purpose of this CWPP are consolidated in Table 11. Projects non-specific in nature or outside the scope of a CWPP are not included.

Table 11 Community Recommended Hazard Mitigation Projects

Planning Unit	Fire Safe Council	Objective	Project Description	Priority
PU # 1,2,3,4 Malibu Beach Communities		Improve house-out defensible space	Organize “brush clearance” program for the City of Malibu.	H
	City of Mailbu Emergency Preparedness	Improve communications during wildfire emergency	Malibu resident education regarding emergency notification programs available.	Non-fuels
		Improve water availability for fire fighting	Improve signage regarding water sources available in the community	Non-fuels
		Improve access and egress for wildfire	Assure “Knox Box” installation to provide for firefighter access	Non fuels
		Improve water availability for fire fighting	Protect water sources from damage related to vehicle collision along PCH	Non-fuels

PU # 5 Decker/Encinal Canyon		Reduce wildfire ignitions	Coordinate with jurisdictional authority and remove fire hazard trees that impact powerlines	M
		Improve house-out defensible space	Reduce fire hazard urban fuels around upper Avenida de la Encinal and Encinal	H
PU # 6 West Malibu	Horizon Hills Fire Safe Council	Reduce structure ignitability	Create a wildfire home assessment project	H
		Reduce wildfire ignitions	Coordinate with jurisdictional authority and remove fire hazard trees that impact powerlines	M
		Improve wildfire access and egress	Remove hazardous Eucalyptus trees in Trancas	L
	Malibu West Fire Safe Council	Improve wildfire access and egress	Improve hazard fuel mitigation efforts along “escape routes”	H
	Malibu West Fire Safe Council	Improve water availability for fire fighting	Improve water source signage within the communities	Non-fuels
PU # 7 Zumirez/Puerco Canyons		Improve fire fighting capability in community	Install “fire boxes” with pre-attack plans at community gate entrances	Non fuels
		Reduce hazardous fuels	Improve hazard mitigation work in and adjacent to Ramirez Canyon Park	H
		Improve wildfire access and egress	Complete hazard fuel mitigation work on Willmott and Latigo	M
		Improve water availability for fire fighting	Improve water availability by installing exclusive use water tanks for use during wildfire	Non fuels
PU # 8 Civic Center		Improve house-out defensible space	Initiate a fire hazard tree removal program around structures	H
PU # 9 Cross Creek/Carbon Canyon		Improve wildfire access and egress	Limb/maintain Eucalyptus on lower Carbon Canyon Road	M

		Improve wildfire access and egress	Increase the spacing and reduce ladder fuels of the Eucalyptus canopy on Serra Road	H
PU # 10 La Costa/Big Rock/Pena Canyon		Improve house-out defensible space	Initiate a fire hazard tree removal program around structures	H
		Improve water availability for fire fighting	Improve viability of power source to water tank pumps	Non fuels
		Improve wildfire access and egress	Improve hazard fuels reduction on Seaboard Road	M
		Improve water availability for fire fighting	Facilitate the replacement of the missing hydrant on Rambla Pacifica near Sumac Ridge	Non fuels
		Improve water availability for fire fighting	Install a gravity feed water tank at Tuna	Non fuels
PU# 11 Rancho Guadalasca/Yerba Buena		Improve house out defensible space	Create Community Chipper days program for planning unit	H
		Improve wildfire access and egress	Work with jurisdictional authorities to initiate a fuels reduction program along roadways	M
		Improve water availability for fire fighting	Improve water source signage throughout the community	Non fuels
		Improve wildfire access and egress	Improve roadside clearance along fire roads	L
		Improve communications during wildfire emergency	Work with cellular providers and land management agencies to improve cell coverage throughout the community	Non fuels
Pu # 12 Sycamore Canyon/Upper Latigo		Improve house-out defensible space	Initiate a cooperative community based hazard fuels reduction program for and work on private lands	H
		Improve wildfire access and egress	Improve roadside clearance on public and private roads	M

		Improve water availability for fire fighting	Improve the viability of power sources for water tanks during emergencies	Non fuels
		Improve water availability for fire fighting	Create an incentive program for the installation of water storage tanks	Non fuels
PU # 13 Corral Canyon/Pepperdine	Corral Canyon Fire safety Alliance	Improve communications during wildfire emergency	Work with cellular providers and land management agencies to improve cell coverage – Malibu Bowl/El Nido	Non fuels
	Corral Canyon Fire safety Alliance	Improve house-out defensible space	FSC Community risk analysis and improve homes defensible space	H
	Corral Canyon Fire safety Alliance	Improve wildfire access and egress and	FSC community risk analysis and hazardous fuels reduction	M
PU # 14 Upper Rambla/LasFlores/La Tuna		Improve wildfire access and egress	Improve hazardous fuels mitigation along Piuma, Scheuren, Rambla Pacifico, Las Flores Roads and Hume Bridge Roads	H
		Reduce hazardous fuels	Create a community “shaded fuelbreak”	M
		Improve water availability for fire fighting	Improve signage for water sources throughout the community.	Non fuels
PU # 15 Topanga Canyon		Reduce hazardous fuels	Initiate a fire hazard tree removal program throughout the community	M
		Improve water availability for fire fighting	Install water tank to service Topanga Skyline	Non fuels
	North Topanga Fire Safe Council	Improve wildfire access and egress	Improve clearance along major travel routes	H
		Improve evacuation success	Remove hazardous fuels at established community “Fire Safe Zones”	H
		Improve evacuation success	Install “Escape Route” signage	Non fuels

		Improve wildfire access and egress	Remove non-native trees along Old Topanga Road	L
		Improve wildfire access and egress	Initiate Lower Cheney to Mermaid Tavern fuel reduction projects	M
	West Hillside Homeowners	Improve house-out defensible space	Initiate West Hillside fuel reduction project	H
		Improve water availability for fire fighting	Improve signage for existing water sources	Non fuels
PU # 16 Las Virgenes Canyon		Reduce hazardous fuels	Arundo removal – Mulholland and McKain Roads	M
	Monte Nido Homeowners	Improve house-out defensible space	Hazardous fuels removal – Monte Nido	H
		Improve water availability for fire fighting	Improve signage for existing water sources	Non fuels
		Reduce hazardous fuels	Invasive species removal through the community	L
		Reduce hazardous fuels	Create a "shaded fuelbreak" around the wildlife center	M
PU # 17 Cornell	Malibou Lake Homeowners Associations	Improve house-out defensible space	Malibou Lakes public/private hazardous fuels removal	H
	Malibu Lakeside Homeowners Associations	Improve house-out defensible space	Initiate fuels reduction project Malibu Lakeside	H
PU # 18 Liberty Canyon/Lost Hills		Improve house-out defensible space	Improve the fuels reduction between the community and the open space	M
		Improve house-out defensible space	Initiate a community-wide fire hazardous tree removal program	H
		Reduce fire ignitions	Coordinate fire prevention planning efforts with Calabasas and Augora Hills	Non fuels

PU # 19 Calabasas		Improve evacuation success	Develop a comprehensive plan for the evacuation of large animals during wildfire events	Non fuels
		Improve house-out defensible space	Initiate a community-wide fire hazardous tree removal program	H
PU # 20 Hidden Valley		Improve water availability for fire fighting	Work with jurisdictional agencies to add hydrants on Potrero, Carlisle Canyon and Hidden Valley roads	Non fuels
		Improve communications during wildfire emergency	Work towards improving cellular and radio communication based at Rasnow Peak	Non fuels

6.2.4.2 Suggested Fuel Treatment Types and Treatment Levels

In a typical fuel treatment prescription, the amount of fuel removed can vary due to a number of contributing factors in a given location. This variation in the amount of fuel removed is also referred to as the intensiveness fuel treatment level. More intensive fuel treatment removes more fuel; therefore, less fuel is available to burn which moderates fire behavior.

Fuel treatment types for the Planning Area take on a variety of forms including mechanical treatments, manual treatments, biological treatments and herbicide treatments. Mechanical and manual treatments rely on a variety of methods to physically modify or remove fuel with more precision. The following are brief descriptions of mechanical and manual treatments:

Mowing

Mowing of grasses, weeds and low-shrubs is a familiar treatment activity to those that care for lawns and yards. Mowing in this setting is usually done using a larger commercial size mower where the operator rides atop the equipment. Mowing may also involve the cutting attachment being pulled behind a tractor like vehicle.

Mastication

Mastication is the mechanical grinding, crushing, shredding, chipping and chopping of fuel that reduces fire intensity and rate of spread. Many types of machinery have the capacity to do the mastication work. Examples include feller-bunchers or skidders modified with a masticating head, tractors pulling a mower/masticating head, excavators with a masticating head on their boom, dozers with masticator-type capability and innovative or custom machines with masticating capabilities.

Manual Fuel Treatment

Manual work to accomplish fuels reduction work is a slower process, is the most expensive but is also the most precise method. The types of manual treatments often utilized include hand thinning or removal of small understory brush and trees, limbing of larger trees, raking and hand piling of surface debris, and weed-whacking grasses or low-growing shrubs.

Thinning

Tree and shrub thinning is used as a treatment to modify the fuel structure in stands of trees and shrubs/brush that have become more dense. Thinning a stand reduces ladder fuel or crown fuel continuity and effectively moderates crown fire behavior. In most cases, thinning is only effective as a fuel management technique when the fine surface fuels are also reduced (Agee, J., Skinner, C., 2005). Thinning is an effective fuels management method if it reduces the likelihood that a surface fire will transition into a crown fire by the break-up of vertical and horizontal fuel continuity.

Biological Treatment

Biological treatment involves the use of domestic livestock grazing or browsing to reduce surface fuel loads. This treatment can be very effective in treating fuels. This method is applied primarily within the WUI in shrublands or grasslands. Grazing can reduce the need and costs of mechanical treatments such as mowing or disking and also eliminates the fire hazard aspect of equipment use in high fire hazard areas. Limitations include the need for fencing, transportation costs, access to water source, and potential for the introduction of weedy species through the animals feces and the animal's indiscriminate browsing habit.

6.2.5 Fuel Treatment Implementation Timing - Seasonality

Once a site-specific prescription has been identified (including fuel treatment type and design) the next consideration is timing of implementation.

Seasonal limitations include rainy weather, which causes soil/site conditions that are not conducive to mechanical work. Some limited manual work may be an option during these wet conditions on a site-by-site basis. Mechanical work should be strictly limited during the hottest, driest time periods because hot machinery (i.e. exhaust systems), or metal scraping on a rock to send sparks into dry grassy fuels and ignite a wildfire. The fire history database is filled with records of fires accidentally started by people operating power equipment in dry weather. Mowing after June would have to should be carefully considered on a case-by-case basis depending on the fuelbed, fire danger, site conditions, and limited operating periods for sensitive species. When fall Santa Ana fire weather is forecasted or is occurring, any planned outdoor activities that could possibly start a fire should be postponed until moderate weather returns.

6.3 Protecting Natural and Cultural Resources

The use of prescribed fire as a vegetation modification tool to promote enhanced wildfire safety is not ecologically sound in a system that is currently being degraded by an increasing number of wildfires.

The activities in this Plan focus on areas directly adjacent to structures (i.e. homes, business, outbuildings, and infrastructure) and communities. When vegetation modification to promote defensible space is applied consistently, the improvements within the SMM CWPP Planning Area have an increased potential to survive a wildfire. Additionally, through the maintenance of quality defensible space, the natural and cultural resources of the area are afforded an enhanced level of protection by reducing potential fire suppression damage on adjacent public lands.

The fuel treatments proposed in this plan moderate fire behavior, improve access for firefighters, improve evacuation corridors for the public, and provide a safer working environment for firefighters, while still protecting the natural resources found within the Planning Area.

In implementing the actions proposed in this plan, it's important to consider best management practices (Appendix D) before undertaking any fuels treatment activity. These best management practices are especially important for mitigation activities that are required for any fuel management activity in native vegetation. It is possible to have an aesthetically pleasing landscape that is fire safe, supports local plant and animal species, and still provides privacy and enjoyment.

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Chapter 7 - Monitoring and Maintenance

SMM's residents have access to monitoring expertise through local agencies, including the NPS, California State Parks, Santa Monica Mountains Conservancy, the University of California, the Resource Conservation District of the SMM, and the County of Los Angeles Fire Department, Division of Forestry. These organizations can help FSCs and others develop a monitoring strategy to track the long-term success of hazard mitigation projects.

The importance of a sustainable monitoring program is often overlooked due to time and budget constraints. Clearly, once the decision is made for the initial investment to plan and implement a fuel treatment project, the follow-up work to maintain a site is far less costly in time and funding.

Policy changes, additions to open spaces, boundary changes, or other specific needs require a review of the CWPP. This CWPP is not static and will require periodic review and modification to address the changing social and political factors that affect the communities covered by this plan.

7.1 Project Monitoring

A simple monitoring method for fuels reduction projects is photo point monitoring. This is a requirement for most California Fire Safe Council Clearinghouse grants. Photos are taken of a given place before, during, and after treatments, which provides a basic physical comparison.

A guide to photo point monitoring methodology can be found at www.dep.wv.gov/WWE/getinvolved/sos/Documents/More/PhotoDocumentation.pdf.

West Hillside Hazard Tree Project, Before.

West Hillside Hazard Tree Project, After.

7.2 Project Maintenance

A key component of the vegetation strategy is a reliable fuels treatment maintenance plan, which should be established during the planning phase of a treatment program. Success of fuel treatments are commonly measured by their long-term effectiveness. Due to consistent growth and changes in vegetation, a fuel treatment will become less effective over time; therefore, revisiting the treatment areas at a determined time interval is essential to maintaining a site's hazardous fuels mitigation benefit.

Tools such as mechanized equipment, manual, and biological treatment used for initial removal and control of vegetation are also part of long-term maintenance actions (Green, 1977). In developing fuel treatment maintenance operations for property owners, factors to consider are fuel types, treatment extent, and economics.

Fuel Type: Each plant species has individual characteristics such as growth rate, timing and amount of new growth, time of dormancy, age of maturity, and overall lifespan. For the purposes of standard fuel maintenance, planning growth rates and amount of new growth are foremost considerations. Although some site-specific cases may require attention to the needs of individual plant species (i.e. some ESHAs or sites with special features), most hazardous fuels mitigation projects can be broadly designated by fuel types such as grasses/forbs, and shrubs/brush.

- Grasses/Forbs
  - Display earliest green-up and more rapid cycle to curing/drying of the fuel types.
  - Annual height of vegetation is directly dependent on quantity of precipitation.
  - Tend to be aggressive in their invasive tendencies.
  - When cured, have potential to sustain fast moving wildfire.
  - Treatments of mowing or weed whacking often need multiple treatments in growing season.

- Shrubs/Brush
  - Have a later season green-up and cure cycle than grasses/forbs
  - Annual amount of new growth is dependent on quantity of precipitation
  - Not normally found to be aggressive on the invasive scale
  - Driest in very late summer through late fall, can sustain severe fire behavior
  - Treatments should be scheduled toward the end of the growing period (i.e. mid to late summer). Sites should be visually monitored on an annual basis. Following the initial treatment, the interval may extend to 3 to 7 years depending on observed growth.

Fuel Treatment Extent: Factors that comprise "extent" include the size, coverage, location of treatment area, and the degree or intensity of the vegetation removal. An acceptable maintenance schedule should incorporate these elements for each treatment area.

- Size: In larger treatment areas, it may be important to schedule maintenance somewhat early in the field season to ensure the necessary work can be completed prior to the driest, high fire danger portion of the year.
- Location: Treatment location can contribute to maintenance issues due to potential factors that may limit operating procedures. Riparian ESHAs and streamside corridors are all examples where treatments must follow specific procedures and timelines. The maintenance schedule will reflect the special circumstances for these sites that have environmentally sensitive issues.

- Intensity/Degree: A common treatment scenario consists of more intensive fuel removal near the value at risk and less intensive as the distance increases. The scheduled treatment maintenance requirements for these sites logically follow a gradient scale similar to that described in the established site intensity levels. The more intensive areas closer to the target value will fall into a higher maintenance level, shorter intervals, and more removal.

Economics: Incorporating a viable maintenance schedule is a critical component in the planning and development of a fuel treatment strategy. Substantial economic investments are necessary to establish fuel treatment areas, these investments can only be sustained if they are properly maintained on a regular basis. Establishing a fuel treatment program including a maintenance schedule is an important step forward for long-term community safety. Fluctuating economics will necessitate staging of treatments, reviewing and following priorities, and continuing to watch for grant opportunities.

7.3 Updating This Plan

This CWPP is based on current conditions and best available information. At a minimum, this plan should be updated every five years or sooner if social, political, or economic factors warrant.

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Appendices

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Appendix A - Glossary

Aspect: The direction that a slope faces—north, south, east, west, etc.

Best Management Practices (BMPs): In this context, fire safety activities that effectively reduce wildfire risk while limiting potential negative environmental impacts. BMPs can range from reducing impacts on specific wildlife species, to maintaining or enhancing ecosystem functions and processes.

Biodiversity: The abundant variety of plant, fungi, and animal species found in an ecosystem, including the diversity of genetics, species, and ecological types.

Biomass: The total weight of living matter in a given ecosystem. May also be defined as the total weight of plant debris that can be burned as a fuel.

Built Environment: Man-made structures as opposed to the natural environment.

Canopy: The top layer of a forest, tree, or lower growing stand of shrubs, which is formed by leaves, needles, and branches creating a continuous cover.

Chip: To cut up slash materials into small pieces, or chips.

Chipping Program: A program where several individuals or communities share the resources associated with processing debris from fuel reduction activities, including the chipper (the machine that creates the chips), staff, insurance, etc.

Collaborative: An open, inclusive process that assumes all participants have valuable knowledge and opinions, and all of their comments are heard and considered. Collaboration does not mean consensus or ownership.

Compact: To pack closely or tightly together, as in the fragments of soil being compacted by heavy equipment, thereby limiting the ability of oxygen or water to pass through freely.

Condition class: Refers to the general deviation of ecosystems from their prehistoric (pre-settlement) natural fire regime. It can be viewed as a measure of sensitivity to fire damage of key species and related ecosystem processes. Condition class is based on a relative measure describing the degree of departure from the historical natural fire regime. This results in changes to one or more of the following ecological components: vegetation characteristics (species composition, structural stages, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity, and pattern; and other associated disturbances (i.e. insect and disease mortality, grazing, and drought).

Cover: Any plants or organic matter that hold soil in place and/or grow over and create shade that provides wildlife with an area to reproduce and find protection from predators and weather.

Crown Fire: A fire that spreads through the top of the vegetative canopy and is characteristic of hot fires and dry conditions. Crown fires are generally more complex to control than surface fires.

Defensible Space: An area around a home/structure where flammable materials have been reduced to act as a barrier between wildfires and property, thereby decreasing the risk of damage or loss. This space is currently defined as 100 feet around a structure in California.

Diurnal: Belonging to or active during the day (opposite of nocturnal).

Dominant: The species or individual that is the most abundant or influential in an ecosystem. For example, a dominant tree is one that stands taller than the rest and receives full sun, or the shrub species most abundant in the local understory.

Duff: A layer on top of the soil made up of mostly fine (small) decomposing organic matter such as leaves, needles, and small branches.

Ecosystem: A community of organisms (including plants, animals, and fungi and the non-living aspects of the physical environment) that makes up a specific area. Examples of ecosystem types include a pond or a forest.

Embers: Small glowing or smoldering pieces of wood or other organic debris, often dispersed ahead of a fire (also known as firebrands).

Endemic: A plant or animal that is native to a certain limited area and found nowhere else.

Endangered Species: A population of organisms classified as such by the state or federal government as being at risk of becoming extinct because it is few in number and/or threatened by changing environmental or predation parameters.

Environmentally Sensitive Habitat Area (ESHA): An area protected from human activities or development due to the existence of rare or especially valuable and/or vulnerable plants, animals, and habitats.

Erosion: The removal of soil over time by weather, wind and/or water, such as rain or water runoff from roads.

Escape Route: A path or road that has been pre-planned for getting out of harm's way in a fire situation. The route should be well understood in advance of crisis by all participants. If there is any unclear direction, the path should be marked.

Extirpated: A species is considered extirpated when it no longer exists in the wild in a certain area.

Facultative Sprouter: A plant species that can resprout after a fire from the rootstock, although this may not be its usual or primary method of reproduction in the absence of fire. The ability to resprout may be dependent on the intensity of the fire.

Federal Responsibility Area (FRA): An area where fire protection responsibility and liability is federal.

Firebrand: A piece of wood or a coal that is hot and glowing from fire activity, often dispersed by wind ahead of a fire. Also called embers.

Fireline Intensity: The heat energy released by the fire at the forefront of the fire.

Fire Ecology: The study of fire and its relationship to the physical, chemical, and biological components of an ecosystem.

Fire Followers: Plants that flourish after a fire; seeds from long lived seedbanks typically germinate abundantly in ashy soils.

Fire Hazard: In this plan it is defined as the wildland fire intensity output from the fire behavior model FlamMap for site-specific locations within the CWPP Planning Area.

Fire Ignition: The act of setting on fire or igniting a fire.

Fire Prevention: Actions taken by homeowners and community members to lessen wildfires and damage caused by wildfires. Includes education, enforcement, and land management practices.

Fire Protection (a.k.a. Fire Suppression): Firefighting tactics used to suppress wildfires. Firefighting efforts in wildland areas require different techniques, equipment, and training from the more familiar structure firefighting found in populated areas.

Fire regime is a description of fire's historic natural occurrence, variability, and influence on vegetation dynamics in the landscape. Fire regimes describe the frequency of fire and fire's expected effects on a particular area's vegetation. Generally based on fire history reconstructions, fire regime descriptions include the season, frequency, severity, size, and spatial distribution of fires.

Fire Regime Condition Class: A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human intervention, but including the influence of aboriginal burning. A fire regime condition class (FRCC) is a classification of the amount of departure from the natural regime.

- Fire Regime I: 0-35 year frequency and low to mixed severity (surface fires most common)
- Fire Regime II: 0-35 year frequency and high severity (stand replacement fires)
- Fire Regime III: 35-:100+ year frequency and mixed severity
- Fire Regime IV: 35-100+ year frequency and high severity (stand replacement fires)
- Fire Regime V: 200+ year frequency and high severity (stand replacement fires)

Fire Resistant: A material, substance, or structure that is difficult to ignite by fire and burn.

Fire Resistant Building Materials: Construction materials that are resistant to ignition when exposed to radiant heat or flames. Examples include clay tile roofs, metal roofing, and stucco siding.

Fire Return Interval: A period of time between fires in a specific region or area.

Fire Risk: Defined in this plan as the burn probability for lands within the Planning Area.

Fire Safe Council: Public and private organizations that comprise a council intended to minimize the potential for wildfire damage to communities and homeowners, while also protecting the health of natural resources. Goals are achieved by distributing fire prevention materials, organizing fire safety programs, implementing fuel reduction projects, and more www.firesafecouncil.org.

Fire Safe Practices: Activities such as creating defensible space, firebreaks, access, fire resistant landscapes, changes to a home in terms of material and design, etc., that make the home/property safer in wildfire situations.

Fire Safe or Fire Safety: The act of preparing something—a home, neighborhood, or community—to survive a wildfire; the ability of an object to survive fire.

Fire Weather: The various types of weather that affect how a fire ignites, behaves, and is controlled.

Flame Length: The span of the flame from the tip to the base, irrespective of tilt.

Flammable: A quality of a substance that makes it likely to catch fire, be easily ignited, burn quickly and/or have a fast rate of spreading flames.

Foëhn Wind Events: A type of dry downslope wind that occurs in the lee (down wind side) of a mountain range. It typically blows warm, dry, and generally strong, creating extremely dry fuel and dangerous fire potential.

Forbs: Herbaceous flowering plants, other than grasses.

Fuel: All burnable materials including but not limited to living or dead vegetation, structures, and chemicals that feed a fire.

Fuelbreak: A strategic area where fuel volumes have been intentionally reduced to slow down a fire and reduce its flame length and intensity; as distinguished from a firebreak, where all fuels are removed to bare mineral soil for fire suppression.

Fuel Complex: The volume, type, condition, arrangement, and location of fuels that determines the degree of ease of fire ignition and of fire resistance to control.

Fuel Continuity: The amount of continuous fuel materials in a fire's path that allows the fire to extend vertically toward the crowns of trees or horizontally into other fuels.

Fuel Model: A standardized description of fuels available to a fire based on the amount, distribution, and continuity of vegetation and wood use in fire behavior prediction. Fuel models distinguish among vegetation (such as tall and short chaparral, or timber with and without an understory), as well as describe the arrangement and amount of vegetative fuels. Fire managers use fuel models within the Fire Behavior Prediction System to analyze the wildfire environment.

Fuels Management: The management of fuels for fire safety or ecosystem health. Examples include thinning vegetation, prescribed burns and creation of fuelbreaks.

Fuel Moisture: The amount of water in vegetation, typically expressed as a percentage, and having a large effect on the rate of spread of fires.

Fuel Reduction/Treatment: The act of removing burnable materials to lower the risk of fires igniting and to lessen the likelihood of damage to property and communities. Treatments may include creating a defensible space, developing fuelbreaks, initiating prescribed burns, and thinning vegetation.

GIS (Geographic Information System): A program for storing and manipulating geographical information on a computer; very useful for landscape level planning efforts.

Growth or Vigor: The ability of plants to exhibit healthy natural growth and survival.

Habitat: An ecological or environmental area that is inhabited by a particular species of animal(s), plant(s), or other type of organisms.

Hardening/Harden Homes: This term refers to improving a building's resistance to fire, especially by reducing its ignitibility by embers. One example might be updating a roof with noncombustible roofing material. The goal is to make the structure survivable in fire.

Hazard Fuel: A fuel complex defined by kind, arrangement, volume, condition, and location that presents a threat of ignition and resistance to control.

Herbaceous Overstory Vegetation: The vegetation layer that forms the uppermost canopy layer and is partly composed of non-woody plants that die back in winter.

Home Ignition Zone: The home and the area out to approximately 100 feet, where local conditions affect the potential ignitability of a home during a wildfire.

Ignitions: The event of combustion initiation that creates fire.

Ignition Zone: The place where combustion is initiated.

Ingress Egress: Roads and other avenues to enter and leave a property. Also refers to the act or right to come in or go through, as in entering a property (ingress), and the act or right to depart or go out, as in exiting a property (egress).

Invasive Weeds: Undesirable plants that are not native and have been introduced to an area by humans. These plants generally have no natural enemies and are able to spread rapidly throughout the new location. Some examples include Himalayan blackberries, English ivy, arundo, tamarisk, and Scotch broom.

Ladder Fuels: Materials such as shrubs, low branches, or small trees connecting the ground to the tree canopy or uppermost vegetation layer. In forests, this allows fire to climb upward into trees.

Landscape: The visible features of an area of land, including topography, water bodies, vegetation, human elements such as land uses and structures, and transitory elements such as lighting and weather conditions.

Limbing: Removing selected branches of a standing or fallen tree or shrub.

Local Responsibility Areas (LRA): An area where fire protection is provided by local sources such as city fire departments, fire protection districts, and counties. Legal responsibility is at a local level, not at the state or federal level.

Mastication: The grinding, shredding, chunking, or chopping of vegetation by heavy machinery.

Meadow: Areas of more or less dense grasses, sedges, and herbs that thrive, at least seasonally, under moist or saturated conditions. They occur from sea level to treeline and on many different substrates. They may be surrounded by grasslands, forests, or shrublands.

Modify Fire Behavior: Using fire safe practices such as fuel treatments, thinning, creating firebreaks, etc., to change the way a fire will behave, with a goal of slowing it down and reducing flame lengths. This can create additional opportunities for firefighters to conduct effective fire suppression operations.

Moisture Content: The dry weight of a material, such as wood or soil, compared to the wet weight of the same material. It is not unusual for live material to have moisture content greater than 100% because it could contain more water than solid material by weight.

Monitor: To watch, keep track of, or check regularly for changes—in this case, to the environment.

Mutual Aid: An agreement among emergency responders to lend assistance across jurisdictional boundaries. This may occur due to an emergency response that exceeds local resources, such as a disaster or a multiple alarm fire.

Obligate Seeder: A plant that reseeds after fires as its only means of recovery and regeneration.

Obligate Sprouter: A plant that resprouts after fires as its only means of recovery and regeneration.

Offshore Flow: The flow of wind blowing from the land to the water, or in other words, wind blowing offshore.

Perennial: Plants that live from year to year. In reference to water, a stream that flows year round during a typical year. May have some flux in a drought year.

Photo Point Monitoring: By utilizing a specific, identifiable point on a property from where photos are taken over time, it's possible to use the same view to compare and monitor changes.

Plant Community: A group of plants that are interrelated and occupy a given area.

Pruning: The act of cutting back the unwanted portions of a plant, or cutting for the purpose of enhancing growth.

Rate of Spread: The speed of an advancing fire measured as distance per unit time. May be measured by the growth in area or by the speed of the leading edge of the fire.

Relative Humidity: A measure of moisture in the air. If the humidity is 100%, the air is completely saturated with moisture. If the humidity is less than 20%, the air is very dry. When the air is dry, it absorbs moisture from the fuels in the forest, making them more flammable. When moist air return, fuels absorb moisture becoming less flammable.

Resilient/Resiliency: The ability of an ecosystem to return to its balanced state after a disturbance.

Riparian: A strip of land along the bank of a natural freshwater stream, river, creek, or lake that provides vast diversity and productivity of plants and animals.

Risk Assessment: The process of identifying and evaluating values at risk.

Seed Bank: A repository of dormant seeds found buried in the soil.

Sensitive Species: A plant or animal species that can tolerate a small range of resources and environmental situations, or habitat. These species raise concerns about population numbers and may be recognized locally as rare, or listed as Threatened or Endangered by the state or federal Endangered Species Act.

Shaded: Blocked from light.

Shaded Fuelbreaks: A fire suppression technique using fuelbreaks in forested areas. Vegetation is reduced and/or modified to reduce fire risk, but an adequate amount of crown canopy remains intact, thus inhibiting weedy undergrowth.

Site-Specific: Applicable to a specific piece of land and its associated attributes and conditions (e.g. microclimate, soils, vegetation).

Slash: The wood debris left on the ground after pruning, thinning, or vegetative clearing—may include branches, bark, chips, or logs.

Slope: A percentage or degree change in elevation over a defined distance that measures the steepness of a landscape.

Spatial Distribution: The manner in which plants are arranged throughout an area.

Spot Fire: A smaller fire outside the boundary of the main fire (usually ahead of the direction the fire is traveling), started by airborne sparks or embers.

Stand: A group of trees or shrubs with similar species composition, age, and condition that makes the group distinguishable from other trees in the area.

State Responsibility Area (SRA): An area that has fire protection provided at the state level. Incorporated cities and federal land do not fall in this area. Legal responsibility is at a state level.

Structural Ignitability: The ease with which a home or other structure ignites.

Structure: The composition of a forest or vegetation, specifically looking at the density, cover, size or diameter, and arrangement.

Surface Fire: A fire at the ground level that consumes debris and smaller plants.

Surface Fuels: Materials on the ground like leaf litter, grass, herbs, or low growing shrubs that provide the fuel for fires to spread on the ground. Surface fuels are generally considered all fuels within 6 feet of the ground.

Thinning: The act of removing a percentage of vegetation to encourage an open space and healthy growth for the remaining vegetation.

Treatment: An action or controlled technique that is applied in a specific process. Refer to “Fuel Treatment” for a more specific definition.

Type Conversion: The unintended replacement of native plant communities due to various disturbances such as more frequent and unnatural fires. Typically replacement is by invasive or non-native plants.

Understory: Generally herbaceous or shrubby vegetation that makes up the plant layer under the tree canopy layer.

Urban Fuels: Any flammable materials within a landscape as a result of urban development. Examples include urban structures, landscaping, vehicles, fuel tanks, and urban debris such as wood piles, trash dumps along roadsides, and die back from weedy invaders.

Vertical Fuels: Those fuels (brush, small trees, decks, etc.) that provide a continuous layer of fuels from the ground up into the top fuel layers (i.e., tree canopy).

Viewshed: The landscape or topography visible from a geographic point, especially that having aesthetic value.

Watershed: All of the land that drains water runoff into a specific body of water. Watersheds may be referred to as drainage areas or drainage basins. Ridges of higher elevation usually form the boundaries between watersheds by directing the water to one side of the ridge or the other. The water then flows to the low point of the watershed.

Wildland Urban Interface (WUI): The area where wildlands and communities converge, often assumed to be at high risk of wildfire, which can be due to increased sources of human caused ignitions.

Wildlands: An area of land that is uncultivated and relatively free of human interference. Plants and animals exist in a natural state, thus wildlands help to maintain biodiversity and to preserve other natural values.

Appendix B - Community Identified Values at Risk

<u>Planning Units 1 – 4 Malibu Beaches</u>

- Adamson House
- Malibu Lagoon State Park
- Bluffs Park
- Malibu Pier
- Commercial District
- Mobile Home Community Centers
- Dukes
- Private wine vineyards
- Malibu Urgent Care
- Paradise Cove Mobile Home Park
- La Costa Beach Club
- Paradise Cove Restaurant
- Los Angeles County Fire Department Station #71
- Post Offices
- Los Angeles County Fire
- Department Station #88
- Tivoli Cove Beach
- Malibu Colony Plaza
- Urgent Care Facility
- Michael Landon Community Center

<u>Planning Unit 5 – Decker Canyon</u>

- Charmlee Park
- Los Angeles County Fire Department Station #99
- Leo Carrillo State Beach
- Malibu Nature Preserve Tennis and Riding Club

<u>Planning Unit 6 – West Malibu</u>

- Bonsall Canyon Trailhead
- Gas station
- Busch shopping center
- Los Angeles County Fire Department Station #71
- Commercial vineyards and wineries (two of them)
- Malibu Stage Company
- Juan Cabrillo Elementary School
- Malibu West Community Club
- Malibu Park Junior High
- Malibu West Public Works Treatment Center
- Malibu High School
- Trancas Park

- Equestrian Center
- Trancas Country Market Center
- Malibu United Methodist Church and Childcare Center
- Zuma Canyon Trailhead

Planning Unit 7 – Zumirez Canyon/Puerco Canyon

- St. Aiden's Episcopal Church
- First Church of Christ, Scientist
- Los Angeles County Fire Department #71
- Power Station

Planning Unit 8 – Malibu Civic Center

- Civic Center courthouse and library
- City Hall complex
- Commercial vineyard and winery
- Cross Creek business center
- Edison substation
- Our Lady of Malibu Church and School
- Malibu Country Mart/business district
- Malibu Glass
- Malibu Presbyterian Church and School
- Veterinary and medical commercial complex
- Webster Elementary School

Planning Unit 9 – Carbon Canyon/Cross Creek

- Business District
- Fire Station #70
- Serra Retreat

Planning Unit 10 – La Costa/Pena Canyon

- Caltrans Maintenance Yard
- Historic Court House
- Las Flores Creek Park – City of Malibu
- Los Angeles County Fire Department Station #70
- New Roads School
- Water tank and pumps – Los Angeles County Waterworks District No. 29

Planning Unit 11 – Ventura: Rancho Guadalasca/Yerba Buena Canyon

- "Animal Actors," "Rockets Film Fauna," wild animal living areas
- Camp Hess Kramer
- Circle X Ranch (National Park Service)
- Communications towers/repeaters (Sandstone Peak)
- Gilmore Ranch aka Salvation Army Road
- Hilltop Camp

- Laguna Peak Repeater Site
- Lazy J Ranch
- Neptune's Net
- Rare/Endangered Areas
- United States Navy Target Range
- Ventura County Fire Station #56

Planning Unit 12 – Sycamore Canyon/Upper Latigo Canyon

- AT&T site (satellite site)
- Arroyo Sequit
- Calamigos Ranch
- Camp 13
- Fred Miller Camp School
- Charmlee Park
- Castro Peak
- Decker Camp
- Los Angeles County Fire Station #72
- Rocky Oaks

Planning Unit 13 – Corral Canyon/Pepperdine University

- Cell repeater(s)
- Charter Internet
- Future volunteer call-firefighter location/staging area
- Pepperdine
- Water tank (Las Virgenes Municipal Water District)

Planning Unit 14 – Rambla Vista/Tuna Canyon

- Camp 8
- Horse camp for handicapped children
- Power lines
- Sea View Estates
- Water tank

Planning Unit 15 – Topanga Canyon

- AmeriGas
- Bonnell Park
- Calmont/Muse Elementary
- Power lines, communication lines, and cellular repeaters along Topanga Canyon Boulevard
- Children's Corner
- Community House
- Dead Horse parking lot – current NSA
- Dog kennel
- T-CEP – Emergency Operations Center
- Fair Hills Farms – large horse ranch – current NSA (significant fuel reduction)
- Fernwood Market

- Froggy's
- Horse stable
- Inn of the 7th Ray
- Library
- Los Angeles County Fire Department Station #69
- Mermaid area safe zone
- Mermaid Tavern
- Mill Creek Stables
- Montessori School
- Old Canyon substation
- Pine Tree Circle
- Phone building
- Post Office
- State Park values, cultural
- State Park values, threatened & endangered
- T-CEP headquarters
- Topanga Chamber
- Topanga Canyon Christian Fellowship
- Topanga Elementary School
- Town Center
- Trippett Ranch
- Turtle pond
- Utilities substations
- Water tanks
- The Nature of Wildworks wildlife rescue and education
- Will Geer Theatricum

Planning Unit 16 – Las Virgenes Canyon Corridor

- Cold Creek Preserve (Stunt Ranch)
- Cottontail Ranch
- Dry Creek
- Diamond X Ranch
- Hindu temple
- Historical structures
- King Gillette Ranch
- Little Dry Creek
- Malibu Creek
- Mountains Recreation and Conservation Authority fire station
- Parklands
- California Wildlife Center

Planning Unit 17 - Cornell

- 210-foot new bridge across Triunfo Creek (to accommodate fire trucks)
- Beach/fishing at the dam

- Canyon Grill
- Commercial rock store/biker hangout
- Los Angeles County Fire Department Station #65
- Malibu Lake
- Malibu Lake Mountain Club Clubhouse
- National Park Service Fire Station Engine 73 and Engine 74
- Paramount Ranch
- Peter Strauss Ranch
- Public Works Yard
- Reagan Ranch
- Road / Caltrans maintenance yard
- Rocky Oaks
- Seminole Hot Springs Community Center
- The Old Place
- Troutdale Farm

Planning Unit 18 – Liberty Canyon/Los Hills

- Arthur E. Wright Middle School
- Agoura Hills / Calabasas Community Center
- Church in the Canyon
- Juan Bautista De Anza Park (City of Calabasas)
- Los Angeles County Malibu/Lost Hills Sheriff's Substation
- Supervisor Zev Yaroslavsky, Calabasas Field Office
- Las Virgenes Municipal Water District compost facility
- Las Virgenes Municipal Water District offices

Planning Unit 19 - Calabasas

- Alice C. Stelle Middle School
- Bay Laurel School
- Leones Adobe
- Calabasas City Hall
- Calabasas High School
- Chaparral Elementary School
- Commons Shopping Center
- Gelsons Village Market Center
- Los Angeles County Fire Department Station #68
- Montessori School
- Motion Picture Home/Assisted Living
- Private day care
- Silverado Alzheimer's Convalescent Home
- Viewpoint Private School

Planning Units 20 – Ventura: Hidden Valley/Lake Sherwood

- 1930s historic barn

• Santa Monica Mountains dudleya (Dudleya cymosa ssp. marcescens) – Rare plant, Hidden Valley
• Ventura County Fire Station #33
• Hidden Valley horse boarding (hundreds)
• Lyons pentachaeta (Pentachaeta lyonii) – Endangered plant
• Movie production sites
• Repeaters for National Park Service and Sheriff Search and Rescue; satellite and cable communication towers on Rasnow Peak

Appendix C - Planning Area Fire History

YEAR	FIRE NAME	ACREAGE	IGNITION SOURCE
1925	Topanga Post Office	172	Unknown/Unidentified
1926	Montgomery Ranch	118	Unknown/Unidentified
1926	Old Topanga No. 2	137	Unknown/Unidentified
1927	Cooper No. 1	3,177	Unknown/Unidentified
1928	Las Flores No. 59	274	Unknown/Unidentified
1930	Potrero No. 42	20,392	Unknown/Unidentified
1933	Agoura No. 2	315	Unknown/Unidentified
1935	Malibu	28,192	Unknown/Unidentified
1936	N/A	59	Unknown/Unidentified
1936	Cold Creek No. 35	2,642	Unknown/Unidentified
1938	Topanga No. 50	14,528	Unknown/Unidentified
1940	Sequít No. 54	178	Unknown/Unidentified
1940	Tuna Summit No. 32	101	Unknown/Unidentified
1942	Las Flores No. 47	5,840	Unknown/Unidentified
1943	Hail No. 66	16	Unknown/Unidentified
1944	McCoy No. 36	93	Unknown/Unidentified
1946	Dume No. 76	213	Unknown/Unidentified
1947	La Fouge	507	Unknown/Unidentified
1948	Topanga No. 118	3,277	Unknown/Unidentified
1948	Miller No. 131	41	Unknown/Unidentified
1949	Reindl No. 78	231	Unknown/Unidentified
1951	Rancho Sierra Vista	3,288	Unknown/Unidentified
1951	Houston	565	Unknown/Unidentified
1953	N/A	3	Unknown/Unidentified
1953	N/A	587	Unknown/Unidentified
1953	N/A	169	Unknown/Unidentified
1955	Houston	489	Unknown/Unidentified
1955	N/A	243	Unknown/Unidentified
1955	N/A	333	Unknown/Unidentified
1955	Ventu Park	13,957	Unknown/Unidentified

YEAR	FIRE NAME	ACREAGE	IGNITION SOURCE
1956	N/A	5	Unknown/Unidentified
1956	Hume	2,194	Unknown/Unidentified
1956	Stone Canyon 2	9	Unknown/Unidentified
1958	N/A	204	Unknown/Unidentified
1958	Brea Canyon	1,244	Unknown/Unidentified
1958	Santa Susana Dump	522	Unknown/Unidentified
1958	County 123158	5,115	Unknown/Unidentified
1959	N/A	79	Unknown/Unidentified
1959	N/A	7	Unknown/Unidentified
1959	N/A	36	Unknown/Unidentified
1959	Broome Ranch	1,240	Unknown/Unidentified
1960	N/A	11	Unknown/Unidentified
1961	N/A	46	Unknown/Unidentified
1961	N/A	7,844	Unknown/Unidentified
1964	N/A	86	Unknown/Unidentified
1966	N/A	13	Unknown/Unidentified
1967	Junction	655	Unknown/Unidentified
1967	Latigo	2,868	Unknown/Unidentified
1968	N/A	20	Unknown/Unidentified
1968	N/A	15	Unknown/Unidentified
1970	N/A	1	Unknown/Unidentified
1970	N/A	12	Unknown/Unidentified
1970	N/A	47	Unknown/Unidentified
1970	Clampitt	77,043	Unknown/Unidentified
1970	Wright	28,197	Unknown/Unidentified
1970	N/A	64	Unknown/Unidentified
1970	Golf Course	201	Unknown/Unidentified
1972	N/A	17	Unknown/Unidentified
1972	N/A	8	Unknown/Unidentified
1972	N/A	6	Unknown/Unidentified
1972	N/A	19	Unknown/Unidentified
1973	Potrero	12,299	Unknown/Unidentified
1973	Trippet	2,831	Unknown/Unidentified
1975	Park	139	Unknown/Unidentified

YEAR	FIRE NAME	ACREAGE	IGNITION SOURCE
1975	N/A	4	Unknown/Unidentified
1976	Los Robles	2,245	Unknown/Unidentified
1976	Decker	156	Unknown/Unidentified
1976	N/A	23	Unknown/Unidentified
1977	N/A	14	Unknown/Unidentified
1977	N/A	2	Unknown/Unidentified
1977	N/A	15	Unknown/Unidentified
1977	Canyon	1,162	Unknown/Unidentified
1977	Carlisle	1,377	Unknown/Unidentified
1978	N/A	6	Unknown/Unidentified
1978	N/A	60	Unknown/Unidentified
1978	N/A	38	Unknown/Unidentified
1978	Trancas	210	Unknown/Unidentified
1978	Kanan	25,586	Unknown/Unidentified
1979	N/A	2	Unknown/Unidentified
1979	Liberty Canyon	158	Unknown/Unidentified
1980	Hill Canyon	11,975	Unknown/Unidentified
1980	Sunland	6,454	Unknown/Unidentified
1980	N/A	20	Unknown/Unidentified
1980	Las Virgenes	2,521	Unknown/Unidentified
1981	N/A	67	Unknown/Unidentified
1982	Brush	1	Unknown/Unidentified
1982	Water	10	Smoking
1982	Highlands	188	Unknown/Unidentified
1982	Dayton Canyon	43,090	Unknown/Unidentified
1982	N/A	9	Unknown/Unidentified
1983	Heldover	0.002	Miscellaneous
1983	Fence	0.4	Unknown/Unidentified
1983	Decker Canyon	0.1	Escaped Prescribed Burn
1984	Ditch	0.03	Equipment
1984	Gun	124	Unknown/Unidentified
1984	N/A	7	Unknown/Unidentified
1984	Viewridge	401	Unknown/Unidentified
1984	La Jolla	7	Playing with fire

YEAR	FIRE NAME	ACREAGE	IGNITION SOURCE
1985	Mt. Olympus	13	Unknown/Unidentified
1985	Mulholland	66	Unknown/Unidentified
1985	Hummingbird	2,382	Unknown/Unidentified
1985	Box Canyon (Pioneer)	1,247	Unknown/Unidentified
1985	Park	156	Unknown/Unidentified
1985	Decker	6,567	Unknown/Unidentified
1986	Rancho 1	0.1	Vehicle
1986	N/A	38	Unknown/Unidentified
1986	A-Team	0.1	Unknown/Unidentified
1986	N/A	2	Unknown/Unidentified
1987	Agoura	163	Unknown/Unidentified
1987	N/A	152	Unknown/Unidentified
1988	Sycamore	368	Unknown/Unidentified
1988	The Adobe	241	Unknown/Unidentified
1989	Black	169	Unknown/Unidentified
1989	N/A	6	Unknown/Unidentified
1990	N/A	50	Unknown/Unidentified
1990	N/A	9	Unknown/Unidentified
1990	N/A	5	Unknown/Unidentified
1990	Old Topanga	20	Unknown/Unidentified
1991	Cook	2	Campfire
1991	Center	0.2	Power Line
1991	Morning	1	Arson
1991	Archery	0.1	Unknown/Unidentified
1991	Potrero	1	Arson
1991	Encinal	0.2	Unknown/Unidentified
1992	Party Rock	0.1	Vehicle
1992	Pier	1	Campfire
1992	Party Rock 2	0.1	Unknown/Unidentified
1992	Phone Line	0.1	Power Line
1992	Carlisle	0.2	Power Line
1992	Big Rock	0.1	Unknown/Unidentified
1992	Tápia	0.1	Unknown/Unidentified
1992	Malibu	5	Campfire

YEAR	FIRE NAME	ACREAGE	IGNITION SOURCE
1993	Satwiwa	45	Campfire
1993	Sycamore	5	Unknown/Unidentified
1993	Malibu	10	Unknown/Unidentified
1993	Malibu 15 Ac	14	Unknown/Unidentified
1993	Green Meadows	38,480	Unknown/Unidentified
1993	Old Topanga	16,198	Arson
1994	Kanan	1	Unknown/Unidentified
1994	Nicholas	1	Unknown/Unidentified
1994	Latigo	63	Unknown/Unidentified
1995	Busch	0.1	Power Line
1995	Circle X	0.1	Debris
1995	Stonyvale	9	Smoking
1995	Triunfo	0.2	Playing with fire
1996	Triunfo 1	0.2	Unknown/Unidentified
1996	Encinal	0.1	Escaped Prescribed Burn
1996	Charmlee	6	Arson
1996	Calabasas	12,187	Power Line
1997	Decker	1	Campfire
1997	Malibu	10	Power Line
1997	Las Virgenes	2	Equipment
1997	Sycamore	18	Playing with fire
1997	Mulholland	20	Unknown/Unidentified
1997	Lost Hills	5	Unknown/Unidentified
1997	School	0.1	Vehicle
1997	Yerba	0.2	Debris
1997	Malibu	3	Unknown/Unidentified
1997	Hidden	0.1	Debris
1998	Potrero	2	Unknown/Unidentified
1998	Encinal	0.5	Unknown/Unidentified
1998	Malibu Creek	0.1	Campfire
1998	Corral	0.5	Unknown/Unidentified
1998	Sherwood	0.2	Lightning
1998	Trancas	0.2	Lightning
1998	Yerba Buena	0.1	Lightning

YEAR	FIRE NAME	ACREAGE	IGNITION SOURCE
1998	Triunfo	0.2	Lightning
1998	Yerba	0.1	Vehicle
1999	Pchic	0.1	Unknown/Unidentified
1999	No Name	0.5	Miscellaneous
1999	Peter Strauss	1	Campfire
1999	Greenwood	85	Playing with fire
1999	Mulholland	3	Unknown/Unidentified
2000	NPS Truck	0.01	Vehicle
2000	Topanga	0.3	Vehicle
2000	Wendy	0.05	Unknown/Unidentified
2001	Malibu Tunnel	0.1	Debris
2002	West PCH	0.2	Unknown/Unidentified
2002	Mulholland	0.2	Debris
2002	Backbone	0.2	Arson
2002	Entrada	0.1	Arson
2002	Deer Creek	1	Vehicle
2002	Decker	15	Campfire
2003	Latigo	0.3	Power Line
2003	Corral	8	Power Line
2003	Dump	9	Miscellaneous
2003	Sycamore Incident	77	Power Line
2003	101	0.2	Vehicle
2003	Lofty Kanan	0.1	Vehicle
2003	Malibu-PCH	0.02	Campfire
2003	Old Topanga	16	Equipment
2003	134812	0.1	Smoking
2003	Bulldog	0.1	Power Line
2003	Corral	37	Power Line
2003	Norman	0.1	Equipment
2003	Rodeo	0.2	Structure
2006	Latigo	37	Vehicle
2004	Foothill	1	Arson
2004	Wendy Incident	121	Vehicle
2005	CSUCI	2	Unknown/Unidentified

YEAR	FIRE NAME	ACREAGE	IGNITION SOURCE
2005	Freeway	15	Vehicle
2005	Topanga	23,392	Unknown/Unidentified
2006	Sherwood	168	Unknown/Unidentified
2006	Westlake	34	Equipment
2007	Malibu	37	Smoking
2007	Rocky Oaks	0.3	Miscellaneous
2007	Latigo Canyon	0.1	Miscellaneous
2007	Triunfo	0.3	Miscellaneous
2007	Latigo	0.2	Equipment
2007	Tunnel	0.3	Miscellaneous
2007	Kanan	1	Equipment
2007	Sandstone	0.1	Vehicle
2007	Creek	1	Miscellaneous
2007	Flores	0.1	Vehicle
2007	Deer Creek	0.1	Vehicle
2007	Agoura 2	2	Arson
2007	Sesnon	30	Unknown/Unidentified
2007	Virgenes	0.02	Miscellaneous
2007	Corral	4,707	Unknown/Unidentified
2007	Sterling	0.01	Lightning
2008	Mulholland	0.1	Unknown/Unidentified
2008	Westlake	0.3	Unknown/Unidentified
2008	Triunfo	0.5	Unknown/Unidentified
2008	Malibu	51	Structure
2008	Bluff	0.3	Aircraft
2008	Lost	167	Unknown/Unidentified
2008	Topanga	1	Vehicle
2008	Kanan	2	Unknown/Unidentified
2008	La Jolla	22	Unknown/Unidentified
2008	Yellow Hill	2	Unknown/Unidentified

Appendix D – Fire Model Inputs

Weather Data for the Planning Area

RAWS station	Coastal SIG		Inland SIG	
stations	Leo Carrillo, Camp 8 (=Malibu)		Cheeseboro, Malibu Cyn	
time period	1982-2009 (Jun1-Nov30)		1982-2009 (Jun1-Nov30)	
percentile	10(90)%	5(95)%	10(90)%	5(95)%
$Temp_{max}$ (deg F)	89	92	98	101
$Temp_{min}$ (deg F)	64	67	69	72
RH_{max}	65.0	50.0	35.0	24.0
RH_{min}	20.0	13.0	10.0	8.0
fuel moisture 1hr	5.0%	3.6%	2.3%	1.7%
fuel moisture 10hr	7.0%	5.7%	3.3%	2.8%
fuel moisture 100hr	11.2%	9.8%	6.8%	5.9%
$windspeed_{max}$ (20' daily mean, mph)	13.0	15.0	14.5	16.0
Elevation (feet)	50', 1400' (avg = 725')		610', 1650' (avg = 1130')	

Fuel Model Data for the Planning Area

Code[a]	Description	fuel loading (tons/acre)					model type	surface area/ volume ratio (ft^{-1})			fuelbed depth (ft)	moisture extinction	heat content (BTU/lb) [b]
		1hr dead	10hr dead	100hr dead	live herb	live woody		1hr dead	live herb	live woody			
14	Chaparral, Manzanita (*Arctostaphylos* sp.)	3.00	4.50	1.05	1.45	5.00	static	350	1500	250	3.0	14%	9211
15	Chaparral, Chamise 1-old *(Adenostoma fasciculatum)*	2.00	3.00	1.00	0.50	2.00	static	640	2200	640	3.0	14%	10000
16	Chaparral, north slope *Ceanothus* sp.	2.25	4.80	1.80	3.00	2.80	static	500	1500	500	6.0	14%	8000
17	Chaparral, chamise 2-young *(Adenostoma fasciculatum)*	1.30	1.00	1.00	2.00	2.00	static	640	2200	640	4.0	20%	8000
18	Coastal Sage Scrub (*Artemisia californica*, *Eriogonum* sp.)	5.50	0.80	0.10	0.75	2.50	static	640	1500	640	3.0	25%	9200
19	Black mustard *(Brassica nigra), dense*	6.34	0.00	0.00	0.00	0.00	static	857	305	305	4.2	14%	8000
101	GR1 (grass- sparse, dry climate)	0.10	0.00	0.00	0.30	0.00	dynamic	2200	2000	-	0.4	15%	8000
102	GR2 (grass- low load, dry climate)	0.10	0.00	0.00	1.00	0.00	dynamic	2000	1800	-	1.0	15%	8000
104	GR4 (grass- moderate load, dry climate)	0.25	0.00	0.00	1.90	0.00	dynamic	2000	1800	-	2.0	15%	8000
107	GR7 (grass- high load, dry climate)	1.00	0.00	0.00	5.40	0.00	dynamic	2000	1800	-	3.0	15%	8000
121	GS1 (grass-shrub, low load, dry climate)	0.20	0.00	0.00	0.50	0.65	dynamic	2000	1800	1800	0.9	15%	8000
122	GS2 (grass-shrub, moderate load, dry climate)	0.50	0.50	0.00	0.60	1.00	dynamic	2000	1800	1800	1.5	15%	8000
141	SH1 (shrub, low load, dry climate)	0.25	0.25	0.00	0.15	1.30	dynamic	2000	1800	1600	1.0	15%	8000
142	SH2 (shrub, moderate load, dry climate)	1.35	2.40	0.75	0.00	3.85	static	2000	-	1600	1.0	15%	8000
145	SH5 (shrub, high load, dry climate)	3.60	2.10	0.00	0.00	2.90	static	750	-	1600	6.0	15%	8000
147	SH7 (shrub, very high load, dry climate)	3.50	5.30	2.20	0.00	3.40	static	750	-	1600	6.0	15%	8000
161	TU1 (timber understory-grass-shrub, low load, dry climate)	0.20	0.90	1.50	0.20	0.90	dynamic	2000	1800	1600	0.6	20%	8000
165	TU5 (timber understory-shrub, very high load, dry climate)	4.00	4.00	3.00	0.00	3.00	static	1500	-	750	1.0	25%	8000
181	TL1 (timber litter, low load compact conifer)	1.00	2.20	3.60	0.00	0.00	static	2000	-	-	0.2	30%	8000
182	TL2 (timber litter, low load broadleaf)	1.40	2.30	2.20	0.00	0.00	static	2000	-	-	0.2	25%	8000
183	TL3 (timber litter, moderate load conifer)	0.50	2.20	2.80	0.00	0.00	static	2000	-	-	0.3	20%	8000
186	TL6 (timber litter, moderate load broadleaf)	2.40	1.20	1.20	0.00	0.00	static	2000	-	-	0.3	25%	8000

[a] Numbers 14-19 are custom fuel models. Numbers 101-186 are standard fuel models.
- Fuel models 14-18: David R. Weise and Jon Regelbrugge, 1997. "Recent Chaparral Fuel Modeling Efforts." US Department of Agriculture, Forest Service, Pacific SW Research Station, Rx Fire and Fire Effects ResearchUnit. In-house report on Chaparral Fuel Modeling Workshop March 1-12, 1997. 5 pp.
- Fuel model 19 by Adam Anderson, Irvine Ranch Conservancy from field plot data and qualitative observations of fire behavior during the Santiago Fire (10/21/2007).
- Fuel model 25 developed by US Department of Agriculture, Forest Service, PSW Region Fuels Specialist Bernie Bahro. Model is similar to a heavy slash fuel model.
- Reference for Fuel models 101-186: Scott, Joe H. and Robert E. Burgan. 2005. *Standard fire behavior fuel models: a comprehensive set for use with Rothermel's surface fire spread model.* Gen. Tech. Rep. RMRS-GTR-153. Fort Collins CO: US Department of Agriculture, Forest Service, Rocky Mtn Research Station. 72pp.

[b] The same heat content value was applied to both live and dead fuels.

Appendix E - Best Management Practices

Best management practices are methods or techniques found to be the most effective in achieving an objective while minimizing environmental impacts. BMPs try to balance fire safety with other important considerations in the Planning Area. Everyone is encouraged to utilize BMPs in fuel reduction and fire safety activities.

A Road Map to Fire Safety

The Santa Monica Mountains Fire Safe Alliance created this guide to help residents comply with the requirements for defensible space, brush clearance, and fuel modification on their properties in the Santa Monica Mountains. Their mission is to ***"integrate best management practices that will create defensible space while protecting the wildland."*** The *Road Map* provides information on the fuel modification requirements for different property types, FAIR plan insurance, fire access road standards, environmental considerations for planting and clearance, and detailed information on how to create a safe defensible space. Mitigation efforts should start from the structure out, including structural modifcations that can prevent home ignitions in combination with best management practices while creating defensible space.

The *Road Map* is available at http://fire.lacounty.gov/forestry/RoadMaptoFireSafety.pdf

Best Management Practices for Conservation

Vegetation

- Act conservatively

  To reduce the risks of fire proactively redesign the property to a more fire resilient landscape. Ensure that when native vegetation is removed, it is done with careful planning and consideration to ensure that what is left is healthy and resilient. For more information, visit www.firewise.org/Information/Who-is-this-for/Homeowners.aspx and http://celosangeles.ucdavis.edu/UCCE_Helps_Homeowners_Be_Fire_Safe.

- Protect native species

  Become familiar with native vegetation. Prune shrubs where you can rather than eliminate them, incorporating them into your landscaping. There may be plants that are threatened, endangered, or locally rare. Consult with the area's land management experts on their protection. For more information, visit www.lasmmcnps.org/nativeplants.html and www.nps.gov/samo/naturescience/plants.htm.

- Manage for invasive weeds

  Follow vegetation treatments with invasive weed mitigation. Remove them or manage them by cutting them before seed production. Minimize the introduction of exotic plant species. Invasive species can increase the fire hazard, degrade the habitat for native creatures and are difficult to eradicate. For more information, visit www.cal-ipc.org/ and www.ipm.ucdavis.edu/PMG/weeds_common.html.

- Keep the oldest and biggest native trees

  Protect and retain trees with nests and cavities, or where obvious wildlife feeding or nesting activities are occurring. Prune dead material from trees, limb them high enough to let fire pass under them without flames traveling into their canopy (branches and leaves). Remove "ladder fuels", plants underneath trees that will allow flames to carry into the tree canopy. Laws in every jurisdiction throughout the Santa Monica Mountains protect oak trees. Oaks and other native trees provide many conservation benefits. For additional information, visit www.fire.lacounty.gov/forestry/environmentalreview_oaktreeordiance.asp and www.treepeople.org/santa-monica-mountains-restoration and http://rcdsmm.org/oak-trees.

- Standing dead trees

  Standing dead trees or snags provide both shelter and food to many birds and other animals. However, they are a wildfire hazard if they are near structures or block an evacuation route during a fire. Remove snags near property and roads, but leave them in more remote areas that do not threaten structures and can provide important habitat. For more information, visit www.fs.fed.us/r6/nr/wildlife/animalinn/hab_wlsnag.htm.

Wildlife

- Provide wildlife a place to live

  Become familiar with the animals that live in your area. Learn what wildlife need in terms of shelter, food, water, and reproduction. Find ways to balance land management activities with their needs. For more information, visit www.californiachaparral.com/cplantsanimals.html and www.nwf.org/Get-Outside/Outdoor-Activities/Garden-for-Wildlife/Create-a-Habitat.aspx .

- Provide access to food and water.

  Make sure all natural water supplies are safe by keeping any poisons and sediments away from areas that drain into fresh water. For more information, visit http://santamonicabay.org/smbay/ProblemsSolutions/HabitatsLivingResources/WetlandsandRiparianCorridors/tabid/77/Default.aspx.

- Protect future generations of wildlife

  Find out when local species are nesting and/or breeding and avoid treating fuels during those periods. Learn what kind of habitat local species might use for nesting and breeding, and be sure to protect those areas during fuel reduction and other management activities. For more information visit www.audubon.org/bird/at_home/SafeMisc.html.

A general rule of thumb: November to February is a good time for vegetation management in the Santa Monica Mountains.

- Conserve threatened and endangered species

  Find out if rare or endangered species are in the area by talking to local Cooperative Extension Agents or federal or state wildlife biologists. State and federal laws protect these species. Often an adjustment in fuel treatment activity such as timing, technique, or extent can protect species while meeting laws such as PRC 4291. Formal environmental compliance is legally required for any large fuel management project. For more information, visit www.dfg.ca.gov/wildlife/nongame/, Sensitive Species section.

Soil

- Maintain the life in soil

  Discuss soil with the local Cooperative Extension Agent, Natural Resource Conservation Service, or County Agricultural Commissioner's Office to find out what soil types exist. Some soil types can tolerate much more disturbance than others can. Minimize activities that can compact, flood, or erode soil. For more information, visit http://managingwholes.com/new-topsoil.htm.

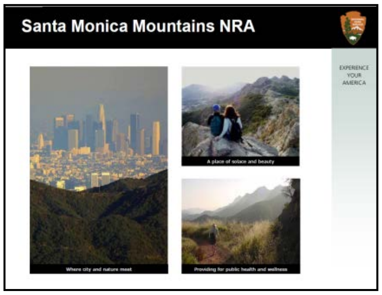
- Ensure that soil cover is fire safe

  Replace cover around property that burns easily, such as dry or dead vegetation and light mulch with cover that is less flammable (i.e. gravel, rocks, etc.). For example, a light layer of oak leaves can help with soil erosion, but too much can be a fire problem. For more information, visit http://firecenter.berkeley.edu/docs/CE_homelandscaping.pdf and www.laspilitas.com/classes/fire_burn_times.html.

- Minimize erosion

  Do not allow soil to become bare. Cover helps to prevent erosion; it keeps the soil in place. Retaining some vegetative cover significantly reduces soil erosion and slope failures. Minimize ground-disturbing activities, and never allow them in unstable areas and riparian (streamside) areas. Pay special attention to steep slopes. The steeper the slope, the faster the soil can move downhill if it is disturbed. For more information, visit www.laspilitas.com/garden/howto/slope.html and www.watershed.org/?q=node/329.

Minimizing Impacts to Natural Resources



Mitigating Impacts

The major threats to the natural resources of the Santa Monica Mountains are habitat loss, habitat degradation, habitat fragmentation, and invasive species. Fuel modification, while essential for living safely in the Santa Monica Mountains wildfire zone, exacerbates development impacts by increasing the amount of habitat loss associated with each new development. Any steps that can be taken to reduce the amount of native vegetation removed or to limit associated secondary impacts such as erosion, summer watering, increased storm water runoff, weed establishment and spread will reduce the cumulative impacts of fuel modification in the mountains.

There is extensive information available to learn more about the Santa Monica Mountains and how to protect your home and your family from wildfire, while limiting damage to the surrounding wildlands. Links to resources that guide property owners in protecting the natural resources around structures and communities will be available at the following link in the near future: http://mednscience.org/fire.

Appendix F - Informational Links

Fire Safety Links

- Ready! Set! Go! 2009 (LA County Version): www.fire.lacounty.gov/safetypreparedness/ReadySetGo/pdf/Ready%20Set%20Go%2009.pdf
- Ready! Set! Go! 2009 (Ventura County Version): http://fire.countyofventura.org/LinkClick.aspx?fileticket=9hQO1rR_ezw=&tabid=231
- CALFIRE: Fire Safety Education: www.fire.ca.gov/communications/communications_firesafety.php
- California Fire Safe Council: www.firesafecouncil.org/
- Firewise - Resources for the Homeowner: www.firewise.org/resources/homeowner.htm
- Homeowner's Wildfire Mitigation Guide: http://groups.ucanr.org/HWMG/index.cfm
- Take Responsibility: http://takeresponsibility.cafirealliance.com/
- The Wildland Urban Interface Fire Problem - Jack Cohen: www.foresthistory.org/Publications/FHT/FHTFall2008/Cohen.pdf
- Wildland Urban Fire, A different approach - Jack Cohen: www.nps.gov/fire/download/pub_pub_wildlandurbanfire.pdf
- Wildfire Zone: http://wildfirezone.org/
- California Chaparral Institute: www.californiachaparral.com/
- Holiday Safety Precautions: www.disasterprepped.com/holiday_safety.php
- Be Ember Aware http://embervent.com/emberaware.pdf

Fire Safe Homes

- Builder's Wildfire Mitigation Guide: http://firecenter.berkeley.edu/bwmg/default.html
- CA Fire Marshal: Wildland Urban Interface (WUI) Building Code Information: www.fire.ca.gov/fire_prevention/fire_prevention_wildland_codes.php
- CA Fire Marshal: Approved WUI Building Materials: www.osfm.fire.ca.gov/strucfireengineer/strucfireengineer_bml.php
- CA Fire Marshal: WUI Products Handbook: www.osfm.fire.ca.gov/strucfireengineer/strucfireengineer_bml.php
- California Wildfires: the 'fire-proof' house: http://news.bbc.co.uk/2/hi/americas/8388620.stm
- Very High Fire Hazard Severity Zone Building Requirements:
  Los Angeles Co:
  http://dpw.lacounty.gov/BSD/lib/fp/Building/Very%20High%20Fire%20Hazard%20Severity%20Zone/2011%20Code%20Version/2011%20VHFHSZ%20Plan%20Review%20List.pdf
  Ventura Co:
  www.ventura.org/rma/build_safe/pdf/handouts/b-60.pdf

- Radiant Heat versus Firebrands (Embers), Jack Cohen: www.youtube.com/watch?v=Dq6wy_tffpg
- Wildfire! Preventing Home Ignitions: www.youtube.com/watch?v=p0iR8o54hDU&feature=related
- Wildfire Rebuild Guidelines: http://fire.lacounty.gov/FirePrevention/wildfire_Rebuild_Guid.asp
- Will your home survive a wildfire?: http://takeresponsibility.cafirealliance.com/structure.php

Local Emergency Preparedness

- City of Calabasas, Emergency Preparedness Guide: www.cityofcalabasas.com/pdf/emergency-guide-2008.pdf
- City of Malibu, Emergency Preparedness Program: www.ci.malibu.ca.us/index.cfm/fuseaction/nav/navid/182/
- City of Malibu, Emergency Notification System: www.ci.malibu.ca.us/index.cfm/fuseaction/DetailGroup/navid/471/cid/11670/
- Community Emergency Response Teams (CERT): http://fire.lacounty.gov/ProgramsEvents/PECERT.asp
- Topanga Coalition for Emergency Preparedness: www.t-cep.org/fire.htm
- Topanga Disaster Survival Guide: www.topangasurvival.org/

General Emergency Preparedness

- Are You Prepared?: http://72hours.org/index.html
- Humane Society - Disaster Preparedness Brochures for Pets and Animals: www.hsus.org/hsus_field/hsus_disaster_center/resources/disaster_preparedness_brochures.html
- Red Cross - Evacuation: www.redcross.org/preparedness/cdc_english/evac-1.html
- Red Cross - Prepare your Family for Disasters: www.redcross.org/preparedness/cdc_english/evac-plan.html

After A Fire

- California Chaparral Institute: www.californiachaparral.com/
- California Wildfire Restoration Initiative: www.treepeople.org/california-wildfire-restoration-initiative
- Guide to Bird-Friendly Tree and Shrub Trimming and Removal: http://losangelesaudubon.org/
- Guide to Flash Flood Preparation: ftp://ftp-fc.sc.egov.usda.gov/CA/programs/EWP/2007/BAER_flooding_brochure.pdf
- USGS Post-Wildfire Landslide Hazards http://landslides.usgs.gov/research/wildfire/
- Resource Conservation District of the Santa Monica Mountains - Interesting Info for Locals: http://rcdsmm.org/interesting-information-locals

State and Local Codes

- CALFIRE: 100' of Defensible Space: www.fire.ca.gov/communications/downloads/fact_sheets/DefensibleSpaceFlyer.pdf
- Ventura County: http://fire.countyofventura.org/RecordsDocuments/tabid/58/Default.aspx
- LA County: http://fire.lacounty.gov/FirePrevention/FirePrevCodesOrdinances.asp

Fire Safe Councils

- California Fire Safe Council: www.firesafecouncil.org/
- How to Form a Fire Safe Council: www.firesafecouncil.org/ca/howtoform1.cfm
- Running a Local Fire Safe Council: www.firesafecouncil.org/ca/index.cfm
- Grants Clearinghouse: http://grants.firesafecouncil.org/

Fire Science

- California Fire Science Consortium www.cafiresci.org/
- Joint Fire Science Program: www.firescience.gov/
- The Wildland Urban Interface Fire Problem - Jack Cohen: Pacific Wildfire Fire Science: www.fs.fed.us/pnw/pwfsl/

CWPP Collaborating Agencies

- California Department of Parks and Recreation: www.parks.ca.gov/parkindex/region_info.asp?id=8&tab=1
- California Fire Safe Council: www.firesafecouncil.org/
- City of Malibu: www.ci.malibu.ca.us/index.cfm/fuseaction/nav/navid/396/
- County of Los Angeles Fire Department: http://fire.lacounty.gov/
- National Park Service, Santa Monica Mountains National Recreation Area: www.nps.gov/samo/index.htm
- Resource Conservation District of the SMM's: www.rcdsmm.org/
- Santa Monica Mountains Conservancy: www.smmc.ca.gov
- United States Forest Service: www.fs.fed.us/fire/
- Ventura County Fire Department: http://fire.countyofventura.org

CWPP Consultants

- ForEverGreen Forestry: http://forevergreenforestry.com/fire.html
- Geo Elements, LLC: www.geoelementsllc.com