



COMMUNITY WILDFIRE PROTECTION PLAN

Prepared for:
City of Goleta
Neighborhood Services and Public Safety Department
130 Cremona Drive, Suite 100
Goleta, California 93117



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Prepared by:
Geo Elements, LLC
PO Box 955
Cedar City, Utah 84721

Community Wildfire Protection Plan

Mutual Agreement Page

The Community Wildfire Protection Plan developed for the City of Goleta:

- ✓ Was collaboratively developed. Interested parties and federal land management agencies managing land in the vicinity of the City of Goleta have been consulted.
- ✓ This plan identifies and prioritizes areas for hazardous fuel reduction treatments and recommends the types and methods of treatment that will protect the City of Goleta.
- ✓ 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:

Daniel Singer
City of Goleta City Manager

Michael Dyer
Santa Barbara County Fire Chief

Robert Lewin
San Luis Obispo Unit Chief,
California Department of Forestry & Fire Protection

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1. INTRODUCTION

The development of a Community Wildfire Protection Plan (CWPP) is the process whereby a community collaboratively seeks to understand the threat of wildfires. It identifies the community's values, and determines whether these values are vulnerable to damage or loss from wildfire then develops a course of action for protecting those values.

The City of Goleta's CWPP provides a science-based assessment that includes extensive field data gathering, compilation of existing data and information, and the participation of stakeholders such as citizens, business owners, local organizations, community leaders, and agencies such as Santa Barbara County Fire Department (SBCFD) and the Los Padres National Forest.

This CWPP was prepared in consideration of and consistent with objectives and policies set forth in the City's General Plan, Strategic Plan, and related Open Space Management Plans.

1.1 PURPOSE OF THE PLAN

The purpose of this community wildfire protection plan is to enhance community wildfire protection by identifying fire hazard treatments, which are in balance with sustainable ecological management and fiscal resources.

1.2 GOALS AND OBJECTIVES

The goals and objectives for this CWPP help guide future activities intended to reduce the wildfire threat to the City of Goleta's values. The goals were developed based on questions, issues, and concerns collected from stakeholders during a public workshop. A second public workshop was held to present the CWPP in a more formal educational-oriented environment. In addition, issues and comments from interested parties were received by the City staff and considered during the development of the CWPP's goals. Table 1 presents the goals and objectives of this CWPP.

Each question, issue, and comment were captured and addressed in this CWPP. Appendix B details the individual comments, questions, issues, and the related response or resolution to the issue as presented in the CWPP.

Table 1 Goals and Objectives

Goals	Objectives
Minimize the wildland fire threat to life safety.	<ul style="list-style-type: none"> • Develop a citywide assessment utilizing existing data to identify wildfire hazards and risks on both city- and privately-owned lands. • Develop guidelines to mitigate these hazards and risks. • Identify vulnerable populations in consideration of special needs for pre-planning.
Enhance Goleta’s fire protection and reduce the wildfire threat to the City’s values at risk (i.e. homes, neighborhoods, critical infrastructure, businesses, natural resources, historic resources, and recreation opportunities).	<ul style="list-style-type: none"> • Utilize existing data to identify and develop vegetation management units. • Utilize the citywide assessment and designated vegetation management units to guide a vegetation management strategy that includes recommendations for specific actions to reduce the wildfire threat to values. • Identify and prioritize areas within the City’s vegetation management units to focus fuel treatment projects. • Develop recommendations for homeowner mitigation strategies to reduce structure vulnerability. • Provide recommendations on hazardous fuel treatment strategies to private landowners.
Balance wildfire mitigation strategies with natural resource sustainability.	<ul style="list-style-type: none"> • Utilize existing and available natural resource science to minimize adverse impacts to natural resources while developing mitigation strategies. • Collaborate on the concurrent development of the Monarch Butterfly Habitat Management Plan. • Utilize minimum impact tactics during implementation of wildfire mitigation treatments in sensitive habitat and natural resource areas. • Maintain communication with the various environmental resource specialists.
Improve City eligibility for funding assistance from federal and state agencies (National Fire Plan, Healthy Forest Restoration Act, FEMA, and other sources)	<ul style="list-style-type: none"> • Develop a Goleta-specific plan that exceeds the requirements of a Community Wildfire Protection Plan.

1.3 POLICY AND REGULATORY FRAMEWORK

It is essential to understand all applicable local, state and federal policy relevant to the process of developing a CWPP. The knowledge of laws and regulations ensures a path of compliance for the wildfire mitigation recommendations disclosed in the City of Goleta’s CWPP.

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 Incident Management System (NIMS)

The City adopted NIMS, which provides a systematic, proactive approach to guide departments and agencies at all levels of government, nongovernmental organizations, and the private sector to work seamlessly to prevent, protect against, respond to, recover from, and mitigate the effects of incidents, regardless of cause, size, location, or complexity, in order to reduce the loss of life and property and harm to the environment. NIMS improves and enhances the City's ability to prepare for and respond to potential incidents and hazard scenarios.

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

The wildfire problem continued to be at the forefront of national issues. 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.

1.3.2 State Level Policy

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 hazardous fuel treatment project recommended in this CWPP must comply with CEQA regulations.

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. The Goleta General Plan/Coastal Land Use Plan

(GP/CP) incorporates the Coastal Plan policy in City plan directives. All proposed treatments in the mapped Coastal Zone are subject to permits and approval by the California Coast Commission.

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. SRA lands include the area between the City boundary and the Los Padres National Forest boundary. Fire protection for SRA land is contracted to SBCFD. All construction of new developments on SRA lands approved after January 1, 1991 must follow these regulations. At a minimum, the regulations includes 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. The regulations include several requirements for how the vegetation surrounding buildings and structures should be managed to create defensible space.

2010 California Fire Code (adopted by Santa Barbara County and City of Goleta in 2011)

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 County Level Policy

Office of Emergency Services – Multi-Jurisdictional Hazard Mitigation Plan

This plan is a tool 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.

Santa Barbara Unit Fire Plan - 2011

The Santa Barbara Unit Fire Plan is intended to convey management direction from the County Fire Chief, involve and educate stakeholders on the wildfire environment, establish strategic priorities for wildfire prevention and suppression projects and programs into a single unified plan, and be a living document that will adapt to changing conditions and be updated on a regular basis.

1.3.4 City Level Policy

Goleta General Plan/Coastal Land Use Plan Policy (GP/CP) 2006

This plan governs 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 GP/CP policy in the Plan. There are five chapters covering policy items including:

Chapter 2 – “Land Use Element”

- Policy LU 5: Public and Quasi-Public Land Uses
- Policy LU 6: Park and Open Space Uses

Chapter 3 - “Open Space Element”

- Policy OS 4: Trails and Bikeways
- Policy OS 5: Ellwood-Devereux Open Space Area
- Policy OS 6: Public Park System Plan

Chapter 4 – “Conservation Element”

- Policy CE 4: Protection of Monarch Butterfly Habitat Areas
- Policy CE 5: Protection of other Terrestrial Habitat Areas

Chapter 5 – “Safety Element”

- Policy SE 7: Urban and Wildland fire hazards

Chapter 6 – “Visual and Historic Resources Element”

- Policy VH 5: Historic Resources
- Policy VH 6: Historical and Cultural Landscapes

Chapter 10 – Housing Element

- Goleta Municipal Codes (Codes are available at <http://qcode.us/codes/Goleta>)

Chapter 21, Subdivision Regulations

- Title 15 Buildings and Construction
- Title 16 Subdivisions

Ordinances

- Ratifies Santa Barbara County Ordinance 4704 adopting the 2010 California Fire Code and updating the Fire Code Fee Schedule

1.3.5 Additional Local Level Policies

Ellwood-Devereux Plan (2004)

This plan describes goals, policies and management activities to protect and enhance the Ellwood-Devereux Open Space Plan Area and provide for public access compatible with the conservation of its regionally significant coastal resources.

Coronado Butterfly Preserve Management & Enhancement Plan (2000)

Provides planning and management guidelines necessary to restore and maintain the land's value as a natural open space, to enhance its utility as an aggregation and foraging habitat for the monarch butterfly, and promotes ecologically compatible public access and environmental education activities.

Monarch Butterfly Habitat Management Plan (Planning in progress)

This management plan will prescribe both habitat maintenance and improvement measures.

It will explain the purpose and importance of managing monarch butterfly habitat protection, study methods, inventory results, and discussion of the Ellwood and Goleta population in the context of the greater western monarch butterfly population. Recommendations will be made regarding beneficial measures for all life stages of the monarch butterfly. (NOTE: There has been collaborative work between specialists on management recommendations for monarch butterfly habitat improvement and wildfire hazard mitigations.)

Lake Los Carneros Natural & Historical Preserve Master Plan

This plan guides the use and management of Lake Los Carneros, considers concerns of residents, and maintains the Park's development consistent with other plans. It provides an inventory and assessment of natural, cultural, and historical resources in the largest open space in the City with management opportunities for recreation development and constraints for activities in order to protect natural and cultural resources. This area includes several historical structures such as the Stow House and Goleta Depot.

1.4 CWPP PROCESS

The wildland urban interface (WUI) is a line, area or zone where structures and other human development meet or intermingle with undeveloped wildland and vegetative fuels. A CWPP represents the best opportunity to address the challenges of the WUI in a way that delivers comprehensive and locally supported solutions.

The HFRA's emphasis on community planning extends a variety of benefits to communities with a wildfire protection plan in place. Among the benefits to a community of having a CWPP is the option of establishing a localized definition and boundary for WUI, the opportunity to help shape fuels treatment priorities for surrounding federal and non-federal lands, and provides potential federal funding through grants to implement fuel treatments.

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)."

The CWPP process brings together diverse local interests to discuss their mutual concerns for public safety, community sustainability, and natural resources. It offers a positive, solution-oriented environment in which to address challenges such as local firefighting capability and the need for defensible space around structures and subdivisions.

The minimum requirements for a CWPP as described in the HFRA are:

1. Collaboration: A CWPP must be collaboratively developed by local and state government representatives, in consultation with federal agencies and other interested parties.
2. Prioritized Fuel Reduction: A CWPP must identify and prioritize areas for hazardous fuel reduction treatments and recommend the types and methods of treatment that will protect one or more at-risk communities and essential infrastructure.
3. Treatment of Structural Ignitability: A CWPP must recommend measures that homeowners and communities can take to reduce the ignitability of structures throughout the area addressed by the plan.

1.4.1 Collaborative Approach

In a CWPP development process, 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 community. 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.

Elements of Successful Collaboration in Community Wildfire Protection Planning include:

- Broad participation
- A fair, equitable process
- Well understood, reasonable expectations
- Multiple avenues for participation
- Commitment to the process

1.4.2 Goleta CWPP Collaboration

The initial step was to organize a public workshop to encourage participation and input by all stakeholders (including citizens, homeowner associations, local organizations, and local, state, and federal agencies within and adjacent to the City of Goleta) in the development of this CWPP and the Monarch Butterfly Habitat Management Plan (MBHMP). A variety of methods were used to invite stakeholders including post card invitations mailed to all property owners, phone calls to local organizations and agencies, information and the invitation was posted on the City's website, and media releases were made through the print and electronic/digital media.

The workshop took place at the Goleta Valley Community Center on the evening of February 23, 2011. The workshop was well attended by stakeholders who took part in identifying issues and concerns related to wildland fire, butterfly habitat, and both the development of the CWPP and MBHMP. Participants included citizens, the Goleta Mayor, City council members, many City Staffers, SBCFD personnel, Office of Emergency Services (OES), Santa Barbara County Fire Safe Council members, Los Padres National Forest personnel, and Geo Elements, LLC's team of wildland fire specialists.

An informative, visual presentation was presented on the CWPP followed by an educational briefing on the MBHMP. Following the presentations, stations/tables were set up to allow an informal interactive opportunity for people to dialog individually with presenters and City Staff on topics of their interest or concern. The group then reconvened to discuss questions/comments collected throughout the workshop allowing a forum for everyone to ask additional questions and get immediate feedback. Finally, a question and answer session with the larger group concluded the workshop. The process was highly collaborative for an overall successful workshop. The session was video-recorded and notes were captured for all comments and concerns to be addressed in the CWPP planning process.



In addition, information sharing and on-going discussions throughout the CWPP process occurred with City Staff, SBCFD personnel, Dr. Richard Meade with Althouse and Meade (Monarch Butterfly Habitat Management Plan consultants), Office of Emergency Services planning manager, and the Los Padres National Forest personnel. In an effort to promote cost efficiency, much of the consultation, collaboration, and discussion occurred frequently through phone calls, emails, and data sharing through a website.

For more information on the general CWPP Process, please visit the following websites:

- “Preparing a Community Wildfire Protection Plan – a handbook for Wildland-Urban Interface Communities” at <http://www.cafirealliance.org/cwpp>
- Partnership Resource Center - www.partnershipresourcecenter.org/cwpp

2. COMMUNITY OVERVIEW

The City of Goleta is a beautiful and unique coastal community that sits on a narrow one to five mile wide coastal plain on California's Central Coast. The coast here is oriented east to west below the Santa Ynez Mountains, which rises dramatically from sea level to peaks above 3,000 feet. Narrow, moist riparian corridors contrast sharply with an otherwise dry landscape.

The natural beauty of Goleta is a major part of the quality of life. Scenic coastal shoreline, sparkling Pacific Ocean, steep and dense chaparral covered Santa Ynez Mountains of the Los Padres National Forest, numerous parks and open spaces, and abundant wildlife all contribute to the feelings that this is one of the best places to live.

This natural beauty, however, has an often overlooked but inherent ecological aspect – the area is highly prone to large wildfires. A combination of hot and dry Mediterranean climate, highly ignitable vegetation, numerous fire ignitions, and human development creates significant potential for a major disaster from wildfire. Throughout the summer, the area experiences numerous small wildfires and every decade large, catastrophic wildfires occur along the South Coast of Santa Barbara County.

2.1 VALUES AT RISK

Values at risk are the intrinsic values threatened by wildfire that are important to our way of life. Values can include structures, infrastructure, businesses, and other tangible things but values can also include intangible things such as natural resources, sensitive species, wildlife, cultural resources, and a community's feelings about their community and the landscape around them.

The City of Goleta's vision statement summarizes well what is valued in the community:

"Goleta remains a beautiful and safe small town community, with family-friendly neighborhoods, that values the environment, agriculture, and open space while providing housing, recreation and business opportunities."

Although we cannot address the non-spatial intangible values in mitigating wildfire hazard and risk, we can take action to protect those spatial tangible values by developing strategies to reduce the wildfire threat. The challenge is to consider the level of mitigation that is required to protect one value without jeopardizing other values from wildfire.

Public outreach in the community has emphasized the importance of the following values:

- Life safety, homes, and neighborhoods
- Natural resources
- Recreational uses
- Critical infrastructure
- Cultural and historic resources
- Municipal properties

2.1.1 Life Safety and Structures

Fast moving wildfires in the South Coast of Santa Barbara County, such as the Romero, Coyote, and Painted Cave Fires, have killed firefighters and a resident. The protection of human life and safety is

the highest priority for all mitigation strategies in the City followed by property. Life safety considers both the life and physical well-being of all people in the community.

A home or residence includes a permanent home such as a single-family structure, apartment, condominium or a temporary home such as a nursing homes, hospitals, and hospice care.

The 2010 Census reports that Goleta has 29,888 residents that inhabit approximately 11,473 housing units, and approximately 22 percent of those residents are under the age of 18 years old (2010 Census, <http://factfinder2.census.gov/main.html>). Currently it is estimated that thousands of disabled people live in WUI areas as do those in assisted living housing and nursing homes (according to the 2000 US Census, 1 in 5 individuals claim some degree of disability). Unfortunately, little data is available for vulnerable populations living in Goleta. Available information includes:

- In 2006, it was estimated that 10% of the population (40,000 people) in Santa Barbara County could be defined as “vulnerable”. However, this number only includes the “medically fragile” such as bedridden, totally dependent, difficulty swallowing, requires electrical equipment to sustain life, critical medications requiring daily monitoring, insulin-dependent diabetic unable to monitor blood sugar, requires continuous IV therapy, and terminally ill (Report of the 2005-2006 Santa Barbara County Civil Grand Jury).
- In 2009 it was estimated that almost five percent of all families fell below the poverty level and thirty-five percent of Goleta’s population speaks a language other than English of which fifteen percent speak English less than “very well” (2005-2009 American Community Survey 5-Year Estimates Data).

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

Often times during a wildfire, residents in the WUI will choose not to evacuate but stay and defend their homes or decide to shelter in place until the fire danger passes. Without the proper understanding the effects of their decisions, citizen’s actions can put their life safety at risk as well as that of firefighters and law enforcement personnel. Threats to life safety include inadequate defensible space around structures. It can also include structures that are vulnerable due to flammable exterior construction material and/or design making homes/structures indefensible during a wildfire. Citizens lacking firefighting knowledge, limited water sources, low water pressure, improper or late evacuation, and limitations on access and egress for citizens and emergency personnel are also big concerns especially in areas with high-density neighborhoods. Individuals who have delayed their evacuation with the intent of defending their homes, or to shelter in place, or slow to leave their homes due to packing personal items have died while fleeing WUI fires in a panic.

Vulnerable populations have special needs that are critical to address during disasters such as wildfire. These populations may be less likely to respond to, cope with, recover from wildfire, and are less likely to get involved in wildfire mitigation activities. (Ojerio, 2008). Age and physical and mental disabilities and limitations 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). In addition, visitors to the City and are likely

unfamiliar with the wildfire threat or the extent of their exposure making them potentially vulnerable as well.

Pets and animals are another vulnerable population to consider. 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 taking more time to evacuate, 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 oftentimes homeowners are unwilling to evacuate or enter a shelter during an emergency without their animals so they remain at risk and/or place rescue workers at risk.

2.1.2 Natural and Cultural Resources

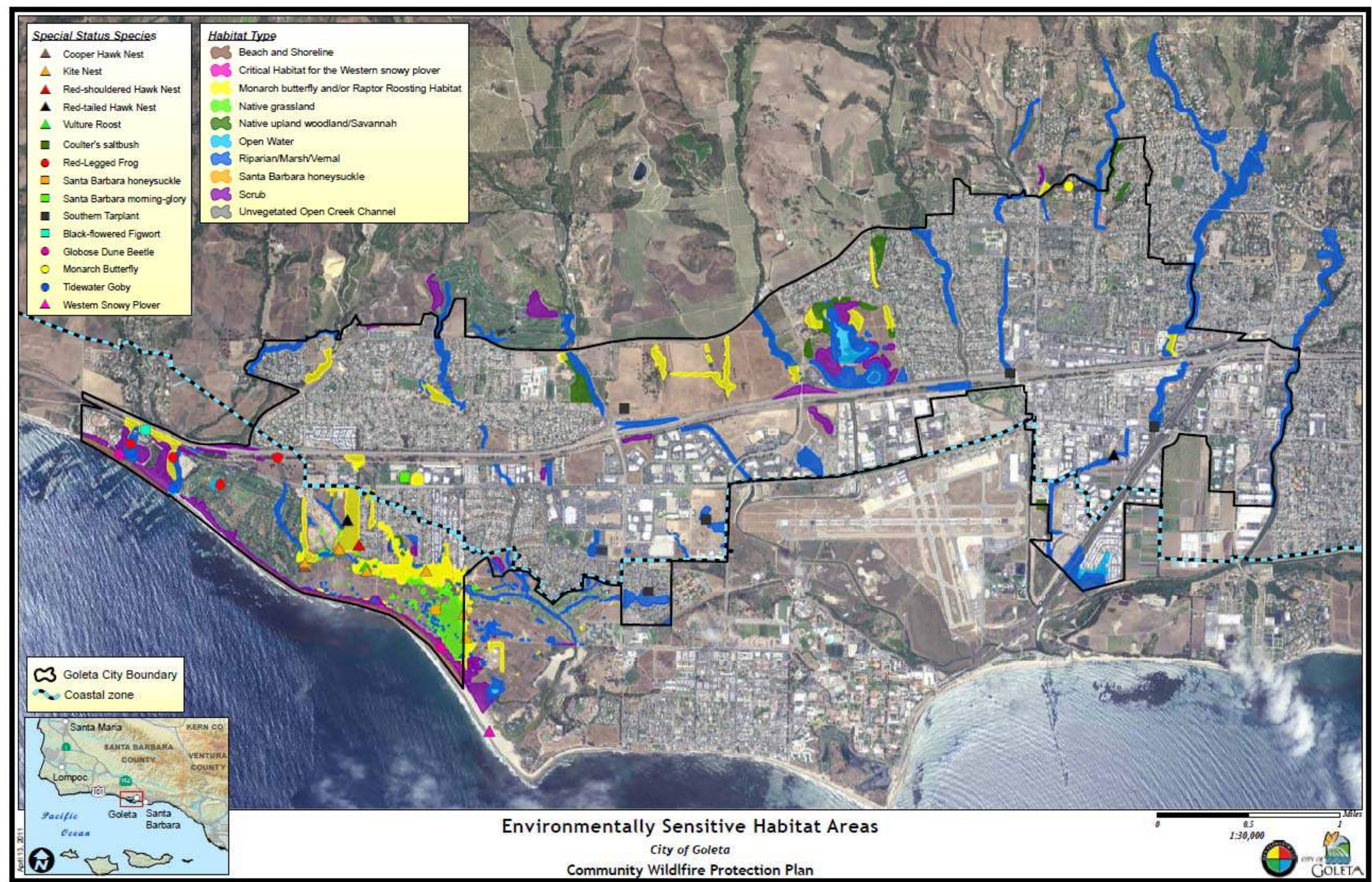
The setting within and surrounding Goleta City is plentiful in natural resources ranging from unique coastal habitat to inland native woodlands and savannahs to distinctive eucalyptus groves housing the monarch butterfly (See most recent ESHA Map, Figure 1). Goleta's natural resources have the potential to be destroyed or adversely affected by a wildfire event. There are a variety of Environmentally Sensitive Habitat Areas (ESHAs) where plants, animals, or habitats are either rare or especially valuable. The ESHAs across Goleta are both unique and diverse in species and composition characteristics. The general ESHA designations across Goleta include but are not limited to:

- Creek and riparian areas
- Wetlands, such as vernal pools
- Coastal dunes, lagoons or estuaries, coastal bluffs, coastal bluff scrub
- Beach and shoreline habitats
- Marine habitats
- Coastal sage scrub and chaparral
- Native woodlands and savannahs, including oak woodlands
- Native grasslands
- Monarch butterfly aggregation sites and related habitat areas
- Beach dune areas; nesting and foraging locations for the western snowy plover
- Nesting and roosting sites and related habitat area for various raptor species
- Other habitat area for wildlife/plant species designated rare, threatened or endangered under state or federal law
- Other habitat areas that are rare or especially valuable from a local, regional or statewide perspective

The monarch butterfly habitat area is of particular significance in that it attracts worldwide visitation to the City. Monarch butterfly aggregations in Goleta are quite accessible due to their location and the temperate year-round climate of California's coast. Local, national and international visitors are drawn with interests ranging from casual viewing to research studies. Further information on Goleta's monarch butterfly habitat will be available in the newly authored "Monarch Butterfly Habitat Management Plan".

Visual and Scenic Resources are vital components that shape the natural beauty of Goleta and the surrounding area. A primary objective of the California Coastal Act is 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. Goleta Valley is well known for the scenic splendor of its open spaces, foothills, and both

Figure 1 City of Goleta Environmentally Sensitive Habitat Areas



ocean and mountain views. Visually attractive open spaces include public recreation areas, agricultural lands and highly scenic coastal open spaces - all visible to the public. The Goleta GP/CP, Scenic Views policy objective states, "To identify, protect and enhance Goleta's scenic resources and protect views or vistas of these resources from public and private areas". Visual and Scenic Resources are an inherent natural resource that can be threatened, damaged or destroyed in a wildfire.

Cultural Resources are derived from the beliefs, arts, and institutions that help shape and define the character of an area's population. Cultural resources include buildings, structures, sites or other artifacts created by or associated with human culture and valued for their cultural and/or historic significance. A guiding principle in the Visual and Historic Resources Element of Goleta's GP/CP Chapter 6 states, "Recognize and preserve the unique and valuable scenic and historic resources that reflect the cultural and historical heritage of Goleta."

A cultural landscape is defined as a geographical area including both cultural and natural resources associated with a historic event, activity, or person. A historical landscape is composed of character-defining features that contribute to the physical appearance over time.

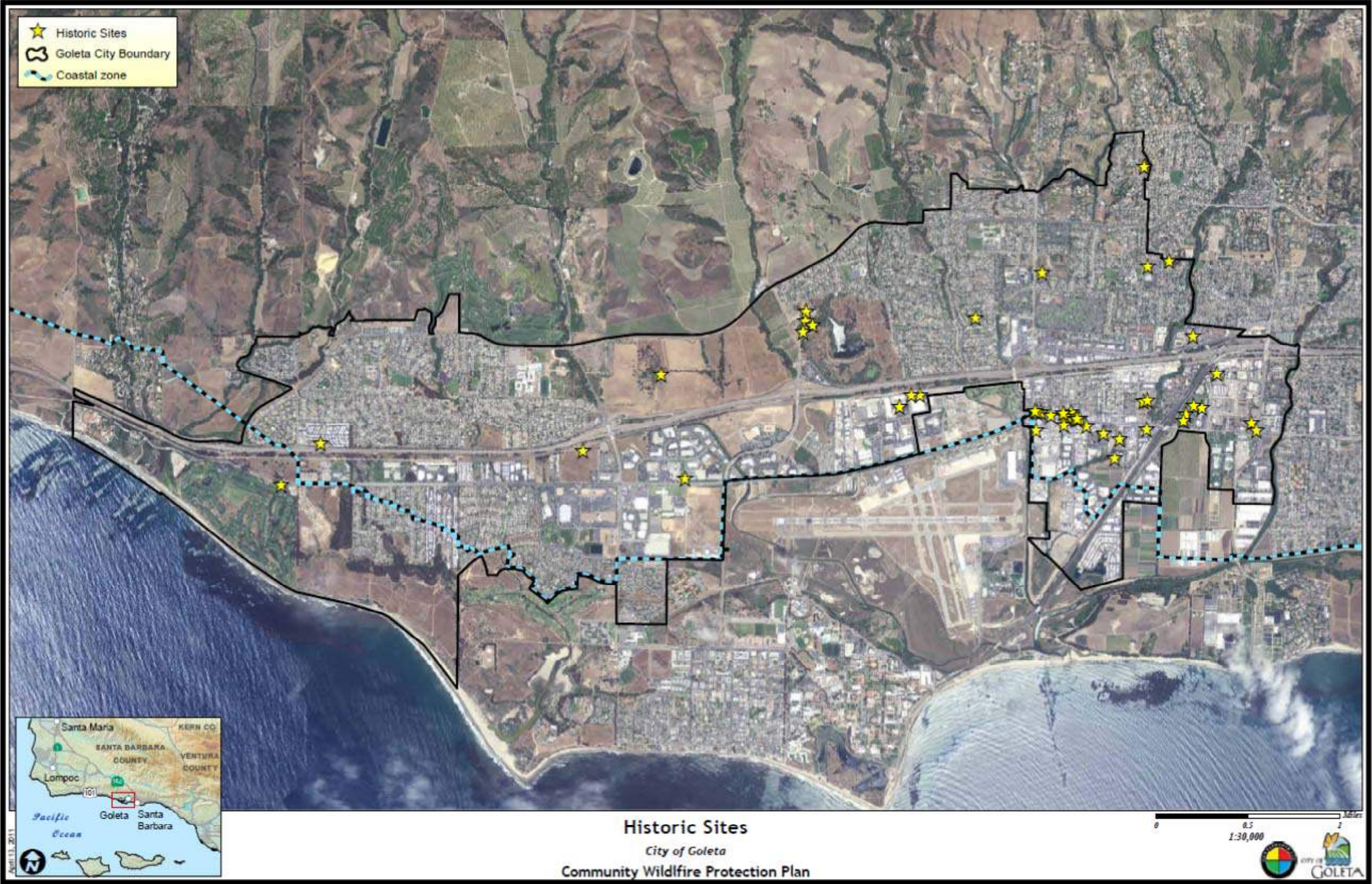
Policy in Goleta's GP/CP states that historical and cultural landscapes and the heritage they represent shall be protected, preserved, and enhanced to the fullest extent feasible. These areas include archaeological sites, historic buildings (i.e. Stow House, Sexton House, Goleta Depot, Barnsdall-Rio Grande Gasoline Station, Shrode Produce Company, etc), historic landscaping, gardens, and open spaces such as agricultural areas that provide a historic context for buildings (i.e. Bishop Ranch). Included in this policy are heritage trees that contribute to the distinctive setting in Goleta. Protection responsibility should include awareness and understanding of the inherent hazards and risks that wildfire poses in these environments (See Historic Site Map, Figure 2).

2.1.3 Economy, Commerce, and Infrastructure

Census data for 2010 is limited at the time of this Plan, but a 2006 estimate shows that the estimated Goleta CDP median household income was \$69,446 and the estimated per capita income was \$33,047.

Catastrophic WUI fires have historically caused significant property, economic, and infrastructure losses. Goleta is located in the commercial and industrial center of Santa Barbara County. Short and long term losses can include loss of day-to-day delivery services from the City and businesses, destroyed or damaged schools may cause displacement of students, railway damage affecting Amtrak, damaged roads, depleted water systems, damaged sewer systems and water treatment plants, and lack of power due to burned power poles and melted powerlines. In addition, the impacts to Goleta Valley Cottage Hospital, numerous nursing and rehab facilities, and municipal properties may be greatly affected. It can take days, weeks, or months to repair these critical infrastructure.

Figure 2 City of Goleta Historic Sites



Losses or damages to any of businesses can affect employment opportunities in the City. The top employers in Goleta to consider include:

Table 2 Top Employers in Goleta 2009

Employer	Number of Employees
Raytheon	1,573
Sansum Clinic	965
Cintrix Online	544
Barcara Resorts	527
Yardi Systems	380
Allergan (Inamed)	350
FLIR	325
Cottage Hospital	325
Karl Storz Imaging	300
Goleta Unified School District	278
Mentor Corp	265
Jordano's	182
ATK	156
Costco	150
The Home Depot	140
<i>Taken from the 2010 Comprehensive Annual Financial Report, 2010 Data was not available.</i>	

Economic and financial losses can have long-term effects, including:

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

2.1.4 Recreation and Lifestyle

Fundamental elements that attract people to the City of Goleta include the temperate coastal climate, the beautiful scenery, and the friendly community setting. A large portion of the Goleta population enjoys 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 recreating at the beach or at one of the many parks and open spaces. People of all age groups engage in outdoor exercise or activities including bicycle riding, running, hiking, walking, rollerblading, surfing, and swimming (ocean or pool). The community infrastructure supports this healthy lifestyle by investing in the upkeep of public parks and an extensive network of paved bike-paths throughout the City.

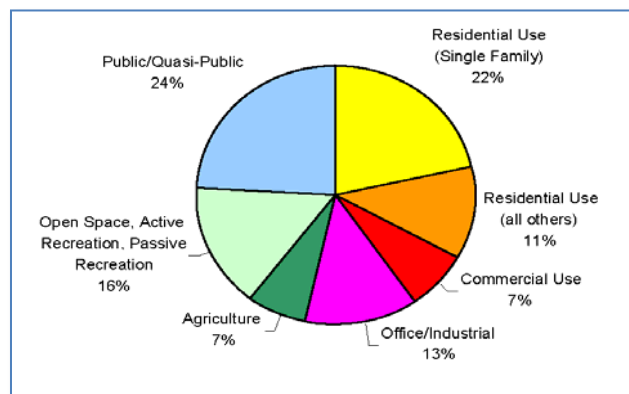
An essential aspect exhibited in Goleta's diverse character is the open space and resource lands within and adjacent to the community. The undeveloped open-space areas both protect environmental resources and support numerous recreational opportunities. An example is the system of unpaved

hiking trails used by hikers, runners, mountain bike riders, and walkers. This includes approximately 2 miles of Pacific shoreline, beaches and coastal bluffs. Late summer and fall is a high-use outdoor recreation time-period in Goleta and the weather is commonly warm and dry. The impacts of wildfires to recreational opportunities includes the loss of recreation facilities, degradation of scenic values, loss of picnic tables, recreation related structure loss, and loss of wildlife viewing experiences. A keen awareness of the potential for destructive wildfire including ignition potential, hazards and risks in the Goleta vicinity is critical knowledge for all members of the community.

2.2 LAND USE/ZONING

Land use decisions in Goleta are shaped by the community's desire to preserve and protect its natural resources, its attractive neighborhoods, existing land use patterns, and quality of life.

Distribution of Planned Land Use by Use Category (City of Goleta, 2006)



As shown in the chart, the top three land use categories comprise 62% of land use distribution in Goleta include:

- Public/Quasi-Public – Governmental administration and operations, schools, fire stations, and other public and institutional uses within the City.
- Residential Use (Single Family) – Residential needs of existing and future city residents consistent with the existing character of the City's neighborhoods.
- Open Space, Active and Passive Recreation – Public parks, recreation, and open space land uses and private recreational lands within the City.

Of these three land use categories, Open Spaces are a key focal point when addressing potential wildfire hazards and risks that pose a threat to portions of Goleta.

The parks and open spaces in Goleta provide a highly valued and important component of the existing and future environment. A combination of manicured parks and undeveloped open spaces comprise a total of 526 acres. The three largest city-owned regional open preserves are the Sperling Preserve, Santa Barbara Shores Park, and Lake Los Carneros Natural and Historical Preserve with a collective land-base of 336 acres. Additionally, 2-miles of Pacific shoreline is also owned by the City. These preserves and neighborhood open space areas afford many opportunities for passive recreation activities and enjoyment of natural areas but can also increase wildfire ignition potential and the undeveloped components contribute significantly to fire spread.

GP/CP policies pertaining to the Open Space Element recognize, manage and protect open space areas with a set of nine guiding principles and goals. The context in three of these principles (Principles 1,5, and 7 shown below) describe fundamental provisions that support the adoption of a community wildfire plan to provide guidance to work toward sustaining these open spaces through time.

Principle 1. Provide and maintain, in coordination with other agencies, a system of parks, open spaces, and recreation facilities that are accessible to and will meet the needs of present and future users of all age groups.

Principle 5. Preserve Goleta's existing open space areas, including its beaches and Pacific shoreline, sensitive habitat areas, and agricultural lands, and increase the amount of permanently protected open space as opportunities for acquisition arise.

Principle 7. Manage open space areas in a manner that provides for public access, passive and active recreational use, and enjoyment, consistent with protection of natural and scenic resource values.

The common theme present in the above three principles involves providing, maintaining, preserving, and managing open areas in and around the City.

2.3 FIRE PROTECTION

Through a contract, Santa Barbara County Fire Department provides fire protection for the City of Goleta. The SBCFD serves a large area encompassing approximately 2,700 square miles. There are five fire stations that service Goleta area located at 4570 Hollister Avenue, 5330 Calle Real, 381 Storke Road, 320 Los Carneros Road, and one on the University of California Santa Barbara (UCSB) campus. The fire station located on the UCSB campus provides service to the University and most of Isla Vista.

The Fire Department is responsible for managing the following activities for the City of Goleta:

- Fire Suppression
- Assist in planning and development of Development Standards for High Fire Hazard Areas, as well as enforcing these standards
- Enforcing fuel breaks along highway corridors and public roadways
- Conducting outreach and education
- Conducting prescribed burns
- Participate in the Healthy Forest Initiative
- Monitoring "fire weather" and completing annual action plans based on data from fire service agencies

Most of Goleta falls within a 5-minute response time from existing fire stations, although the western edge of the City and some northern neighborhoods can experience longer response times. The City of Goleta is actively pursuing the development of a proposed fire station in western Goleta (Fire Station 10) to reduce response times and minimize the threat to existing and proposed development. Without the benefit of this additional fire station, wildfires that start along the western and northern portion of Goleta have a greater

The 5-minute response time for urban areas refers to the following objectives:

"one minute for turnout time, four minutes or less for arrival of the first arriving engine company at a fire suppression incident and/or eight minutes or less for the deployment of a full alarm assignment at a fire suppression incident" (National Fire Protection Association 1710, Chapter 4, Section 4.1.2.1). Response times under 5 minutes are considered adequate and response times over 5 minutes are considered substandard.

probability of establishing thereby getting larger and more difficult to control.

2.3.1 Additional Fire Protection

The California Fire Master Mutual Aid Agreement requires each county to have a mutual aid plan. Because several cities and unincorporated areas of Santa Barbara County provide their own fire protection services, the Santa Barbara County Mutual Aid Plan is an essential mechanism for coordinating fire protection resources. Mutual Aid takes on several different forms. For initial attack purposes, “local mutual aid” facilitates the day-to-day responses where the closest resources are dispatched regardless of jurisdictional boundaries.

Through a mutual aid agreement, an automatic response of supplemental aerial and ground fire suppression resources from the U.S. Forest Service and CAL FIRE will respond to the area north of Cathedral Oaks to assist SBCFD. This is to protect the Los Padres National Forest and SRA lands respectively. If SBCFD needs additional fire suppression resources at any time for fires occurring within the City of Goleta, there are mutual aid agreements in place with other fire agencies to request assistance.

3. DEFINING GOLETA'S WILDFIRE PROBLEM

Wildfire has always been part of Santa Barbara County's normal ecological processes both benefiting and damaging natural resources; however when these fires encroach on people and human development they can become disastrous. A wildland fire becomes a WUI fire when a fire burning in wildland fuels spreads to urban fuels (i.e. structures, wood decks, flammable landscaping, etc.) through flames and/or burning embers. The probability of a catastrophic wildfire occurring at any particular location within or adjacent to the City is dependent on a chain of events that includes fire ignition, fire weather, fire behavior, suppression actions taken, and the interaction of these factors.

Each year Santa Barbara County firefighters are successful in containing most fires to less than one acre, which is a direct result of favorable weather and fuels conditions, early reporting, a large and fast aerial and ground fire suppression response, and good access to wildfires by fire suppression resources. However, when an ignition occurs during unfavorable weather and fuel conditions, and/or there is poor or limited access for fire suppression resources due to poor road conditions, and/or a lack or delay of aerial fire suppression resources these fires become unmanageable. Wildfires, once established, may grow very quickly and burn intensely often leading to the destruction of structures, infrastructure, watersheds, cultural or historic sites, and natural habitats. This section will describe the City of Goleta's wildfire problem.

3.1 FIRE ECOLOGY

Fire ecology examines the role of fire in ecosystems and includes vegetation and animals that interact with one another and with their physical environment. Animal populations and human communities have developed in the habitats where wildfire has been the dynamic factor.

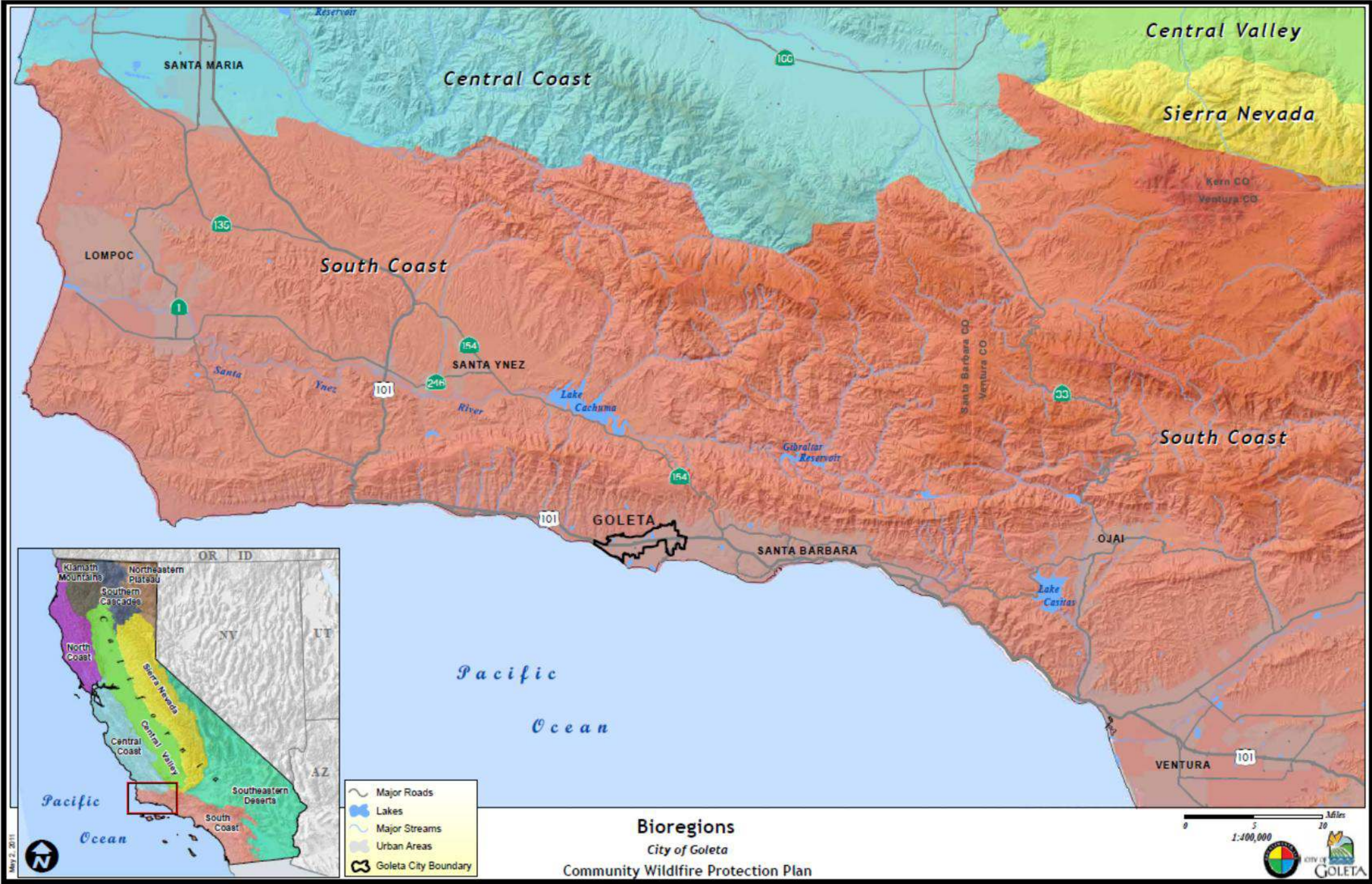
Wildfire is a pervasive, natural, environmental occurrence throughout much of California's ecosystems and is a natural component of the South Coast ecosystem. Wildfire visits nearly every landscape in California with a remarkable variety in frequency, intensity, and effects. California's expansive and varied land base includes nine different bioregions (See Figure 3) based on relatively consistent patterns of vegetation and fire regimes (Sugihara, 2006).

3.1.1 Chaparral Ecology

The South Coast bioregion, which includes the wildlands above Goleta, is a complex mosaic of grasslands, shrublands, forest and woodland that forms a relatively fine-grained landscape. Chaparral vegetation species native to the area includes manzanita, California-lilac - Ceanothus, mountain-mahogany, flannelbush, Christmas berry, cherry, oak, coffeeberry or red-berry, chamise, and sumac or sugarbush. These species have existed in this bioregion since at least mid to late Miocene – 5 to 15 million years ago (Sugihara, 2006). Chaparral ecosystems consist of a dense growth of shrubs native to the Santa Ynez Mountains above Goleta.

A fire regime is a function of five components: frequency, season, extent or patchiness, type of fire, and fire intensity (Whelan, 1995). Many small fires and few large fires likely characterized the natural chaparral fire regime in the South Coast with fire intensity and severity variable (Keeley, J. Fotheringham, CJ, 2001). There is some disagreement over the historic fire-return interval for coastal sage scrub communities but some researchers estimate the fire return interval to range from <35 to

Figure 3 South Coast Bioregion



<100 years while others believe the natural fire frequency in coastal sage scrub to be near the lower end of a 20- to 40-year cycle, which is common in adjacent chaparral communities. Researchers believe there is a significant loss of a historic range due to development, agriculture, human-caused fires, and vegetation type conversion that has altered fire regimes in coastal sage scrub communities (Hauser, 2006).

Many chaparral species in naturally fire-affected environments require fire to germinate. Chaparral shrubs are very flammable due to the resinous foliage, woody stems, accumulated litter, and standing dead branches. The flammability of chaparral species increases over time through deposition of flammable leaf litter impregnated with volatile oil (oils in the leaves help make the plant drought resistant) and with rare exceptions, chaparral always burns as active crown fires. Fire intensity is generally high, but varies depending on fuel moisture and weather. The output of a disturbance such as wildfire can create diversity in the chaparral environment.

Immediately after a fire event, the short-lived herbs and forbs (called “fire-followers”) initially dominate because of their sheer numbers and often produce a spectacular display of wildflowers. Within 2 - 5 years, the seedlings of chaparral plants and shrubs resprouting from their crown roots or burls take over. Their more aggressive root systems exploit deeper water reserves, they will eventually shade out the forbs, and grasses then replace them. The seeds of these herbaceous fire followers persist in the soil until released by heat from the next wildfire.

Today, fire frequency in the South Coast Chaparral bioregion is highest in the summer but the bulk of the landscape burns in the fall. California has always been and will continue to be a fire environment unmatched in North America. It is an integral natural element that has shaped California’s ecosystems through time.

3.1.2 Eucalyptus Ecology

Eucalyptus trees from Australia were introduced into California in the late 1850’s and into the Goleta area in the 1870’s. In its native habitat, bluegum eucalyptus grows in pure stands and in mixtures with many other eucalypt species. In California, it has been planted with forest redgum eucalyptus and river redgum eucalyptus. Bluegum eucalyptus is a deciduous tree that generally grows from 98 to 180 feet tall but some bluegums have attained heights of 260 feet in California. Most growth of bluegum eucalyptus occurs within the first 5 to 10 years when 60 to 70 percent of their total height is achieved by about age 10. Bluegum eucalyptus trees typically grow in dense monocultures and are almost devoid of understory vegetation, except for a few hardy grasses (Esser, FEIS Database accessed 2011).

The way in which a plant species responds after fire exposure is often a reflection of the fire regime and vice versa. Most eucalypt species have acquired traits, which allow them to promote wildfires and survive them and/or rapidly take over the newly-burned environment. Bark, crown structure, and leaf characteristics of eucalypts all promote the kindling and spread of wildfires. Some eucalypts are termed “stringybarks” or “candlebarks” since their bark hangs in long, fibrous stringers which wildfire can easily light and spread up into the canopy. Wildfire convection and winds can also send burning bark and leaves into the air carrying them to other dry patches (Pyne 1991). They also shed their bark as it burns, preventing long-term heat exposure to the underlying cambium. Bluegum eucalyptus readily sprouts and tends to grow into dense thickets and produce pendulous leaves. Heavy dense production promotes intense fires and the leaf arrangement funnels hot air upwards through the canopy.

Fuel buildup occurs very rapidly in unmanaged bluegum eucalyptus stands in California. Based on this swift fuels accumulation process, the highly flammable leaves and the volatile composition of shedding bark and limbs of bluegum eucalyptus should not be planted near homes or other structures (Esser, 1993). In December 1972, the San Francisco Bay Area experienced a severe cold snap resulting in extensive frost damage to bluegum eucalyptus trees. Frost-killed leaves and twigs increased bluegum eucalyptus litter ten-fold. By early 1973, following a particularly hot dry summer and autumn, the litter combined with standing dead and damaged bluegums constituted a major fire hazard. Several fuel reduction methods such as mechanical removal of trees, thinning of present stands, and prescribed fire occurred. The first two alternatives are commonly applied now in freeze-killed or damaged stands. Limited in its use in California, prescribed burning has been widely applied to eucalyptus forests in Australia to reduce fuel loads and prevent wildfires.

3.1.3 Ecological Enhancement

Although CWPPs often focus on actions needed within residential neighborhoods to reduce risks to life safety and property from wildfire, the development of this CWPP provides a strategic opportunity for the community to consider the ecological needs of the wildlands and open spaces. In fact, restoring the ecological resilience of a wildland vegetative area can be a very effective strategy for reducing the overall risk of wildfire to a community and its infrastructure. The open spaces or wildlands within and adjacent to Goleta are an important ecological resource for wildlife habitat as well as recreational enjoyment.

3.2 CLIMATE

Under the Köppen-Geiger Climate Classification System (<http://koeppen-geiger.vu-wien.ac.at/index.htm>), Goleta sits in a dry-summer subtropical climate often referred to as “Mediterranean”, which is characterized by warm to hot, dry summers and mild to cool, wet winters. Snow occasionally falls on the mountains but rarely stays more than a few days. The long dry seasons typical of the Mediterranean climate ensures a prolonged fire season every year.

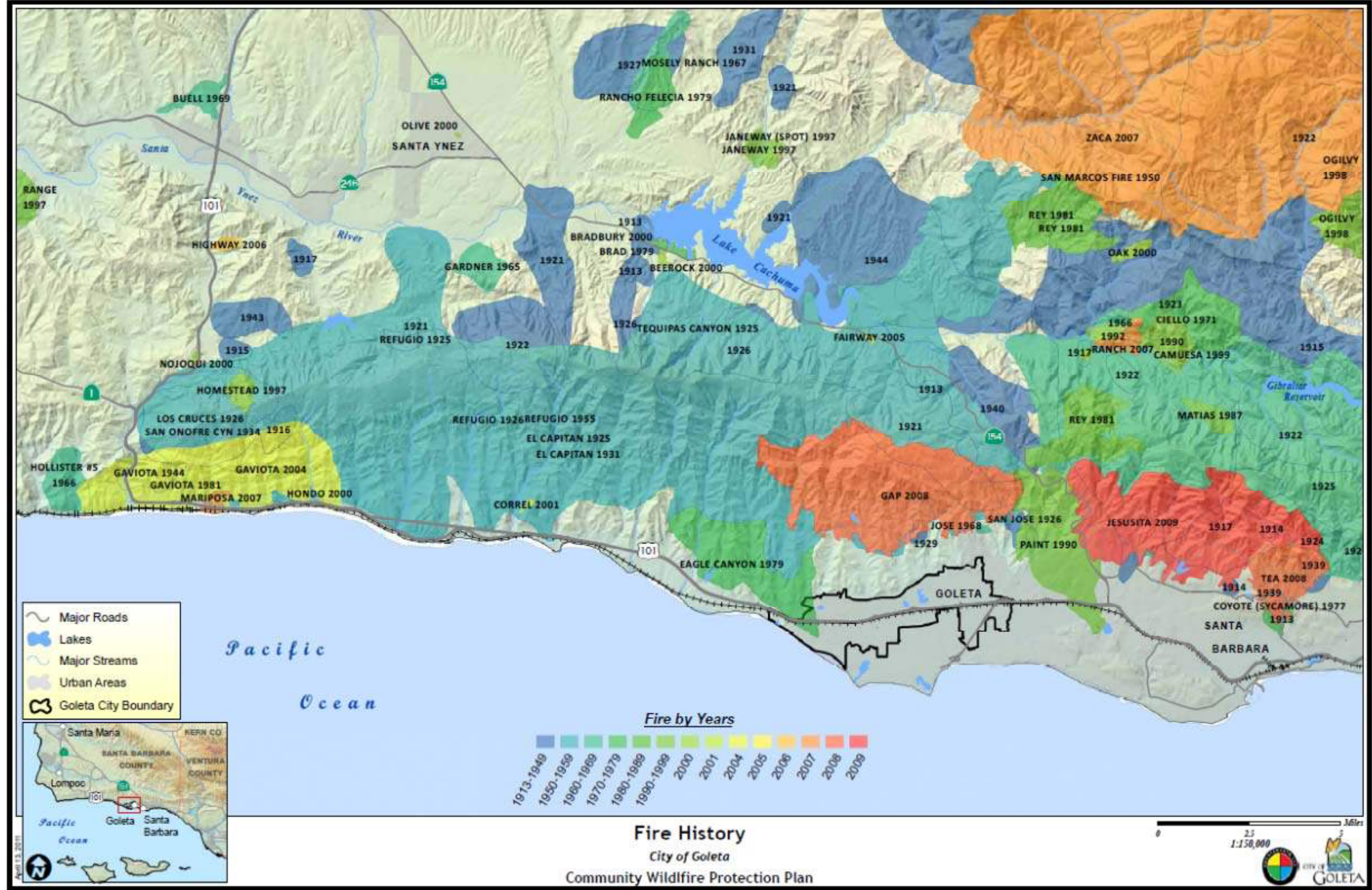
3.2.1 Climate Change

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, both snowmelt and rainwater running off sooner in the year and drought conditions are likely to 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 will likely be seen as one of the earliest climate impacts that we experience (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 Santa Barbara County.

3.3 FIRE HISTORY

Research has shown over the past 560 years, large fires have occurred in the Santa Barbara area on an average of every 20 to 30 years (Mensing et al. 1999); however, the frequency of fire occurrence has increased in recent years. Since the 1950s on average there has been one large fire per decade but in the last seven years, four have occurred (See Fire History Map, Figure 4).

Figure 4 South Coast Wildfire History



The City of Goleta and neighboring communities along the South Coast of Santa Barbara County have a long history of destructive wildfires. Since 1953 Santa Barbara County has received three Presidential declarations of disaster due to wildfires, two of those occurred along the South Coast.

One of the most destructive wildfires in the area occurred in 1990 when the Painted Cave Fire burned from Highway 154 near the community of Painted Cave downhill into the City of Santa Barbara and unincorporated areas. The fire killed one civilian and a large percentage of the almost 641 homes lost were destroyed within the first two hours of the fire's ignition (Cohen, 2000). The California Department of Forestry and Fire Protection (CAL FIRE) still lists the 1990 Painted Cave Fire as number six out of twenty of the most destructive fires in California's history in terms of structures lost (CAL FIRE, 2011).

Another example of a destructive wildfire in the area is the 1977 Sycamore Canyon Fire, which burned just over 800 hundred acres within a seven-hour burning period destroying approximately 234 homes. Neither the Painted Cave nor the Sycamore Canyon Fires are considered very large in size and would likely be just a footnote in the area's fire history except for the loss of one life and the number of homes and structures lost.

The following table lists wildfires that have threatened and/or destroyed homes in Goleta and neighboring coastal communities from the 1950s to present day.

Table 3 List of Historical Large Wildfires

Fire Name	Month/Year	Fire Size (approx. acres)	Structures Lost (approx reported # of homes, outbuildings, etc)	Fatalities
Refugio	Sept/1955	84,770	20	0
Coyote	Sept/ 1964	65,339	106	1
Romero	Oct/1971	15,650	4	4
Sycamore	July/1977	805	195	0
Eagle Canyon	June/1979	4,530	5	0
Painted Cave	June/1990	4,900	440 homes, 28 apartments, 30 misc	1
Gaviota	June/2004	7,443	4	0
Gap	July/2008	9,445	4	0
Tea	Nov/2008	1,940	210	0
Jesusita	May/2009	8,733	160	0

3.4 GOLETA'S WILDLAND FIRE ENVIRONMENT

The interaction of fuels, topography, weather, and with the fire itself, affect the likelihood of a fire 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 within and surrounding the City of Goleta.

3.4.1 Fuels

Vegetation is the primary fuel source for wildfires and is the most important factor in determining fire hazard; however, it is important to recognize that many human-made sources of fuel such as structures

can also contribute to the fire environment and significantly affect fire behavior. This section will focus on wildland vegetation as the fuel source.

The land base within the City of Goleta is a mosaic of residential, commercial, agricultural, recreational, and industrial land uses of which approximately 16% is designated as open space. This open space consists of thirty-six city parks, private parks, and undeveloped areas that total approximately 530 acres. The largest of the open spaces include the Sperling Preserve, Santa Barbara Shores Park, and Lake Los Carneros Natural and Historical Preserve that account for almost 363 of those acres.

The following table lists the vegetation or “fuels” in undeveloped areas directly adjacent to and within the City.

Table 4 Fuels in Undeveloped Open Spaces and Wildland Areas

SPECIES	DESCRIPTION
Chaparral	This habitat has limited distribution within the City limits, restricted to scattered small patches, but dominates the steep dry slopes on the Santa Ynez Mountains above the City. There are two types of chaparral within or adjacent to the City – 1) Ceanothus chaparral is the most common type, dominated by buckbrush or greenbark. Greenbark ceanothus is common on the cool rocky canyons. Buckbrush is more common on dry slopes. 2) Mixed chaparral includes a variety of plant species such as mountain mahogany, greenbark ceanothus, scrub oak, holly leaf redberry, buck brush, toyon, chaparral mallow, and chamise.
Coastal Sage Scrub	This habitat consists of a low, dense to sparse scrub dominated by purple sage, coyote brush, California sagebrush, goldenbush, morning glory, giant wild rye, and annual non-native grasses.
Coyote Brush Shrub	This habitat type is dominated by coyote brush, a ubiquitous native shrub that readily colonizes disturbed areas and is very drought resistant. Coyote brush shrub is dominated by coyote brush with a matrix of annual grasses.
Non-native Annual Grassland	A very common habitat type is dominated by widespread non-native annual grasses including Italian ryegrass, wild oats, common barley, and rip-gut brome.
Native Grassland	Purple needlegrass is the most common native grass and generally grows in relatively pure stands, occasionally intermixing with other native grass species, particularly meadow barley.
Oak Woodland	This habitat consists of coast live oak trees and associated shrubs and perennials. The structure of oak woodland ranges from open savanna-like woodlands with scattered trees and a grassy understory to relatively dense woodland. Oak woodland typically occupies north-facing slopes, canyon bottoms and along the outer edges of stream courses where soil is well developed and/or the site is relatively mesic. This vegetation type intergrades with chaparral on drier sites, grassland on sites with well developed soils and riparian woodland on wetter sites. Common understory plants include poison oak, coffeeberry, blackberry, stinging nettle, and toyon.
Eucalyptus Woodland	This habitat consists of monoculture of large non-native evergreen trees, primarily blue gum.
Herbaceous Riparian	A variety of small native perennial plants occur in the seasonally moist bottoms of creeks and drainages. In general, these species occur as scattered individuals, rather than in dense stands. They occur on sandbars and protected, moist portions of the channel bed with full or partial sunlight. Common species include mugwort, mulefat, arroyo willow, ricegrass, salt grass, and horehound. Non-native plants are also common, such as rabbitsfoot grass, periwinkle, curly dock, cocklebur, castor bean, horseweed, and white sweet.

Riparian Scrub	This habitat consists of dense monocultures of arroyo willow or mulefat. This habitat occurs in the channel bottom or lower banks where there is periodic inundation, but insufficient flows to remove the woody plants. The density and height of plants varies depending upon the amount of moisture and sunlight in the channel.
Riparian Woodland	The most common trees include willow (arroyo, sandbar, narrow leaf and red willow), western sycamore, and black cottonwood. Other less common trees include white alder, elderberry, and California bay. This habitat creates a tall closed canopy over narrow drainages. A highly variable shrub understory is present with such species as blackberry, poison oak, gooseberry, nightshade, and coyote brush. This habitat consists of mature trees that occur along the middle stream terraces, slope of banks, tops of banks, and floodplain of creeks.
Oak Woodland- Riparian Woodland	This habitat occurs on the floodplain adjacent to creeks where there are deep soils to support oak trees. It consists of a mixture of riparian woodland (see above) and coast live oak woodland. In closed canopy woodlands, the understory is dominated by shade tolerant shrubs and woody vines such as nightshade, poison oak, and blackberry; and by perennial herbs such as wood mint and fiesta flower. In openings in the canopy, common understory shrubs include California sagebrush and coyote brush. Vines such as wild cucumber, honeysuckle, and virgin's bower often climb trees.

3.4.1.1 Fuel Characteristics

The principal characteristics of fuels 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. Understanding the fire behavior characteristics of wildland vegetation facilitates effective fuel treatment strategies on a local, as well as landscape level.

3.4.1.1.1 Fuel Types

Fuel types within and adjacent to the City include grasses, shrubs/brush, timber litter and understory, and slash. 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 the moisture content of air surrounding the fuel, which changes the amount of fuel moisture in dead fuels. The more moist the air the more moist the fuel, and conversely the more dry the air the more dry the dead fuel. Timelag is the time it takes for the moisture content to reach 63% of their Equilibrium Moisture Content with the surrounding environment. Timelag is expressed as a rate usually in hours (See Table 5).

Table 5 Dead Fuel Moisture & Timelag Relationship to Fuel Size

Timelag	Diameter of Fuel (inches)	Examples
1-hour	Less than ¼	Annual dead grass (i.e., cheatgrass)
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, growing vegetation. Live moisture is mostly controlled by internal physiological mechanisms rather than by external influences; although live fuels are affected by external influences over time such as normal seasonal drying and drought. Typically, live fuel moistures in the area are highest in the spring through early summer and at their lowest in late summer through winter.

Locally, live fuel moisture sampling of chamise occurs every 2 weeks throughout fire season by the Los Padres National Forest at San Marcos Pass but transitions to monthly during the off-season. These samples can range as low as 53% to as high as over 187% (Los Padres NF Live Fuel Moisture Samples, accessed 2011). Live fuel moistures of 60% or below in chamise indicate a critical threshold to increased fire behavior in which these live fuels will burn as if they are dead fuels.

3.4.1.1.3 Fuel Loadings

Fuel loadings vary 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, and timber 100 to 600 tons per acre. Lighter fuels contribute to how fast a fire will ignite and how quickly it spreads. Heavy fuel loadings will result in a more intense fire.

It is important to note that fuel is the only element in the fire environment that fire managers can influence with an active fuels management program.

3.4.1.1.4 Chemical Properties

Chemical properties include the presence of volatile substances such as oils, resins, wax, and pitch in the fuels, especially in chaparral and eucalyptus trees. 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).

Eucalyptus adds another element of concern in that eucalyptus oil is highly flammable. On warm days, vaporized Eucalyptus oil rises above the bush to create the characteristic distant blue haze of the Australian landscape. The heat generated from the combustion of various eucalyptus species is similar to those of typical North American species; however, eucalyptus oil burns much hotter. The leaves of all eucalypt species contain some amount of volatile oils. In a study conducted by McArthur and Cheney (Whelan 1995), it was found that although eucalyptus wood does not burn particularly hot, the leaf oils burn nearly twice as hot as the wood (See Table 6).

Table 6 Heat of Combustion for Various Fuels

Fuel Type	Heat of Combustion (MJ/kg)
Oak	19.33
Pine	21.28
Eucalyptus obliqua	19.23
E. capitellata	19.92
E. amygdalia	21.35
Pine sawdust	21.74
Pine pitch	35.13
Eucalyptus oil	37.20

3.4.1.1.5 Horizontal Continuity

The horizontal continuity of fuels describes the uniformity or patchiness of fuels across the landscape, which affects the ability of a fire to spread. The fuelbed above Goleta is mostly continuous up to the Santa Ynez Ridgeline allowing fire to spread very quickly. Within the City of Goleta, the open spaces are isolated islands broken up by road systems and neighborhoods providing a discontinuous fuelbed. Wildfire cannot spread from one open space to another along the surface but can spread very quickly when burning embers from a wildfire in the wildland area above Goleta or from another open space are carried through the air by the smoke column and/or wind then dropped on to a receptive fuelbed (such as flammable vegetation, combustible roofs, etc).

3.4.1.1.6 Vertical Arrangement

Vertically arranged fuels are those that can carry fire burning in grasses or low shrubs up through shorter shrubs and branches into the crowns or canopies of taller shrubs and trees called “ladder” fuels. This is a primary concern in eucalyptus groves in Sperling Preserve, Santa Barbara Shores, and Evergreen Park.

3.4.2 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.

The warmest month of the year in Goleta is August with an average maximum temperature of 78.70 degrees Fahrenheit (F) and the most recent high record temperature was 109 degrees F in 1985 (at one time Goleta held the U.S. temperature record for many years of 133 degrees from a Sundowner wind event on June 17, 1859). The coldest month of the year is December with an average minimum temperature of 39.90 degrees F and the lowest cold temperature was 20 degrees F in 1990. The annual average precipitation at Goleta is 16.93-inches. Winter months tend to be wetter than summer months with February having the greatest rainfall averaging 4.28 Inches. The relative humidity can range from the single digits to 100%. Average winds at the Santa Barbara Airport, which is directly

adjacent to Goleta, are approximately 5.7 miles per hour from the west-southwest. It is important to note that fire weather can occur at any time of the year in this Mediterranean Climate, therefore wildfires can occur at any time of the year.

Sundowner winds are a significant weather pattern unique to the Goleta, Santa Barbara, and Montecito area. These winds often begin in the late afternoon or early evening and are usually associated with a rapid rise in temperature and decrease in relative humidity. Sundowner wind events are more common in the summer than the fall. The strongest Sundowner winds channel east of Santa Ynez Peak near San Marcos Pass down towards the Hollister and Turnpike area as well as Glen Annie Canyon, which all lead directly to down into the City of Goleta. Sundowner wind events can have sustained wind speeds of 50+ miles per hour with gusts reaching 70+ miles per hour.

The combination of high temperatures, low relative humidities, high winds that occur in the area can and do create explosive conditions under which wildfires will react and burn.

3.4.3 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, produces orographic thunderstorms, and contributes to foehn or Sundowner 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.

Goleta sits on an open low elevation alluvial coastal plain in the western Transverse Range along an east-trending segment of the California coastline. The coastal plain is relatively flat but includes gently rolling hills and mesas with a gradual rise in elevation from sea level to approximately 280 feet at the northwestern portion of the City just east of Ellwood Canyon Creek. Elevation and slope have minor roles in contributing to wildland fire behavior in the City of Goleta; however, slope is a significant factor north of the City where the Santa Ynez Mountains rise sharply to 2,600 feet. Slopes here can reach 100%.

The City has a mostly southern aspect with some variation such as the edges of mesas, creeks, and drainages. A south aspect typically experiences longer periods of sunshine with higher temperatures, lower relative humidities, and light flashier fuels than a north aspect which contributes to fire spread; however, the coastal influence of this area helps maintain cooler temperatures, higher relative humidity, and the fuels tend to be heavier than areas without a coastal influence.

Terrain or land configuration, such as ridges, mountain, narrow canyons, and steep drainages, affect the direction and speed of wind. Canyons and creeks dropping from the Santa Ynez Mountains down through the City of Goleta include Tecolote Creek, Winchester/Bell Creek, Ellwood Creek, El Encanto Creek/ Phelps Ditch, Devereux Creek, Glen Annie/Tecolotito Creek, Carneros Creek, San Pedro Creek, Las Vegas Creek, Maria Ygnacio Creek, and Atascadero Creek. These canyons and creeks are extremely steep and narrow above the City but shallow out as they meet the coastal plain. These north-south trending canyon form paths for the flow of air from Sundowner wind events that can increase wind speeds and may change the direction of fire spread.

3.4.4 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 fuels and weather patterns in Goleta establishes a fire environment that will support a broad spectrum of fire behavior. The range of wildland fire behavior includes:

- Ground fires burn in the organic material beneath the surface litter, such as layer of duff, roots, and buried or partially buried dead and decaying logs.
- Surface fires burn in material above the ground including low vegetation such as grasses, low shrubs, small trees, and loose debris such as dead branches, leaves on the surface.
- Crown fires burn in the tops of trees and tall shrubs or brush. Three types of crown fire can occur including passive, active, and independent.
- Spotting occurs when firebrands are transported naturally by wind, convection, or gravity beyond the main perimeter of the fire in receptive fuels.

Typically, the City of Goleta experiences more moderate conditions such as little to no wind, higher humidity, higher fuel moistures, and/or patchy or discontinuous fuels. Wildfire behavior during these conditions will likely include slow spreading ground and surface fires with possible torching of single trees that firefighters can easily control.

However, severe conditions do periodically occur in Goleta such as Sundowner wind events. This brings a combination of low fuel moistures, abundant fuels, high temperatures, low relative humidities, and high winds creating conditions where a wildfire becomes explosive. Fire behavior observed on past wildfires in the area during these conditions include over 70-foot high flame lengths, fires spreading on the surface and in the crowns of shrubs and trees with speeds in excess of 2-miles an hour and spotting distances of up to $\frac{3}{4}$ of a mile. These explosive conditions have resulted in loss of life, loss of structures, loss of infrastructure, and loss of critical habitat.

4. GOLETA: A COMMUNITY AT RISK

A key component of the 2000 National Fire Plan outlined a comprehensive strategy with a commitment to fund a continued level of hazardous fuel reduction and new funding for community assistance and a community protection initiative. 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.

4.1 DESIGNATION AS A COMMUNITY AT RISK

As a result of Healthy Forest Restoration Act, 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 City of Goleta is one of 1,264 communities in California identified as a CAR and has a Hazard Level Code of “3” which indicates the highest fire threat level (CAL FIRE, 2001).

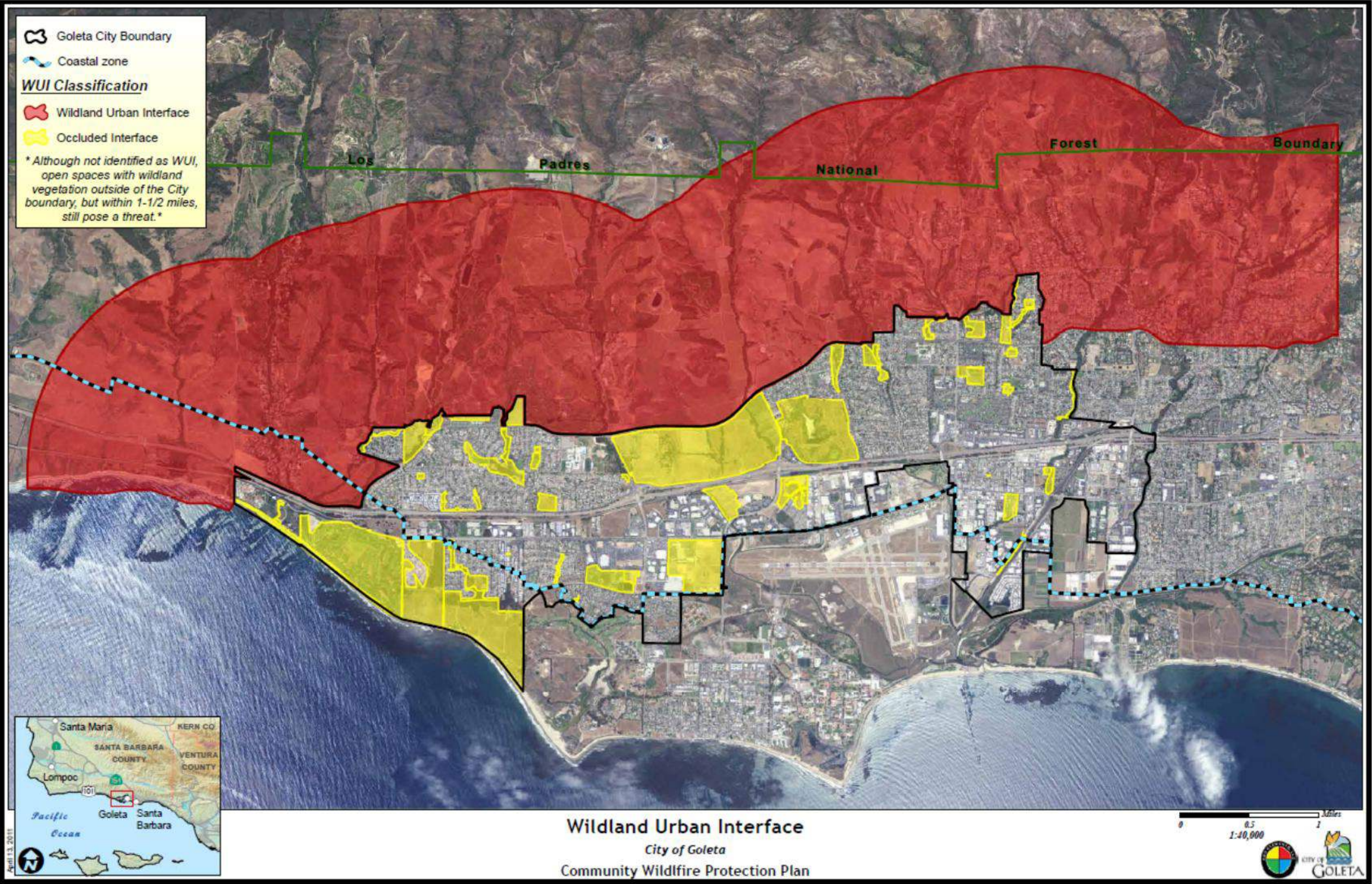
The State Forester (CAL FIRE Director) has assigned the task of managing the list to the California Fire Alliance. The California Fire Alliance is a cooperative membership dedicated to the support of pre-fire principles and activities. Partnering agencies include the Bureau of Land Management; Cal Fire; USDA Forest Service; California Fire Safe 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.

4.2 GOLETA'S WILDLAND URBAN INTERFACE

The City of Goleta has an interface, or clear line of demarcation, between neighborhoods and wildland fuels along roads or back fences, such as along the western portion of Cathedral Oaks, Rio Vista, Northgate, and Serenidad Place as examples (See WUI Map, Figure 5). These areas have high structure density where the distance between residences is narrow. In a high wind event, like a Sundowner wind, neighboring structures can become a significant ignition source and become a “fuel type” with the potential of spreading fire from structure to structure. The closer the structures are together, the easier it is for structures to ignite due to the radiant heat from the burning neighboring structure and, much like a tightly packed wildland fuel type, the structures can carry fire from one structure to another. The wildfire scenario affords little to no safe operational space for firefighters to protect structures.

In addition, Goleta has numerous open spaces scattered throughout the City. These areas act as islands of wildland fuels where structures abut open spaces, some of which are undeveloped. The undeveloped open spaces such as Lake Los Carneros, Coronado Preserve, Santa Barbara Shores, sections of Evergreen Acres, and Stonebridge can pose a serious wildfire threat to homes and neighborhoods.

Figure 5 City of Goleta Wildland Urban Interface



The combination of highly flammable fuels, local weather conditions, and structure ignitability all contribute to put homes, neighborhoods, infrastructure, and commercial businesses in Goleta at risk of significant losses due to wildfire.

4.3 NATURAL AND CULTURAL RESOURCE CONCERNS IN THE COMMUNITY

The fact that Goleta is a “community at risk”, places highly valued natural and cultural elements in an extremely vulnerable position. Although the natural or wild landscape prevalent to many of these resources areas may be desirable in terms of visual or recreational aspects, in most cases this unmaintained setting contributes to the significant threat when exposed to wildfire.

The ESHAs, Visual, Recreational, and Scenic Resources exemplify key natural resource elements. Generally, these areas pose high wildfire hazard issues primarily related to conditions and characteristics of the fuels and proximity to community structures. Goleta City policy statements (in the GP/CP) regarding each of these elements contain language that emphasizes the need to protect and or conserve these areas.

Of the thirteen ESHAs in Chapter 2 of Goleta’s GP/CP, the following three are more likely to be negatively impacted in a wildfire situation due to their fuel type and location on the landscape (See most recent City of Goleta’s ESHA Map, Figure 1):

- Coastal sage scrub and chaparral
- Native woodlands and savannahs, including oak woodlands
- Monarch butterfly aggregation sites and related habitat areas

Visual and Scenic Resources are a significant valued natural resource that comprises this exceptional setting. 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 adjacent to Goleta, it is imperative that the community takes precautionary measures to protect the community’s natural resource. In many cases, their current condition is conducive to severe wildfire.

Community cultural and historical resources are also a concern. Some of the primary cultural and historical sites in Goleta are preserved within the boundaries of designated undeveloped open spaces. Other historical structures or groups of structures are surrounded by a maintained park-like setting but outside the maintained zone is a large expanse of natural vegetation that will likely produce burning embers. The exterior construction material, design, and condition of these structures can make them particularly susceptible to damage and destruction in a wildfire event.

5. WILDFIRE ASSESSMENT

This assessment utilizes potential fire behavior and historical fire occurrence to identify areas with the greatest hazard and highest risk. In addition, CAL FIRE's existing fire hazard severity assessment is included as part of this assessment. It is important to note that the purpose of this assessment is not to determine the wildfire hazard or risk for individual parcels but to provide a basis for identifying and prioritizing potential mitigation strategies for the entire City.

5.1 CALIFORNIA FIRE HAZARD SEVERITY ZONES

California state law mandated CAL FIRE to identify "fire hazard severity zones" throughout the State. These fire hazard severity zones are areas that have similar burn probabilities and fire behavior characteristics that result in damage to buildings (additional information can be found at <http://frap.fire.ca.gov/projects/hazard/fhz.html>).

Figure 6 identifies areas directly adjacent to the City that include very high fire hazard severity zones.

5.2 HAZARD ASSESSMENT

Historically, and even today, the greatest threat to the City comes from the Los Padres National Forest and SRA land on the Santa Ynez Mountains above the City. This threat stretches west from the Gaviota area along the mountain range east towards Cathedral Peak. Heavy chaparral vegetation, continuous fuels, hot and dry weather with Sundowner winds, difficult and steep terrain, and limited access for firefighters can combine to create extremely hazardous conditions; however, the focus areas for this assessment are the open spaces within the City of Goleta where the City has jurisdictional authority to act.

Wildfire hazard is a fuel complex, defined by volume, type condition, arrangement, and location that determines the degree of ease of ignition and of resistance to control.

Since much of the City was not included in the California fire hazard severity model, well-established fire models were used in an attempt to fill in the blanks. Models used in the assessment include FlamMap (Version 3.0), Behave Plus 5.0.4 (Build 305), Standard Fire Behavior Fuel Models: A Comprehensive Set for Use with Rothermel's Surface Fire Spread Model, and Fire Family Plus (Version 4).

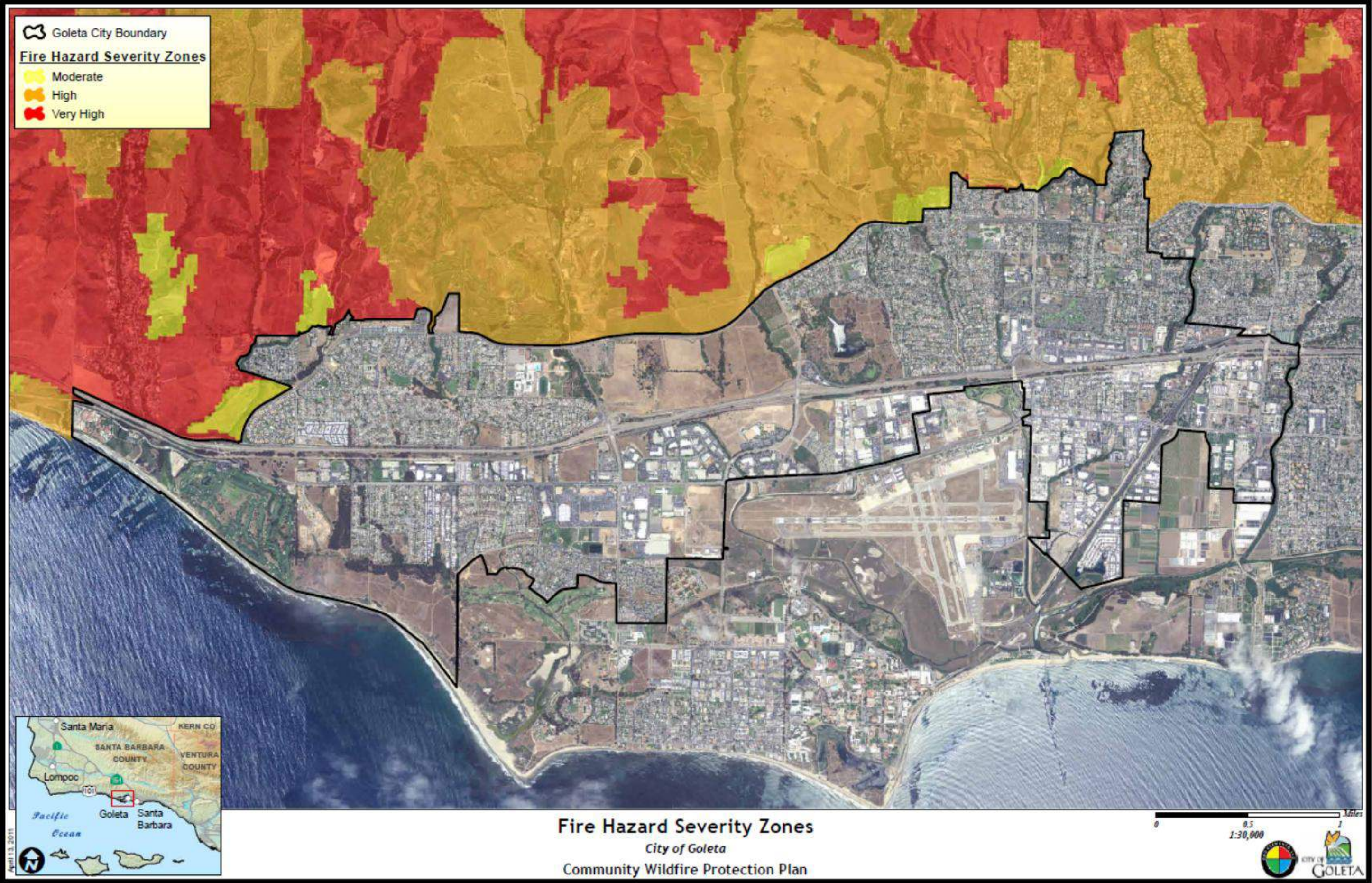
These widely used and accepted mathematical fire models are tools used by land and fire managers across the world. Wildland fire professionals using these tools can successfully apply the outputs to a range of wildfire activities including wildfire behavior prediction, wildfire assessments, and the development of mitigation strategies. Existing and available data used in these models came from a variety of sources including federal, state, and local agencies.

Significant gaps in existing data would not allow us to complete a spatial assessment of the entire City. Other non-spatial fire models provided valid outputs to fill in these gaps.

5.2.1 FlamMap

FlamMap is a spatial fire behavior mapping and analysis program that requires data including elevation, slope, aspect, surface fuel model, canopy cover, fuel moisture, and weather data.

Figure 6 CALFIRE FIRE Hazard Severity Zones



The outputs from FlamMap provide a reasonable representation of surface fire behavior across the landscape. Output values approximate fire behavior interpreted relative to each other and not as absolute predictor of fire behavior. Fire professionals utilized previously observed fire behavior and field visits to the area in order to calibrate FlamMap inputs and validate the outputs. Additional information on methodology and specific inputs used for FlamMap are available in Appendix C.

5.2.2 Behave Plus

This model is the most commonly used program for predicting fire behavior. Behave Plus predicts surface fire characteristics in one-dimension and produces tables, graphs, and simple diagrams for multiple fire management applications. Fire professionals utilizing previously observed fire behavior in the area validated the outputs from Behave Plus. Additional information on methodology and specific inputs used for Behave Plus are available in Appendix C.

5.2.3 Fire Family Plus

Fire Family Plus (Version 4) is a fire climatology and occurrence program that combines the functionality of various weather and climate programs into a single package with a graphical user interface. It allowed fire professionals to summarize and analyze weather observations for use in FlamMap and Behave Plus. Additional information on methodology used for Fire Family Plus is available in Appendix C.

5.2.4 Data Sources for Models

Much of the data used for modeling came from the Wildland Fire Decision Support System (WFDSS). WFDSS is a National product that supports wildfire planning at the landscape level and produces a nationally comprehensive, consistent, scientifically credible suite of spatial data layers for the entire United States. Data products consist of over fifty spatial data layers in the form of maps and other data that support a range of land management related analysis and modeling. For the purpose of this assessment elevation, slope, aspect, surface fuel model, and canopy cover data from WFDSS was utilized.

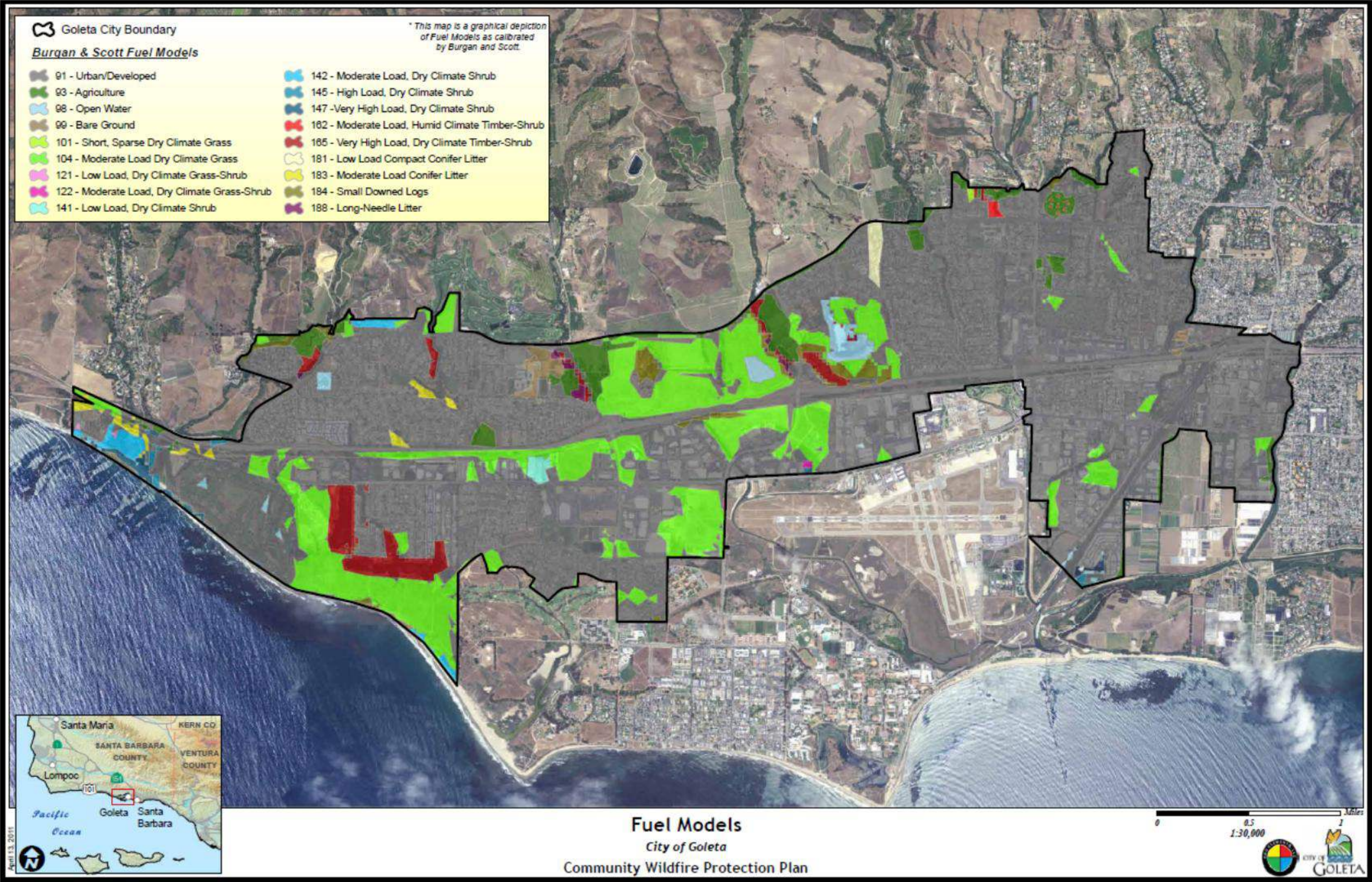
5.2.4.1 Wildland Fuel Models

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. The fire behavior modeling associated with the CWPP analysis utilized Scott and Burgan's Standard Fire Behavior Fuel Model (FBFM) classification system, which describes the composition and characteristics of both surface and canopy fuels (Scott, J.H., Burgan, R.E., 2005).

A major challenge in wildfire assessments is accurate mapping of fuels in order to determine spatial fire hazard and plan mitigation efforts. The WFDSS fuels layer represents best available data for the City. WFDSS fuel models used in the fire behavior modeling and found within the corporate boundary of the City are summarized in Table 7 and Figure 7).

The 30-meter resolution of the fuels data used in WFDSS does not capture the level of detail needed for assessing small areas such as some of the City's open spaces. In addition, many open spaces across the City had no fuels data or were incorrectly characterized as "Urban/Unburnable" or

Figure 7 Fuel Models within Goleta



“Agricultural/Unburnable”. Where possible, discrepancies within the fuels layer were corrected prior to fire modeling.

The fuel models used include:

Table 7 Fire Behavior Fuel Models within Goleta

Fire Behavior Fuel Model	Fuel Type	Fuel Description
91	Urban/Develop Unburnable	Land covered by urban and suburban development. Will not support wildland fire spread. In some cases, areas mapped as 91 may experience structural fire losses during a wildland fire incident; however, structure ignition in those cases is either house-to-house or by firebrands, neither of which is directly modeled using fire behavior fuel models. If sufficient fuel vegetation surrounds structures such that wildland fire spread is possible, then choose a fuel model appropriate for the wildland vegetation rather than 91.
93	Agriculture/Unburnable	Agricultural land maintained in a nonburnable condition; examples include irrigated annual crops, mowed or tilled orchards, and so forth. However, many agricultural areas are not kept in a nonburnable condition. For example, grass is often allowed to grow beneath vines or orchard trees, and wheat or similar crops are allowed to cure before harvest; in those cases use a fuel model other than 93.
98	Open Water/Unburnable	Land covered by open bodies of water such as lakes, rivers and oceans comprises 98.
99	Bare Ground/Unburnable	Land devoid of enough fuel to support wildland fire spread is covered by fuel model 99. Such areas may include gravel pits, arid deserts with little vegetation, sand dunes, rock outcroppings, beaches, and so forth.
104	Grass	Continuous, dry-climate grass. Load and depth are greater than 102; fuelbed depth is about 2 feet. Moderately coarse continuous grass, average depth about 2 feet. Spread rate very high; flame length high.
121	Grass/Shrub Mix	Grass and shrubs combined. Shrubs are about 1 foot high, grass load is low. Spread rate is moderate; flame length low. Moisture of extinction is low. Shrubs are about 1 foot high, low grass load. Spread rate moderate; flame length low.
122	Grass/Shrub Mix	Grass and shrubs combined. Shrubs are 1 to 3 feet high, grass load is moderate. Spread rate is high; flame length moderate. Moisture of extinction is low. Shrubs are 1 to 3 feet high, moderate grass load. Spread rate high; flame length moderate.
141	Shrub	Low shrub fuel load, fuelbed depth about 1 foot; some grass may be present. Spread rate very low; flame length very low.
142	Shrub	Moderate fuel load (higher than SH1), depth about 1 foot, no grass fuel present. Spread rate low; flame length low.
145	Shrub	Heavy shrub load, depth 4 to 6 feet. Spread rate very high; flame length very high.
147	Shrub	Very heavy shrub load, depth 4 to 6 feet. Spread rate lower than SH5, but flame length similar. Spread rate high; flame length very high.
162	Timber Understory	Broadleaf (hardwood) litter. Low load, compact. Spread rate very low; flame length very low.
165	Timber Understory	Heavy forest litter with a shrub or small tree understory. Spread rate is moderate; flame length moderate. Fuel bed is high load conifer litter with shrub understory

181	Timber Litter	Compact forest litter. Light to moderate load, fuels 1 to 2 inches deep. May be used to represent a recently burned forest. Spread rate is very low; flame length very low. Light to moderate load, fuels 1 to 2 inches deep. Spread rate very low; flame length very low.
183	Timber Litter	Moderate load conifer litter, light load of coarse fuels. Spread rate is very low; flame length low. Moderate load conifer litter
184	Timber Litter	Moderate load of fine litter and coarse fuels. Includes small diameter downed logs. Spread rate is low; flame length low. Moderate load, includes small diameter downed logs
188	Timber Litter	Moderate load long-needle pine litter, may include small amount of herbaceous load. Spread rate is moderate; flame length low.
(Taken from Scott, R and Burgan, R, Standard Fire Behavior Fuel Models: A Comprehensive Set for Use with Rothermel's Surface Fire Spread Model)		

5.2.4.2 Weather Data

Available historical weather data came from a local Remote Automated Weather Station (RAWS) in Montecito, which has continuous weather records dating back to 1996. Glen Annie RAWS was not used in the weather analysis due to the limited range of available data from this location. Fire Family Plus evaluated the data based at the height of the wildfire season, June 1 through November 15. Weather and fuel moisture data from the Montecito RAWS were utilized as inputs for FlamMap and Behave Plus. Additional information on methodology used for Fire Family Plus are in Appendix C.

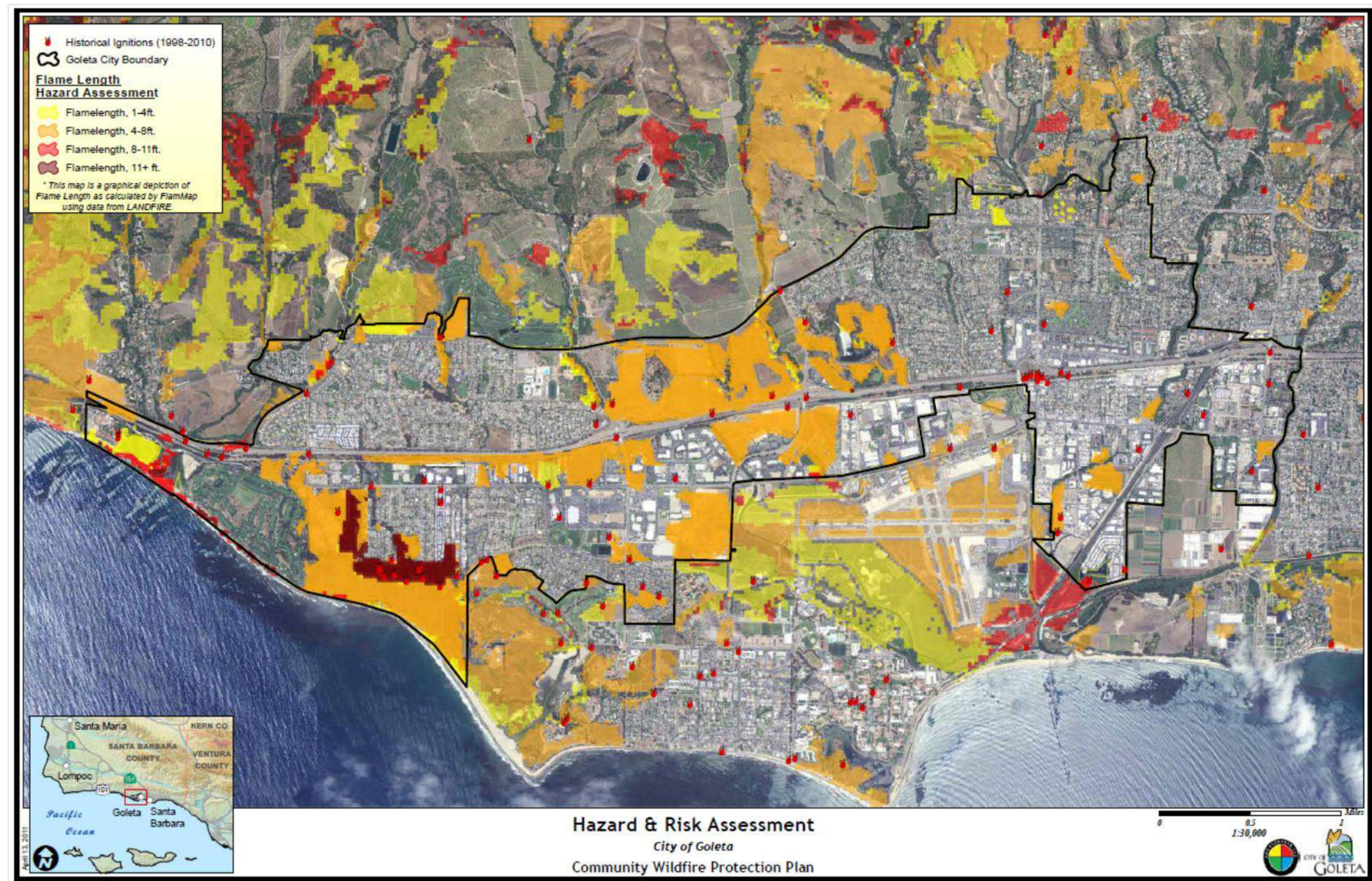
5.3 HAZARD ASSESSMENT RESULTS

The results from FlamMap show areas with flame lengths in excess of 11 feet, indicating an extreme fire hazard. These areas are predominately associated with the eucalyptus groves. FlamMap only captures the surface fire conditions within the groves and the actual flame lengths observed should a crown fire occur in the groves would greatly exceed 11 feet. These extreme hazard areas have fireline intensities predicted in excess of 1,000°F. Wildfires burning at this intensity are difficult to control, and are extremely hazardous to the life safety of the public and firefighters. Values, such as structures, infrastructure, and natural resources, impacted by wildfires burning at these intensities are at significant risk of loss (See Wildfire Hazards and Risks Map, Figure 8).

Large portions of the City show no flame activity based on outputs from FlamMap. These areas therefore appear not to be at risk from a wildfire; however, this is not an appropriate interpretation of the model outputs.

Areas without flame activity are classified as an “Unburnable” fuel type in the data used to analyze wildfire activity. The fuels data used generalizes the surface fuel characteristics within a 30 meter by 30 meter pixel. Areas with urban development, lawns, roads, parking lots or other paved areas receive the “Unburnable” classification. This is also true for agricultural lands. The fuels data layer is not robust enough to capture flammable landscape vegetation, flammable roofs or agriculture lands with burnable fuels under canopies of orchards. Therefore, during modeling these areas will not support combustion, while there is evidence as recent as the 2009 Jesusita Fire indicating that under severe weather conditions wildfire has the potential to spread in these “unburnable” fuels. This burning characteristic is generally associated with embers igniting flammable landscape vegetation, roofs or agricultural debris such as orchards. Often these “spot fires” develop well away from the main fire.

Figure 8 Wildfire Hazards and Risks



In FlamMap, crown fire potential is affected by the amount of biomass in the canopy of the trees and/or tall shrubs or brush, spacing of the canopy, and the height of the base of the canopy from the ground. Outputs from FlamMap provide an estimation of crown fire potential for passive crown fire (single trees) and active crown fire (groups of multiple trees). The model spatially indicates where crown fire is expected to occur. FlamMap does not model the potential for independent crown fire. For the purpose of this plan, crown fire potential is limited to areas with stands of trees such as eucalyptus and pine trees (See Crown Fire Potential Map, Figure 9).

Flame lengths and crown fire activity outputs were calibrated using observed fire behavior from recent wildfires in the area. The value of recorded observations and predicted fire behavior is important to the development of fuel treatment and fire suppression strategies and tactics, particularly in terms of the difficulty of control and effectiveness of suppression resources.

5.4 RISK ASSESSMENT

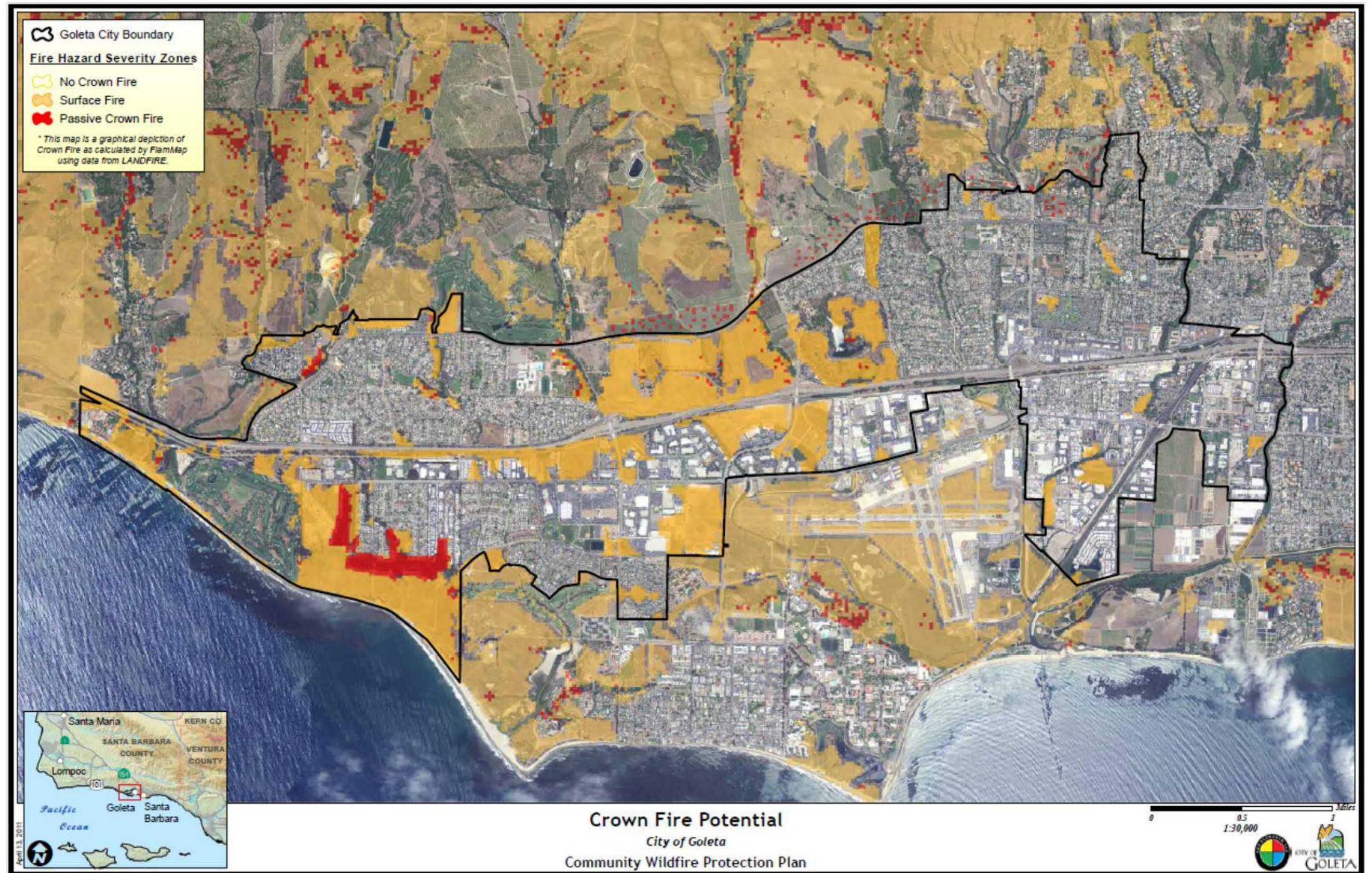
The risk of an ignition is variable with the potential for fires to occur from many types of ignition sources including natural and human activities (accidental, deliberate, or undetermined). The assessment of historical and potential fire occurrences are important to gain a better understanding of ignition potential, the prioritizing of fuel treatments, and the development of prevention strategies. The development of a wildfire risk assessment is essential to understanding the potential threats of wildfire within the community.

For the purpose of this plan, risk is the likelihood of an ignition occurring and is primarily based on historical fire ignitions in the area.

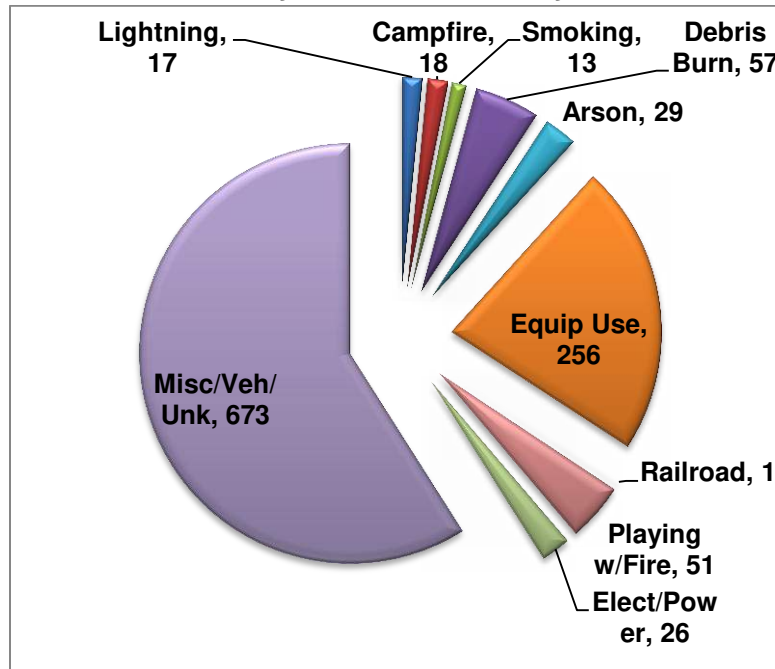
Pre-2007 historic fire occurrence data for Santa Barbara County is limited to data available from CAL FIRE; however, this data only met specific criteria sought by CAL FIRE at that time and does not reflect actual fire occurrence in the County. In 2007, SBCFD began collecting all data related to fire occurrence reported in the County. For the purpose of this assessment, all fire occurrence data was combined, recognizing that the numbers of fires prior to 2007 were likely significantly greater than what is available.

Below displays the number of fire occurrences by cause from 1998 – 2009 (this data was taken from the CAL FIRE website - http://cdfdata.fire.ca.gov/incidents/incidents_statsevents; 2010 is not yet available) that the highest risk of fire occurrence comes from human activity. A mixture of miscellaneous, vehicle fires, fires with unknown origin and equipment use make up the bulk of the ignition sources.

Figure 9 Crown Fire Potential



Santa Barbara County Fire Occurrence by Cause 1998-2009



The Wildfire Hazard and Risk Map, Figure 8 shows heavy concentrations of fire occurrence along Highway 101 at the Fairview Avenue interchange and in the Sperling Preserve. The Highway 101/Fairview Avenue interchange has high vehicle traffic so the risk is high; however, the hazard potential is low due to several factors including:

- Fuel types – a maintained mix of annual grasses and discontinuous stands of shrubs and trees – resistance to control is minimal
- Short response times to the area due to the proximity to SBCFD fire stations
- The area is surrounded by multiple barriers such as Highway 101, Fairview Avenue, and paved parking lots

Sperling Preserve is an undeveloped open space, which includes areas with flame lengths exceeding 11-feet. These flame lengths indicate that crowning, spotting, and significant fire spread is common and that control efforts at the flaming front of a fire would be ineffective (See Table 8). This extreme hazard, coupled with a concentration of fire occurrence, indicates that there is a significant threat to life safety, structures, infrastructure, and natural resources such as sensitive species habitat from Sperling Preserve.

The Fire Suppression Interpretation Table (Table 8) is a guideline used by firefighters to measure the safety and potential effectiveness of various fireline resources based on a visual assessment of active flame length.

Table 8 Fire Suppression Interpretation Table

Flame Length (feet)	Fireline Intensity (BTU/feet/second)	Interpretations
0–4	0–100	Fires can generally be attacked at the head or flanks by persons using hand tools. Handline should hold the fire.
4–8	100–500	Fires are too intense for direct attack on the head by persons using hand tools. Handline cannot be relied on to hold fire. Equipment such as dozers, engines, and retardant aircraft can be effective.
8–11	500–1,000	Fires may present serious control problems—torching out, crowning, and spotting. Control efforts at the head of the fire will probably be ineffective.
11+	1,000+	Crowning, spotting, and major runs are common. Control efforts at the head of the fire are ineffective.
¹ Caution: These are not guides to personal safety; fires can be dangerous at any level of intensity; Wilson (1977) has shown that most fatalities occur in light fuels on small fires or isolated sections of large fires. Source: NWCG Fireline Handbook, Appendix B Fire Behavior, April 2006.		

The value of predicted fire behavior is important to the development of fire suppression strategies and tactics, particularly in terms of the difficulty of control and effectiveness of suppression resources, and the development of fuel treatment strategies. This assessment is intended to help define locations within the area that are higher priority for mitigation work but can also provide potential targeted prevention efforts through outreach, education and enforcement, which can minimize exposure to wildfires and therefore a threat to the community.

5.5 STRUCTURE VULNERABILITY

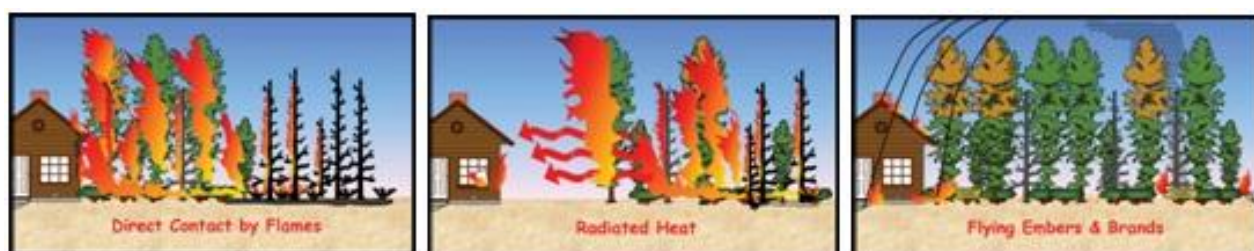
The 1990 Painted Cave Fire destroyed 440 homes, 28 apartments, 30 miscellaneous structures, and damaged an additional 66 structures. This fire was one of the first WUI fires studied for causes of structure loss. The detailed analysis was part of the “Defensible Space Factor Study”, which revealed that 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).

Research has shown repeatedly that the primary reason for structure loss is due to the ignitability of the structure itself. In some situations, a low intensity fire can destroy structures that are highly ignitable while structures with low ignitability 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 1995; Cohen 2000; 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:

- **Convection:** It's 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.
- **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.
- **Burning Embers:** It's 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 (from www.firewise.com)



Defensible space is the space between a structure and the wildland area or neighboring structures that, under normal conditions, 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.

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 flammable 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.

5.5.1 Potential Losses to Goleta from Wildfire

The actual extent and magnitude of vulnerable structures in Goleta is unknown since data does not exist. cursory field trips through neighborhoods show that a high percentage of structures have asphalt, ceramic tile, or clay tile roofs. Several homes with wood shingle roofs were observed but it is unknown whether the wood shingles were treated or untreated - although visually their condition looked poor. Historic structures, such as the Stow House, have wood shingle roofs and are likely susceptible to loss in even a moderate wildfire event especially from burning embers which can reach distances of $\frac{3}{4}$ of a mile in the area.

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6. CITY OF GOLETA - ACTION PLAN

Based on the fire environment and fire history of the area it is clear that wildfires are inevitable; however, we don't have to accept the catastrophic loss of life, homes, infrastructure, businesses, and cultural and natural resources in the community. Since the question is not “if” but “when” wildfires will occur, a strategy to reduce the wildfire threat to the City’s values must be developed. Equipped with the wildfire assessments from Chapter 5, the next step is to develop appropriate actions to mitigate the hazards and risks thereby reducing the wildfire threat to the City’s values.

It is important to note that despite our best efforts, the occurrence of wildfires will continue and threaten the values that the City wants to protect. Whether these wildfires are catastrophic or not depends on the efforts of all stakeholders – citizens, local organizations, businesses, City Staff and officials along with county, state, and federal agencies.

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, Santa Barbara County and the City provide the regulatory basis for preparedness but these alone will not protect Goleta’s values – preparedness requires participation by all stakeholders, at all levels.

6.1.1 City of Goleta Programs

The City has implemented several programs to prepare the community. These include:

6.1.1.1 Goleta City Alert

In the summer of 2008, the City of Goleta implemented a state-of-the-art automated notification system designed to provide emergency and non-emergency information to residents and businesses. This web-based system contacts City residents and businesses quickly and efficiently via landline (home or business phone), cell phone, PDA, and e-mail address that records and sends personalized messages in minutes. The system can notify businesses and residents of emergency incidents such as a fire or robbery, urgent non-emergency incidents such as power outage and road closure, as well as for community outreach. It is capable of sending 2 million 60-second voice messages, the system can send hundreds of thousands of emails and text messages in an hour. For more information and to register go to www.cityofgoleta.org/index.aspx?page=107, click the Connect-CTY icon.

6.1.1.2 Goleta Partnership for Preparedness

The Goleta Partnership for Preparedness (GP4P) is an alliance with the City of Goleta, the Goleta Valley Chamber of Commerce, and the American Red Cross - Santa Barbara County Chapter that started in 2007. These agencies collaborated to develop a partnership in community disaster education and disaster response training to address the disaster preparedness needs of all members of the Goleta community. GP4P’s mission is to encourage the community - both residents and businesses - to be prepared in the event of an emergency through outreach, education, workshops and a strong community presence.

6.1.1.3 Goleta Prepare Now!

GP4P launched "Goleta Prepare Now" in 2009, a two year initiative that provides important disaster preparedness information to every Goleta resident. This two-year program was made possible by a grant through the Aware and Prepare Initiative (for more information on the initiative please visit www.orfaleafoundations.org/go/our-initiatives/aware-prepare). As of 2009 GP4P has provided presentations and community workshops on disaster preparedness, held emergency backpack giveaways for low-income individuals and families, and created a Community Emergency Response Training (CERT) program.

6.1.1.4 Community Emergency Response Team

The Community Emergency Response Team (CERT) began in 1985 to train civilians to meet their own immediate needs following a disaster. Federal Emergency Management Agency (FEMA) recognizes the importance of preparing citizens and the Emergency Management Institute (EMI) and the National Fire Academy adopted and expanded the CERT materials believing them applicable to all hazards. Since 1993 when this training was made available nationally by FEMA, communities in 28 States and Puerto Rico have conducted CERT training. A community can supplement its response capability after a disaster with civilians who can be auxiliary responders.

The City of Goleta, through its "Goleta Prepare Now" program offers free CERT training to residents within the City of Goleta. The CERT training program prepares community members to take a more active role in emergency preparedness and in the event of a catastrophic disaster. They train to work as part of a neighborhood or workplace response teams in the event of a major disaster, when emergency services may not be available and when residents may have to rely on each other for life-saving and life-sustaining needs.

This training covers basic skills in disaster preparedness, fire safety, disaster medical operations, light search and rescue operations, CERT organization, disaster psychology, terrorism and CERT, and an evaluation and disaster simulation.

Additional information on all of the above programs in English and Spanish is available at:

- Goleta Prepare Now/Goleta Prepárese Hoy - www.goletapreparenow.org.
- Goleta Prepare Now Initiative - www.cityofgoleta.org/index.aspx?page=971
- Goleta CERT Program - www.citizencorps.gov/cc/showCert.do?cert&id=42097

6.1.1.5 Emergency Preparedness Program

The Redevelopment, Neighborhood Services and Public Safety Department provides oversight of the City's Emergency Preparedness Program. This program's proactive approach to emergency preparedness includes staff and funding with the purpose of ensuring NIMS compliance, development and management of the City's Emergency Operating Program, and ensuring a coordinated and comprehensive response to any emergency within or adjacent to our jurisdiction.

6.1.2 Santa Barbara County Fire Department

In addition to the fire protection activities in Section 2.3, SBCFD has other programs to assist in community planning and preparedness, including:

6.1.2.1 PRC 4291 Implementation

The SBCFD sends notices to owners of properties in the City to abate fire hazards that potentially pose a fire hazard along with public education efforts through media outlets such as local television stations and newspapers. Property owners have approximately three weeks to meet the requirements for clearing property outlined in the notice for their property.

A misdemeanor citation is issued to all property owners that do not comply by the compliance date. Issuance of a misdemeanor citation may require an appearance in court. If for any reason the County Fire Department is forced to abate a fire hazard, the owner will pay all costs involved, which will be added to the taxes assessed against the property. Current regulations allow an insurance company to require additional clearance. The area to be treated does not extend beyond a property line. Additional information is available at www.sbcfire.com/fp/hrp.html.

6.1.2.2 Red Flag Warning Plan

A Red Flag Warning means that the combinations of terrain, weather and fuel moisture are at hazardous levels and could lead to rapid or dramatic increases in wildfire activity. The Red Flag Warning Plan utilizes available SBCFD personnel, cooperating fire agencies, citizen groups, and the news media to inform the public of high fire danger, the potential for a major wildfire, and the need to be aware of and exercise fire safe practices during these periods. Additional information is available at <http://www.sbcfire.com/sbcfdrfaz/RedFlag.pdf>.

6.1.2.3 Mobile Data Computer/Automatic Vehicle Locator Program

SBCFD utilizes Mobile Data Computers (MDC) in conjunction with the Automatic Vehicle Locator (AVL) system to locate and dispatch the closest available resources available for immediate dispatch to incidents. The installation of hardware on fire department vehicles aid in the management of fire resources in the field and provides emergency responders with up to date information.

6.1.2.4 Public Education

SBCFD's "Ready, Set, Go" program is an important educational tool found on their website www.sbcfire.com. This program was developed in May of 2009 as a new approach for educating Southern California residents on the year-round threat of wildfire. This educational program seeks to gain public involvement in reducing life and property loss caused by wildfires. The fire department provides a myriad of information and programs related to wildland fire safety, including:

- "Wildland Safety" program which provides a comprehensive list of life and safety information regarding measures that can be taken to provide home defensible space tactics as well as some basic preemptive survival measures (http://www.sbcfire.com/fp/education/wildland_safety.pdf).
- The "Fire Safety" education program is offered throughout the county school system and is generally scheduled annually in the spring. If a schoolteacher or program manager wants to request help with an educational program during another time-period, they are encouraged to contact the fire department public education department two to three weeks in advance.
- "Fire Prevention" on the Fire Department's home page provides multiple links for information and tools to help with wildfire prevention education and actions including "Living with Fire" and

“Defensible Space and Hazard Reduction Pages”. These links provide excellent information to assist a homeowner’s in preparing their homes for wildfire.

Other helpful links from the SBCFD website includes:

- National Fire Protection Association (www.nfpa.org) – This site contains information on an educational program ‘Risk Watch’ for children ages 14 and under. Risk Watch is a school-based curriculum that links teachers with community safety experts and parents. The curriculum is divided into four age-appropriate teaching modules.
- Federal Emergency Management Agency and the U.S. Fire Administration (www.usfa.dhs.gov/citizens) - Contains a full suite of awareness and educational information for all fire types, their inherent hazards and preventative actions.
- Sparky (www.sparky.org) – This link brings up a fun, interactive cartoon type learning program for kids.

There are countless other sources on the world-wide web, accessing a whole myriad of educational tools and reference material on potential wildland fire impacts in communities or WUI. The knowledge gained from this information can guide a homeowner on basic yet essential safety measures that could save lives, property and resources. Recommended groups or forums include:

- Fire Safe Council - www.firesafecouncil.org
- California Fire Alliance - www.cafirealliance.org
- FireWise - www.firewisesa.org.za/index.php

6.1.3 Santa Barbara County Office of Emergency Services (SBC OES)

SBC OES is a department within the County Executive Office, and is responsible for emergency planning and coordination for the Santa Barbara Operational Area. OES is responsible for emergency planning and coordination among the Santa Barbara Operational Area entities, which include:

Cities: Buellton, Carpinteria, Goleta, Guadalupe, Lompoc, Santa Barbara, Santa Maria, Solvang

Special Districts: Air Pollution Control District, Fire Districts, Sanitary Districts, School Districts, Vector Control Districts, and Water Districts

- Volunteer Organizations: American Red Cross, Amateur Radio Emergency Services (ARES), Equine Evacuation, and Montecito Emergency Response & Recovery Action Group (MERRAG), Volunteer Organizations Active in Disasters (VOAD)
- Industry Groups: CAER-Community Awareness and Emergency Response, Petroleum industry mutual aid group, SBIA-Santa Barbara Industrial Association.
- Tri-County Coordination: Santa Barbara County OES also coordinates with adjoining offices of emergency services in Ventura and San Luis Obispo Counties. The Tri-County Coordinators meet and discuss regional preparedness several times throughout the year.

SBC OES responsibilities include:

- Maintain the Santa Barbara County Operational Area Multi-Hazard Functional Plan.
- Maintain the County Emergency Operations Center (EOC) in a state of operational readiness.
- Maintain a trained cadre of EOC team members.

- Provide ongoing leadership and coordinate disaster plans and exercises with the eight cities throughout the County.
- Assist County departments in developing department emergency plans, which address how they will perform during disasters.
- Assist County departments with development of facility emergency plans for every occupied County facility.
- Provide ongoing training for County department emergency coordinators.
- Participate in an ever-expanding public education campaign for all hazards through the Earthquake Survival Program (ESP), public venues and various media presentations.

Additional information is available at <http://www.countyofsb.org/ceo/oes.aspx?id=376>.

6.1.3.1 Radio Ready

The Santa Barbara County OES, the Orfalea Fund's Aware and Prepare Initiative, and California Concern, a local citizen group, have partnered with designated local radio stations to create Radio Ready, a system that connects the release of timely information from the OES to the radio-listening public. Information is available at http://www.sbcfire.com/dp/radio_ready.pdf.

6.1.4 Santa Barbara Fire Safe Council

The Santa Barbara County Fire Safe Council is a non-profit community organization formed in 1997. Their by-laws include a mission statement: "To unify public and private organizations to educate, motivate and coordinate Santa Barbara County communities to minimize the losses associated with wildfire".

The Santa Barbara County Fire Safe Council and the community provides education, evacuation planning, community vegetation management projects, fund raising, and neighborhood assistance. For additional information, contact them at 805-969-2983. Additional information on Fire Safe Councils is available at www.firesafecouncil.org/index.cfm.

6.1.5 Santa Barbara County Community Awareness and Emergency Response (CAER)

Since its inception in 1991, Santa Barbara CAER has grown into an "all-risk" mitigation organization. CAER's original charter centered around the proper handling, storage, and disposal of hazardous materials and waste. CAER's members understand that the same steps used to mitigate the hazards associated with such materials and waste can also be applied to the mitigation of hazards from earthquake, fire, flooding, civil unrest, workplace violence, and any other foreseeable incidents or emergencies (Additional information is available at <http://www.sbcaer.org>).

Even though the scope of CAER has grown to encompass more than just hazardous materials and waste management, the original CAER charter still applies:

- Community Awareness and education
- Emergency planning, preparedness, and response

6.1.6 Red Cross

The American Red Cross, a humanitarian organization led by volunteers and guided by its Congressional Charter and the Fundamental Principles of the International Red Cross Movement. The Red Cross will provide relief to victims of disasters and help people prevent, prepare for, and respond

to emergencies. The vision of the American Red Cross, Santa Barbara County Chapter is to provide relief to victims of disasters and help people prevent, prepare for, and respond to emergencies.

The Red Cross is not a governmental agency, and relies on community donations of time and money to do its work. The Santa Barbara County Chapter, founded in 1892, responds to an emergency serving more than 407,000 Santa Barbara County residents throughout the entire county. The Santa Barbara County Chapter has responded to many natural and man-made disasters including the Zaca, Gap, Tea, and Jesusita Fires.

The Red Cross provides a number of preparedness training for a range of disasters, first aid and disaster supply kits, and disaster relief with a focus on meeting people's immediate emergency disaster-caused needs by providing shelter, food, and health and mental health services. For additional information, visit their website at www.sbredcross.org/index.asp?IDCapitulo=0O5561PWP7.

6.2 PROTECTING VALUES

During a WUI fire, the protection of human life safety for both firefighters and civilians is the first priority with property (i.e. homes, businesses, historic sites, infrastructure, etc) and resource values secondary. Many citizens incorrectly assume that there will be a fire truck available to protect their homes or structures during a WUI fire; however, with the thousands of structures in Goleta there are simply not enough fire personnel or fire equipment to defend each structure or value. Often in extreme wildfire situations, such as Sundowner wind events, it is extremely unsafe and impossible for firefighters or citizens to make an effective defensive stand, so these structures and values must be able to survive on their own.

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 defensible. 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. Often times the ornamental vegetation can be more flammable than wildland vegetation.

In addition to defensible space requirements from PRC 4291, firefighters must consider whether the defensible space requirements are enough during a wildfire to provide a safe operational space based on the fire behavior they're observing. Depending on fire behavior 100-feet of defensible space is not sufficient for safety in defending structures and other values. Safety zone guidelines provide safe operational space for firefighters protecting structures. Firefighters require a minimum distances of 4 times the height from observed or anticipated flame lengths (Butler, B., Cohen, J.D, 2000); however, these distances are a minimum and will likely require greater distances if the fire behavior dictates it. The safety zone guidelines assume that there is no wind or slope and convective heat from wind and/or terrain influences. Areas with these influences will need greater distances than those recommended in this analysis to provide for firefighter safety. Observations have shown that flame lengths exceeding 70-feet do occur during wildfires in this area so depending on the slope or wind components defensible space distances greater than 100-feet may be needed.

Although the assessment in Chapter 5 provides some guidance with flame lengths, an onsite consultation with the SBCFD is recommended to determine whether the clearance around a structure

or value is sufficient to provide a safe working environment required for firefighter and citizen's life safety.

When defensible space, fuelbreaks, and area treatments are coordinated, the City's natural resources are afforded an enhanced level of protection from wildfire that may originate from a structure or home. These fuel treatments moderate fire behavior, improve access for firefighters, and provide a safer working environment allowing them to protect the City's natural resource values and suppress the wildfire.

6.2.1 Reducing Structure Ignitability

The ability of a structure to survive wildfire depends on its construction materials and the quality of the defensible space surrounding it. Burning embers from a wildfire will find the weak link in a structure and ignite it because of a small, overlooked or seemingly inconsequential factor. However, there are measures that can be taken to safeguard structures from wildfire. If a structure's vulnerability to ignition can be mitigated, then the catastrophic loss of structures can be minimized. The exterior construction material, structure design, maintenance of the material, and defensible space will determine whether a structure will survive or not. Most actions to reduce the ignition potential of a structure are with the structure itself and the immediate area directly adjacent to the structure within 100 feet. Under some circumstances reducing fire intensity, and therefore the structure ignition risk, may involve extending the zone further depending on steepness of slopes and typical fire weather wind events (i.e. Sundowner winds).

The following mitigation actions will enhance the survivability of structures and the life safety of citizens and firefighters in Goleta.

Table 9 Reducing Structure Ignitability

Structure Component	Mitigation Action
Defensible Space	Follow Primary Zone guidelines in Tables 13 & 14. Select fire resistant plants and non-combustible hardscape for the landscaping. Plants located within this area should be kept healthy and maintained frequently.
Addressing	Required minimum letter/number height of 3" for residential and minimum of 6" for commercial with additional posting for longer access routes
Roof	Replace wood-shake or shingle roofs with a Class-A fire-resistant type (composition, metal or tile). 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.
Chimneys	Chimney and stovepipe openings should be screened with an approved spark arrestor cap.
Eaves	Cover the underside of the eaves with a soffit, or boxing in the eaves, which will reduce the ember threat. Enclose eaves with fiber cement board or 5/8-inch-thick, high-grade plywood. If enclosing the eaves is not possible, fill gaps under open eaves with caulk.
Exterior Siding	Noncombustible siding materials (stucco, brick, cement board and steel) are better choices. If using noncombustible siding materials is not feasible, keep siding in good condition and replace materials in poor condition.
Windows and Skylights	Single-pane windows and large windows are particularly vulnerable. Recommend installing windows that are at least double-glazed and that utilize tempered glass for the exterior pane. 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.
Vents	All vent openings should be covered with 1/8-inch or smaller wire mesh. Another option is to install ember-resistant vents. Do not permanently cover vents, as they play a critical role in preventing wood rot.
Rain Gutters	Always keep rain gutters free of bird's nests, leaves, needles and other debris. Check and clean them several times during the year.
Decks	Keep all deck materials in good condition. Consider using fire-resistant rated materials. Routinely remove combustible debris (pine needles, leaves, twigs and weeds) from the gaps between deck boards and under the deck. Enclosing the sides of the deck may reduce this type of maintenance. Do not store combustible materials under the deck.
Flammable Items	Keep the porch, deck and other areas of the home free of flammable materials (baskets, newspapers, pine needles and debris). Keep firewood stacked at least 30-feet away.

Websites with additional information include:

- Santa Barbara County Fire Department - www.sbcfire.com
- Center for Fire Research and Outreach - <http://firecenter.berkeley.edu>
- Homeowner's Wildfire Mitigation Guide - <http://groups.ucanr.org/HWMG>
- Firesafe Landscape - <http://ucanr.org/safelandscapes>

6.2.2 Development Standards

Development Standards to ensure that new developments incorporate wildfire protection measures to reduce structure loss include:

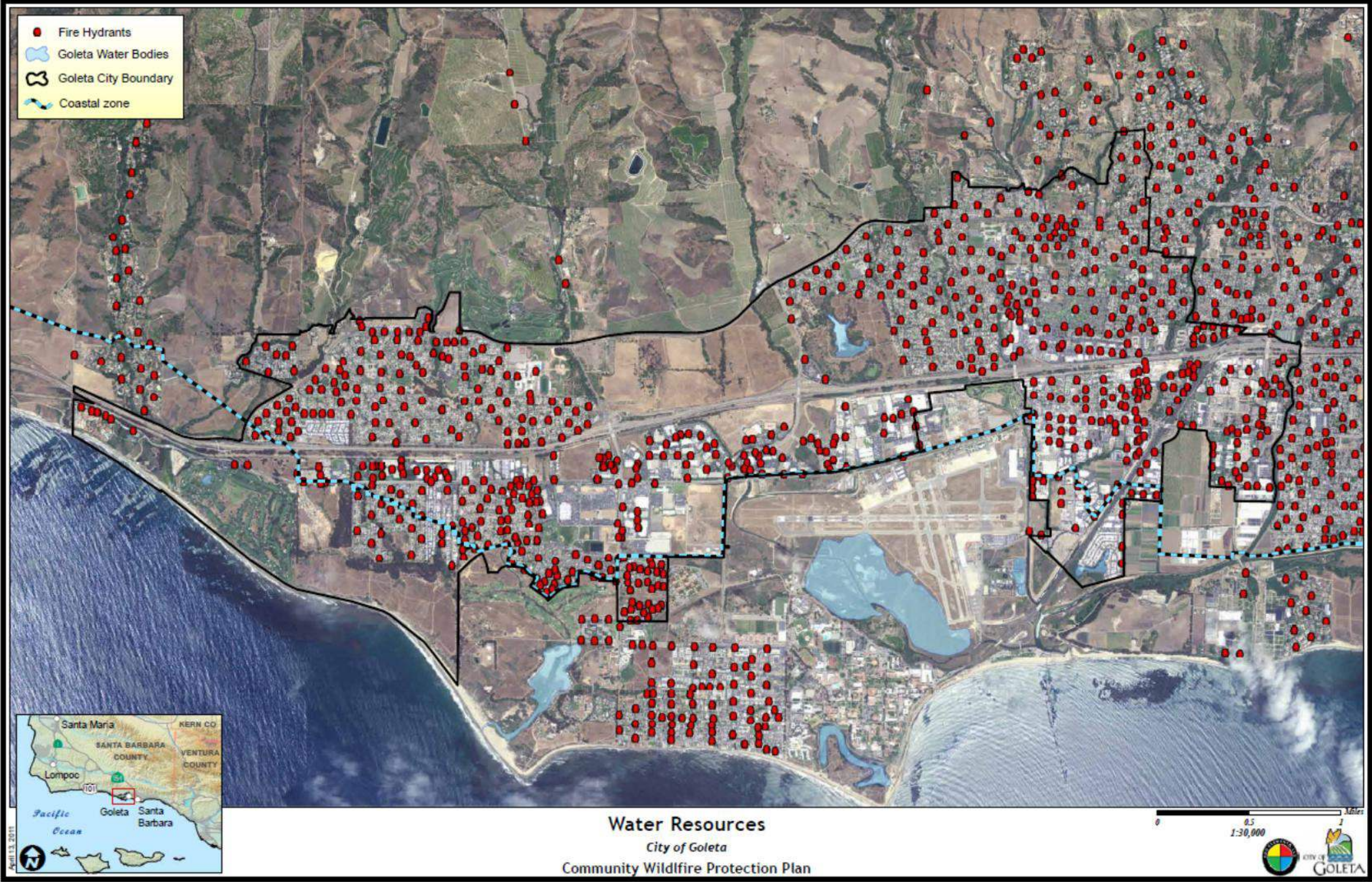
- Private Roads and Driveways – requirements for driveways and private road width, turnouts, grade/slope, switchbacks, construction, curve radius, signing, building addresses, and vegetation clearance.
- Stored Water Fire Protection Systems – requirements for capacity, tank setting, vegetation clearances, outlets, location of outlets, pipe material, standpipes, and pipe sizes.
- Defensible Space Standards – SBCFD enforces requirements for all buildings, structures, and road systems to ensure they maintain the minimum defensible space requirement from on PRC 4291.
- Access Gates – requirements for emergency access to locked gates, types of gates, locking devices, locations, distance from roads, open gate width for ingress and egress, and “fail safe” mechanisms for electric gates.
- Fire Hydrant Spacing and Flow Rates – requirements for hydrant spacing, locations, numbers required, valves, outlets, types, clearance for objects, and flow rates for commercial, residential, and rural use.

See Appendix D for additional Information on Development Standards.

6.2.3 Water Sources

Water supplies are a critical element in a firefighter's ability to suppress a wildfire. There are almost 700 fire hydrants within or near the City with most areas of the City having adequate coverage; however, there are areas of the City with fewer hydrants (See Water Sources Map, Figure 10). In these areas the alternate use of water tenders, fire engines shuttling water to other fire engines, and hose

Figure 10 Water Sources



lays as well as static water sources such as pools, lakes, and other water bodies can be used to supplement areas with fewer hydrants. However, fewer available water sources in some areas may hinder fire suppression efforts and affect how quickly a wildfire is controlled.

6.2.4 Natural and Cultural Resources

The reality is that the priority for fire protection is life safety first, followed by property then natural resources. The fire suppression actions taken to defend and protect life safety, structures, and infrastructure will not be the same for natural resources.

Wildfires in this area often burn through vegetation as a “stand replacement” fire. A stand replacement fire is a fire that either consumes or kills the majority of the dominant vegetation, thereby changing the structure and composition of the vegetation substantially. Unfortunately, most of the habitats (such as monarch butterfly aggregate sites) that are valued so greatly are extremely flammable.

How do we protect these important values? The best way to provide for the protection of values is through fuels treatment. Fuel treatments can reduce the threat of wildfire coming from human development towards critical habitat and reduce the wildfire severity.

6.3 FUELS MITIGATION STRATEGY

The critical role of wildfire and fuels management in California’s ecosystems has long been recognized. Two renowned wildland fire researchers portray the critical role of wildfire/fuels management in the California ecosystem, Their concepts remain the same and apply to the wildfire environment in Goleta today.

Clive Countryman, 1974: “The only alternative to planned and managed vegetation patterns in Southern California appears to be the acceptance of great economic damage, threat to human life, and the unpleasant aesthetic and environmental effects of unmanageable wildfire.”

Harold Biswell, 1989: “The management of wildland fuel has become one of the more important aspects of fire management.”

The fuels mitigation strategy outlined in this CWPP addresses Goleta’s situation and provides guidance on mitigation measures utilizing PRC 4291 (See Appendix E for additional information). The recommendations for hazard mitigation projects such as hazardous fuel treatments are general in nature, meaning site-specific planning addressing location, access, land ownership, biological concerns, archaeological and historical site concerns, topography, soils, and fuels are required prior to implementation. This CWPP does not require implementation of any of the recommendations but these recommendations can serve as guidelines for the implementation process if funding opportunities become available.

As a society, we recognize the necessity of managing the effects of wildfire on both humans and natural resources, and in the last 20 years, fuels management has come to play a leading role in managing ecosystems and natural resources. To be effective at protecting social values and natural resources, California land managers have focused attention on the manipulation of wildland fuel. Fuels management and fire prevention have joined fire suppression as key components of fire management programs.

A fuels management strategy provides guidance for actions involving the manipulation of fuels to accomplish the overall goal of reducing or mitigating destructive wildfire hazards to the community of

Goleta. The tactics developed to implement this strategy consist of fuel treatment prescriptions that are grounded in wildfire science and follow a prioritization process based on protection of life, property and natural resources. Development of fuel treatment prescriptions and parameters draws on wildfire modeling outputs, specific fuel types, topography and location relative to structures and valued habitat.

The following comparison statement may assist in understanding the term ‘fuel treatment prescription’: A doctor advises on medical treatment prescriptions to help sick patients; a fire/fuels specialist advises on fuel treatment prescriptions to improve hazardous landscapes. Fuel prescriptions will vary from high through low intensive treatment levels in the form of vegetation removal to meet site-specific hazard reduction needs while also considering land allocation objectives. The full spectrum of implementation tactics are captured in a fuel treatment plan.

The goal of a fuel treatment plan and program is to modify potential fire behavior or fire effects to achieve a defined condition. The fuel treatment plan for Goleta follows federal and state programs, with a primary purpose of reducing risks to human communities and improving ecosystem health. Common objectives include reducing potential fire intensity, rate of spread, and severity of fire effects. Achieving these objectives can provide dual benefits - reducing the likelihood of damaging wildfire spreading from undeveloped areas to structures or from human development into undeveloped, valuable habitat areas. This fuels treatment plan is a set of site-specific tactics developed for Goleta’s areas of concern, including open spaces, undeveloped lands, and parks.

6.3.1 Existing Fuel Treatment Activities

Goleta’s Planning Department includes a manager that oversees a program-of-work that provides necessary and continual upkeep of their parks and open spaces. This program involves several types of fuel treatment activities depending on the type of site, vegetation, and treatment objectives. The focus areas generally fall into four categories:

- Neighborhood Parks
- Community Parks
- Neighborhood Open Spaces
- Regional Open Spaces

The first of these (neighborhood parks) generally do not require “open space fuel treatments”. The latter three categories may receive “open space fuel treatments”. The application of open space treatments is dependent on the amount of development of the area. The following list captures a summary of current and most commonly applied fuel treatments by the four categories:

- Neighborhood Parks
 - Routine overall manicure/maintenance work
- Community Parks
 - Mowing – mechanical mower equipment on annual herbaceous growth
 - Tree maintenance work – limbing, pruning, removal of dead/damaged
- Neighborhood Open Spaces (as specified)
 - Mowing – mechanical mower equipment on annual herbaceous growth
 - Weed whacking
 - Shrub and tree maintenance – limbing, pruning, removal of dead/damaged vegetation
- Regional Open Space

- Mowing – mechanical mower equipment on annual herbaceous growth
- Shrub and tree maintenance – limbing, pruning, removal of dead/damaged vegetation
- Yard waste removal
- Flammable invasive vegetation removal
- Removal of decadent/dead shrubs/tree stumps
- Chipping of dead/downed material
- Tree pruning

In areas where there is concern of re-sprouting potential after a tree removal treatment, a “stump-grinder” can minimize this problem. The City owns one stump grinder and often contracts it out to various work sites where this technique is needed.

The timing and interval for fuel treatments generally varies by site type and vegetation type. The neighborhood parks are maintained by a contractor typically expected to do the work on a weekly basis throughout the growing months of the year (approximately March – October). Fuel treatments in the larger community parks and open space areas usually occurs two to four times a year. A complete and detailed list of each area and fuel treatment activity is available in Appendix F.

6.3.2 Vegetation Management Units

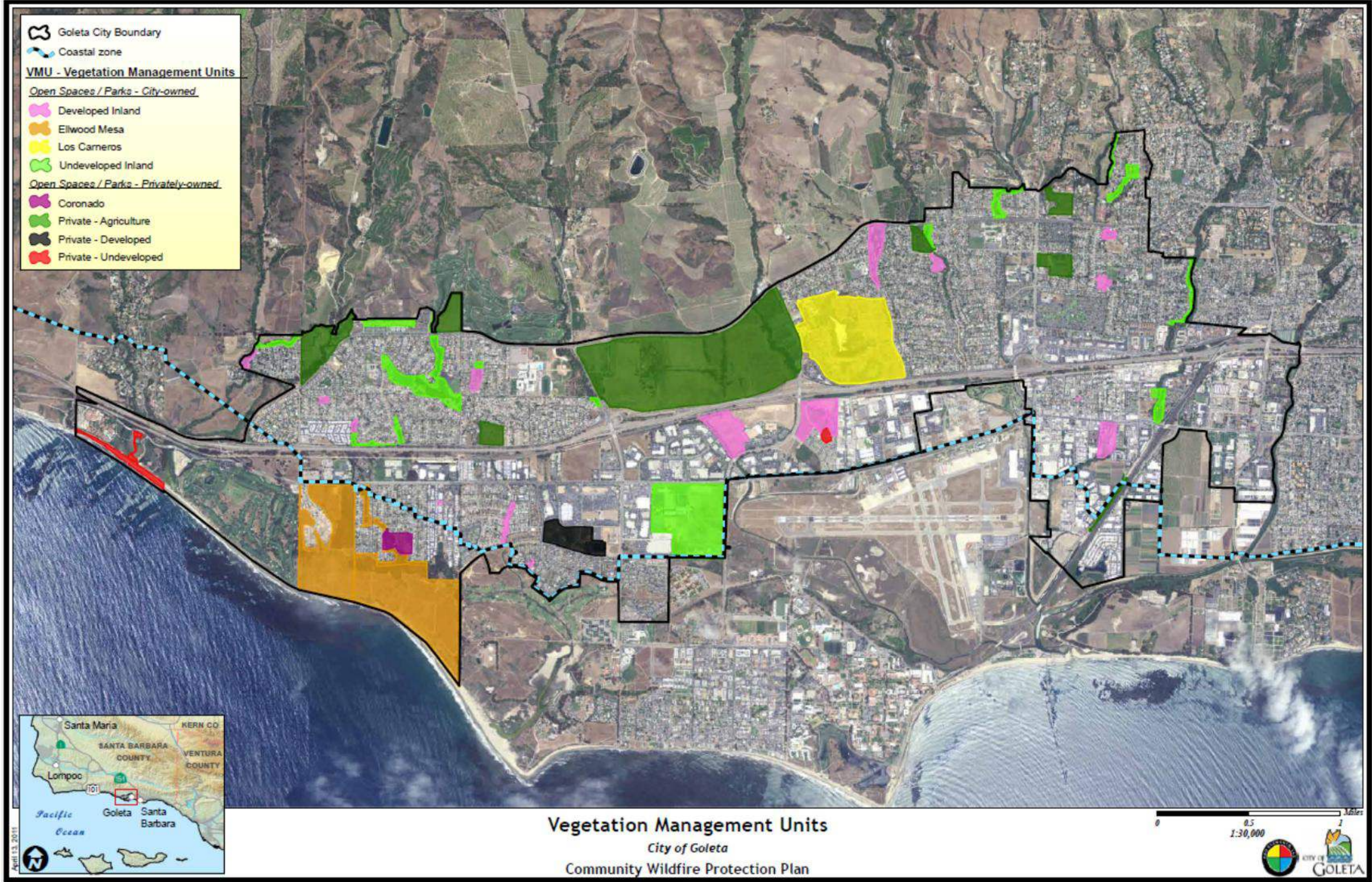
Rather than assigning each of the City’s and privately owned parks and open spaces as individual Vegetation Management Units (VMUs), eight VMUs have been established (See VMU Map, Figure 11. The VMUs designations are based on parks and open spaces with similar management characteristics (i.e. all inland zoned, developed city-owned parks are lumped into a single VMU) or parks and open spaces with individual existing management plans (i.e. Coronado Preserve). This structure will assist with identifying areas that require similar fuel treatment activities.

The VMUs are as follows:

Table 10 Vegetation Management Units

VMU Name	Public Use Open Spaces/Parks
City-Owned	
Ellwood Mesa	Campus Glen, Ellwood Mesa, Santa Barbara Shores (2), Santa Barbara Shores Park, Sperling Preserve
Los Carneros	Lake Los Carneros Natural and Historical Preserve including the Stow House
Developed Inland	Andamar, Armstrong, Bella Vista I & II, Emerald Terrace Tennis Courts, Community Center, Nectarine, San Miguel, Stow Grove Park, Stow Tennis Courts, University Village, Mathilda, Planned “C” ¹ , Planned “D” ¹ , Winchester I, Winchester II,
Undeveloped Inland	Armitos Park, Bella Vista III, Brandon, Evergreen Acres*, Glen Annie at Del Norte, Koarts Apartments (2), La Goleta, Oro Verde (2), Planned “A” ¹ , Planned “E” ¹ , San Jose Creek, San Miguel Open Space, Stonebridge, Winchester I Open Space
*Less than approximately 50% of this open space is developed; it is considered undeveloped. ¹ Planned future park sites.	
Privately-Owned	
Coronado	Coronado Preserve (owned/operated by nonprofit private entities)
Private - Undeveloped	Haskell’s Beach (2), Willow Springs Open Space
Private - Developed	Girsh Park
Private - Agriculture	Bishop Ranch, Ellwood Canyon, Fairview Garden, Shelby

Figure 11 Vegetation Management Units



6.3.3 Private Ownership Lands

There are many privately owned land parcels within the boundary of Goleta City. These lands also fall under the fire protection responsibility of SBCFD. When structures are present, private property owners are required to follow the current defensible space regulations - California PRC-4291 (See Appendix E for additional information). In the open undeveloped land expanses of private ownership, there may be situations where the fuel conditions on the private land pose a wildfire threat to surrounding community values. Clearly, an active wildfire will not stop or change direction due to a designated administrative boundary so the fuel treatment recommendations presented in this CWPP are recommended for the entire land-base in Goleta regardless of ownership or status.

6.3.5 Prioritization of Fuel Treatments

The fuels management program strategy provides the groundwork for treatment prioritization. As in the case of emergency response program planning, wildfire or fuels treatment planning should follow the same priorities in protection, which are

1. Life Safety
2. Property
3. Resources – Natural, Cultural, Visual, Recreational

The fuel treatments recommended for each of Goleta's VMUs follow a basic protocol. Areas in need of treatment that are located in close proximity to dwellings or infrastructure are a higher priority classification than those areas that are further from human developments. The outputs from the fire behavior modeling in Chapter 5 are factored into the prioritization process with high hazard areas (higher flame lengths) typically receiving a higher priority treatment need. The prioritization of fuel treatments are a valuable tool to help guide City managers with decisions for the implementation of hazard mitigation actions across the community.

The prioritization ranking consists of qualitative designators - High, Moderate, or Low for each site within a VMU. In all cases burning embers can still pose a serious threat to values. Following protocol described previously, the primary attributes defining the three designators involve fuels and fire behavior characteristics and proximity to values. These designators are coarsely defined as follows:

- HIGH – Severe fire behavior characteristics are expected with significant threat to values by extreme temperatures from radiant and/or convective heat within 100 feet of values.
- MODERATE – Fire behavior is expected to pose a serious threat to values; values that are flammable can ignite from extreme temperatures from radiant and/or convective heat at distances greater than 100 feet from values.
- LOW – Low fire behavior characteristics are likely with minimal threat from radiant and convective heat to at risk values.

In a majority of the developed parks and open space areas of Goleta, the current program of mowing and maintenance work is effectively keeping the hazard low on those sites. The fuels treatment prioritization information in Table 12 shows these areas in the "low" priority category due to the manicured condition of on-site vegetation. It is important to continue the current treatment program to keep these developed, high-use areas in their low-hazard category.

6.3.4 Fuel Treatment Levels and Treatment Types

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 intensive fuel treatment level. The more intense the treatment, the more fuel is removed making less fuel available to burn, less fuel available to burn means fire behavior is reduced or moderated.

The fuel treatment types take on a wide assortment of forms but can generally be divided broadly into five categories – mechanical treatments, manual treatments, fire treatments, biological treatments and herbicide treatments. The fuel treatment plan for Goleta will primarily focus on mechanical and manual treatments since the amount of biomass material removed is more controllable. Mechanical and manual treatments rely on a variety of methods to physically modify or remove fuel with more precision in application than prescribed fire and avoid smoke impacts and possible damage from the effects of scorching. In some cases, the fuel can be removed and utilized to produce wood products or to generate electricity (Sugihara, 2006).

The following are brief descriptions of the more common types of mechanical and manual treatments:

Mowing

Mowing of grasses, weeds and low-shrubs is likely 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; it may also be a mower that is dragged 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. There are many types of machinery that 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 likely to be 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. A thinning treatment can provide economic returns, possibly producing some commercial products. 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 (Further information on the design of thinning prescriptions are in Chapter 6.3.4).

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. A few limitations include strategic limitations to narrow strips of land along roads due to fencing and transportation costs, required access to water sources or transportation of water to the site, and the animals indiscriminate fuel reduction as compared to manual or mechanical treatments.

6.3.5 Fuel Treatment Prescriptions

The fuel management prescriptions for each of Goleta's VMUs were developed to guide treatments to achieve a less hazardous fuel profile. The specific type of treatment applied at a site is the choice of the person(s) overseeing or managing the fuels treatment program implementation. Treatments types will depend largely on vegetation type, site topography, project objectives, and may have limitations due to sensitive habitat, archaeological concerns, soil, water courses, and proximity to structures. It is important to understand that the work can be costly and prone to limitations such as budget and workforce constraints; therefore, implementation of these projects will likely be in a staged approach. The CWPP is a fundamental tool that will help City managers work with the community to mindfully apply a fuel management strategy. See Tables 13 (Undeveloped Areas) and 14 (Developed Areas) for a summary of treatment recommendations by location and fuel type.

6.3.6 Fuel Treatments and Firefighter Safety

Adequate defensible space provides a safer environment for firefighters when protecting structures. Safe operational space for firefighting personnel was used as the criterion to validate clearance requirements and applies to guidelines used for a wildland fire safety zone.

6.3.7 Fuel Treatment Tactics

The fuel prescription for a given site in a VMU may identify a specific fuel treatment tactic that is a best fit or design for hazard reduction on the site. The fuel treatment types (described in Section 6.3.1) are methods utilized to implement recommended tactical treatment designs. In any treatment design/tactic, the goal is to create a fire resilient area by implementing a three-part objective: reduce surface fuels, reduce ladder fuels, and reduce crown density (Agee, J., Skinner, C., 2005). Commonly applied fuel treatment tactics include fuelbreaks, shaded fuelbreaks, area treatments, a feathered edge effect, and gradient thinning or fuel removal.

- Fuelbreak – “a strategically located wide block, or strip, on which a cover of dense, heavy or flammable vegetation has been permanently changed to one of lower fuel volume or reduced flammability” (Green, 1977). Fuelbreaks have a long history in the western U.S. Recent interest in fuelbreaks and similar concepts has spawned new names such as defensible fuel profile zones and community protection zones (Omi, P., 1996; Weatherspoon, Skinner 1996). Fuelbreak prescriptions including width, amount of fuel reduction, and maintenance standards will vary depending on fuel type, slope and location on the land, and many other environmental

factors. A fuelbreak designed in conjunction with a road can be an advantage due to ease in access for both construction and maintenance. Fuelbreaks are not designed to stop fires but to reduce fire behavior characteristics and provide access for firefighters giving them a higher probability of success in suppressing a wildland fire safely.

- Shaded fuelbreak – is a type of fuelbreak in stands of trees. A shaded fuelbreak is created by altering surface fuels, increasing the height to the base of the live crown of trees, and opening the canopy by removing or thinning some trees. The thinning prescriptions will vary based on many site specific variables including, but not limited to: tree species and size, stand density, site location, and area objectives (further information on thinning is provided later in this section).
- Area treatments - Rather than being an alternative to fuelbreaks, are an expansion of the fuelbreak concept to other areas of the landscape. In Goleta's VMUs, there are small portions of either developed or undeveloped areas that will fall into this type treatment tactic. An area treatment may be necessary due to the fuel condition on the site and proximity to values at risk.
- Feathered edge - a treatment design tactic that would be utilized to create a less visually obtrusive treatment boundary. This is done by allowing some variance in the distance parameters of a treatment zone's horizontal distance such that the final results are not a straight-line or linear hedge appearance. This feathering technique can be used in either timber or brush vegetation type.
- Gradient fuel removal - describes the treatment resulting from a variation in the intensive level of fuel removal on a site. The locations or zones displayed in the columns of Tables 14 and 15 are examples of applying a gradient to the fuels removal, such as a more intensive treatment close to homes, structures or other values graduating out to less intensive away from the value at risk.
- Thinning - generally prescribed by a spatial distance between crowns or stems/boles of larger or "leave" trees and a diameter limit for trees removed. This is also described in terms of a desired percentage of canopy cover to remain after thinning. Another prescription method (more often utilized in commercial timber sale activity) is by specified basal area (the total cross-sectional area of the trees in a stand, at breast height or 4.5 feet above the ground measured in square feet per acre). A prescribed thinning treatment tactic may be part of a recommended prescription for on-site trees in any of the spatial designs treatments described in this section. In any thinning treatment application, the thinned material must be treated; methods may include removal, chipping, mastication, or piling and burning. Recommend a Registered Professional Forester to develop thinning guidelines. NOTE: There are specified techniques required in trimming/removal of eucalyptus that will minimize stump sprouting.
- Roadside fuel treatment - a critical feature that provides safe access/egress routes for both public and fire personnel during a wildfire event. The roadside clearance protocol for Goleta follows the standards adopted by SBCFD.

Table 11 Summary of VMUs w/Open Spaces, Values at Risk, Proposed Activities, & Treatment Priorities

GP/CP Fig. 3-2 Map #s	VMU: Open Space/Park	Values At Risk	Proposed Activities: (Further treatment details in Tables 14 & 15)	Treatment Priority
	Ellwood Mesa:			
31	Campus Glen	Residences, monarch butterfly ESHA, recreation trails	Fuels reduction adjacent to residences; thin, prune, mow	High
33	Santa Barbara Shores (a)	Residences	Fuels reduction adj. to residences; prune, mow, thin-optional	High
33	Santa Barbara Shores (b)	Residences	Fuels reduction adj. to residences; prune, mow, thin-optional	High
34	Ellwood Mesa Open Space (Santa Barbara Shores Park)	Residences, powerlines, monarch butterfly ESHA, recreation trails	Fuels reduction adjacent to residences; thin, prune, mow; mow along edge of grove - non-developed portions	High
30	Ellwood Mesa Open Space (Sperling Preserve)	Residences, monarch butterfly ESHA, recreation trails	Fuels reduction adjacent to residences; thin, prune, mow; mow along edge of grove - non-developed portions	High
	Coronado:	(owned/operated by nonprofit private entities)		
32	Coronado Preserve	Residences, monarch butterfly ESHA, recreation trails	Fuels reduction adjacent to residences; thin, prune, mow	High
	Los Carneros:			
12	Lake Los Carneros Preserve	Residences - Interior & outside, offices, multiple ESHA types, heritage structures, Stow House, recreation trails, lake, picnic area	Continue current fuel reduction work; expand treatment work around interior structures; thin, prune, mow outside edges of preserve – emphasis: La Patera Lane vicinity	High
	Developed Inland:			
19	Andamar	Lawn, play equipment, picnic area, homes in vicinity	Continue current fuel reduction work: mowing	Low
27	Armstrong	Lawn, park play equipment, picnic area, homes in	Continue current fuel maintenance program	Low

		vicinity		
10	Bella Vista I & II	Lawn, play equipment, large picnic area, homes in vicinity	Continue current fuel maintenance program	Low
20	Emerald Terrace Tennis Cts	Lawn, play equipment, picnic area, homes/schools nearby	Continue current fuel maintenance program	Low
23	Community Center	Buildings/classrms, lawn, gazebo, ESHA, developed areas	Continue current fuel maintenance program	Low
24	Nectarine	Sandlot with play equipment, homes in vicinity	Continue current fuel maintenance program	Low
1	San Miguel	Lawn, play structure, picnic areas, homes adjacent, ESHA	Continue current fuel maintnce; attn to road access clearance	Moderate
13	Stow Grove Park	Lawn, fields, recreation/game areas, picnic area, redwoods, ESHA	Continue current fuel maintenance program	Low
15	Stow Tennis Courts	Lawn, tennis courts, ESHA, homes in vicinity	Continue current fuel maintenance program	Low
28	University Village	Lawn, footbridge, homes/businesses in vicinity	Continue current fuel maintenance program	Low
29	Mathilda	Play equipment, picnic area, homes/businesses in vicinity	Continue current fuel maintenance program	Low
C	Planned "C"	Willow Springs neighborhood park	Follow guidance for new development	
D	Planned "D"	Village at Los Carneros neighborhood park	Follow guidance for new development	
3	Winchester I	Small lawn, play equipment, picnic area, homes nearby	Continue current fuel maintenance program	Low
2	Winchester II	Lawn, play equipment, picnic area, homes in vicinity	Continue current fuel maintenance program	Low

	Undeveloped Inland:			
22	Armitos Park	Riparian ESHA, nearby businesses	Continue fuel reduction work: mowing	Low
9	Bella Vista III	Homes in vicinity	Continue current fuel maintenance program	Low
5	Brandon	Open space field, homes/church directly adjacent	Continue mowing work; start: thin, prune along fence line behind El Camino Church & homes	High
6	Evergreen Acres*	Lawn, play fields, rec/game areas, tennis courts, play equipment, walkways, picnic area, adjacent homes, ESHA	Continue fuel reduction work: mowing, tree maintenance (in developed portion); start thin, prune along back of homes/fence off San Milano	High
11	Glen Annie at Del Norte	Open space area, homes in vicinity	Continue fuel reduction work: mowing	Low
7-8	Koarts Apartments (2)	Open fields, directly behind apartment complex	Continue fuel reduction work: mowing	Low
16	LaGoleta	Open space, riparian ESHA, homes in vicinity	Continue fuel reduction work: mow, tree & shrub work; attn: defensible space problem on 1 home @ SE corner of O.S.	Moderate
17-18	OroVerde (2)	Undeveloped area, homes adjacent, ESHA	Continue fuel reduction work: mow, tree/shrub work	Moderate
A	Planned "A"	Expansion of Armitos neighborhood park	Follow guidance for new development	
E	Planned "E"	Cabrillo business neighborhood park, open space	Follow guidance for new development	
21	San Jose Creek	Neighborhood O.S., adjacent to homes, riparian ESHA	Continue fuel reduction work: mow, tree/shrub work	Low
1	San Miguel Open Space	Neighborhood O.S., riparian ESHA, adjacent homes	Continue fuel reduction: mow, tree/shrub work; expand buffer along creek – evac route problems	Moderate
14	Stonebridge	Undeveloped area, hiking trail, riparian ESHA, homes nearby	Continue fuel reduction work: mow, tree/shrub work	Low
4	Winchester I Open Space	Neighborhood O.S., Hwy 101, homes nearby	Continue fuel reduction work: mow, tree/shrub work	Low

	Private –Undeveloped:			
35-36	Haskell's Beach (2)	Beach access walkway, public parking	N/A	
25	Willow Springs Open Space	Cultural resources, structures nearby	Check on fuel reduction needs on regular basis	
	Private-Developed			
26	Girsh Park	Fields, community meeting room, play equipment, picnic areas, riparian ESHA	Advise to continue mowing, trimming; thick riparian vegetation @ SE corner consider a thinning buffer	
	Private – Agriculture:			
	Bishop Ranch	Open space for agriculture production, multiple ESHA types	Remain attentive to Def. Space buffer along boundary area	
	Ellwood Canyon	Open space for agriculture production, ESHA	Remain attentive to Def. Space buffer along boundary area	
	Fairview Garden	Open space for agriculture production,	Remain attentive to Def. Space buffer along boundary area	
*Less than approximately 50% of this open space is developed; it is considered undeveloped.				
Colors correspond to CWPP - VMU Map – Figure 11				

Fuels Management Prescription Guidance Undeveloped VMUS

Table 12 Prescription Guidance in Undeveloped VMUS

Location →	Primary Defense Zone (A) (0 – 30')*	Fuel Reduction Zone (B) (30' – 100')	Fuel Reduction Zone (C) (100' – 150' - applies to larger areas)
Fuel Type ↓	Based on Defensible Space PRC - 4291		Based on Firefighter Safety
Grass/ Forbs	Reduce fuel depth to 4 inches; methods include mowing, masticating, weed-whacking, biological browsing	Same treatment as (A); longer grass in isolated open areas is acceptable	Treatment may be needed in portions on a case by case basis
Surface dead/down material	Clear dead/down flammable materials; methods include raking, hand-piling/removal, masticating chipping/dispersal on site	Reduce dead/down flammable material to < 3" depth; methods same as (A); < 5 tons/acre in isolated logs acceptable.	Reduce heavier pockets of dead/down flammable material to < 5" depth; < 5-7 tons/acre in isolated logs acceptable.
Brush/ Shrub fuel	Remove to a spacing (between edges of brush) generally 2x brush height on <20% slopes; methods include masticating or hand-cutting, biological browsing	Same Treatment as (A); a pocket or clump of brush can be treated as one large shrub in more open site conditions.	Less intensive brush removal; with spacing approximately 10 ft; and more clumping of shrubs.
Trees Overstory (without brush understory)	Thin smaller trees leaving larger trees at 10-20 ft crown spacing (based on slope, tree size and type); reduce ladder fuels by pruning lower branches 6-15 ft up, or lower 1/3 of tree height on smaller trees; method likely hand-cut	Thin smaller trees leaving larger trees at approx. 10 ft crown spacing (based on slope, tree size and type); reduce ladder fuels by pruning lower branches 6 ft up, or lower 1/3 of tree height on smaller trees; method likely hand-cut.	Reduce ladder fuels by pruning lower branches of larger trees that have broken limbs, dead material etc. 6 ft up; method likely hand-cut.
Trees Overstory (with brush understory)	Thinning specs same as Trees Overstory without brush understory (A). Understory: remove brush ladder fuel; methods include masticating or hand-cutting	Thinning specs same as Trees Overstory without brush understory (B). Understory: remove brush ladder fuel; intermittent patches of shrubs and small trees in openings (non-canopy) is acceptable; methods include masticating or hand-cutting	Thinning specs same as Trees Overstory without brush understory (C). Understory: less intensive removal of brush ladder fuel; intermittent patches of shrubs and small trees in openings (non-canopy) is acceptable; methods include masticating or hand-cutting

*For further information specific to homeowner/structure mitigation measures. See Section 6.2.1

Fuels Mitigation Prescription Guidance Developed VMUs

Table 13 Prescription Guidance Developed VMUs

Location →	Primary Defense Zone (A) (0 – 30')*	Fuel Reduction Zone (B) (30' – 100')
Fuel Type ↓	Based on Defensible Space PRC – 4291 and Firefighter Safety	
Grass/ Forbs	Reduce fuel depth to 4 inches; methods include mowing, masticating, weed-whacking, biological browsing	Same treatment as (A); longer grass in isolated open areas is acceptable.
Surface dead/down material	Clear dead/down flammable materials; methods include raking, hand-piling/removal, masticating chipping/dispersal on site	Reduce dead/down flammable material to < 3" depth; methods same as (A).
Brush/ Shrub fuel	Remove to a spacing (between edges of brush) generally 2x brush height on <20% slopes; methods include masticating or hand-cutting, biological browsing	Same Treatment as (A); a pocket or clump of brush can be treated as one large shrub in more open site conditions.
Trees Overstory (without brush understory)	<u>On case-by-case basis**</u> : Thin smaller or unhealthy trees leaving larger trees at 10-20 ft crown spacing (based on slope, tree size and type). Reduce ladder fuels by pruning lower branches 6-15 ft up, or lower 1/3 of tree height on smaller trees; method likely hand-cut	<u>On case-by-case basis**</u> : Thin smaller or unhealthy trees. Reduce ladder fuels by pruning lower branches 6 ft up, or lower 1/3 of tree height on smaller trees; method likely hand-cut.
Trees Overstory (with brush understory)	Thinning specs (case-by-case) same as Trees Overstory without brush understory (A). Understory: remove brush ladder fuel; methods include masticating or hand-cutting	Thinning specs (case-by-case) same as Trees Overstory without brush understory (B). Understory: remove brush ladder fuel; intermittent patches of shrubs and small trees in openings (non-canopy) is acceptable; methods include masticating or hand-cutting

(Note: Treatments listed are primarily those currently applied by Goleta City Management; the areas are mostly smaller, manicured park type settings.)

*For further information specific to homeowner/structure mitigation measures see Section 6.2.1.

**The decision for this treatment need should be from the Goleta City Project Manager overseeing VMU mitigation work. Initial input from a wildland fire specialist is also recommended.

The primary clearance considerations are as follows:

- Vertical clearance of 13-feet, 6-inches shall be maintained (CFC 503.2.1).
- Horizontal clearance of up to 10 feet on each side of the driveway or private road shall be maintained as required by the Fire Chief or his designee.
- Additional clearance may be required in high fire hazard areas. Horizontal clearance recommendations may increase from 5 to 15 feet along roads that encounter high fire hazard areas such as thick chaparral or dense eucalyptus stands. In Goleta, examples of higher fire areas exist primarily along the outer city boundaries adjacent to wildland brush fields and adjacent to eucalyptus groves.
- Eucalyptus Grove Boundary Mowing - a unique fuel ladder reduction technique that has been utilized to a limited extent outside the boundary of the grove in the areas that are adjacent to wildland vegetation. The intent of this action is to break up the continuity of the surface fuels growing into the grove to keep wildfire burning only in surface fuels and out of the canopy of the eucalyptus. Crown fires create a hazardous wildfire situation for the grove and surrounding area.

6.3.8 Monarch Butterfly Aggregation Area Treatment Strategy

Design standards recommended for fuel treatments specific to areas near butterfly aggregation sites were developed to minimize adverse effects on adjacent habitat while reducing hazardous fuels. Careful coordination with City approved butterfly and wildland fire experts will be necessary during planning and implementation of any fuel treatments since conditions within groves can change and aggregation locations may shift. Aggregation locations should be monitored and noted so that any fuel treatment activities can be modified if necessary. All work near butterfly aggregations areas (shown in Figure 12) is to be conducted between April 1 and September 15, outside of monarch butterfly overwintering season.

There are three active aggregation locations within the groves on Ellwood Mesa area (See Figure 12). Two of these sites are directly adjacent to residences along eucalyptus grove boundaries, and the third (the southwest corner of Figure 12) is not directly adjacent to structures, but is adjacent to the Sandpiper Golf Course. In habitat areas that are not adjacent to structures, fuel treatments will consist of mowing along the outside edge of the grove.

Fuel treatments in areas near human developments are critical measures in the wildfire protection strategy for both residences and butterfly aggregations and habitat. Trees along grove edges buffer aggregation sites from wind and weather; therefore, it is important to maintain adequate tree density within these edges. Larger trees are not the primary fuel of concern in the spread potential of wildfire but rather the understory vegetation, dead-downed trees, and fuels creating fire ladders pose the greatest hazard and threat.

In butterfly aggregation areas near homes, fuel treatment strategy prescriptions (in Table 15 - Prescription Guidance for Butterfly Aggregation Areas Adjacent to Structures) are valid guidelines; however, butterfly and wildland fire expertise is required. This site-specific consultation between butterfly and wildland fire experts provides an adaptive management strategy, which does not

Figure 12 April 2011 Monarch Butterfly Aggregation Sites – *Courtesy of Dr. Meade*



compromise the overall wildfire protection objectives. Understory, ladder fuel and dead-downed fuel removal are acceptable hazard reduction actions in these areas, which play the principal role in wildfire propagation. Some level of careful thinning of the smaller or unhealthy trees in the first 30-feet of the grove is recommended with balancing the wind buffering needs of the aggregation. Treatment implementation and subsequent monitoring should involve input by City approved butterfly and wildfire professionals.

Table 14 Prescription Guidance for Butterfly Aggregation Areas Adjacent to Structures

Location →	Primary Defense Zone (A) ^{***} (0 – 30')	Fuel Reduction Zone (B) ^{***} (30' – 100')
Fuel Type ↓	Based on Defensible Space PRC – 4291 and Firefighter Safety	
Grass/ Forbs	Reduce fuel depth to 4 inches; methods include mowing, masticating, weed-whacking, biological browsing	Same treatment as (A); longer grass in isolated open areas is acceptable.
Surface dead/down material	Clear dead/down flammable materials; methods include raking, hand-piling/removal, masticating chipping/dispersal on site	Reduce dead/down flammable material to < 3" depth; methods same as (A).
Brush/ Shrub fuel	Remove to a spacing (between edges of brush) generally 2x brush height on <20% slopes; methods include masticating or hand-cutting, biological browsing	Same Treatment as (A); a pocket or clump of brush can be treated as one large shrub in more open site conditions.
Trees Overstory without brush understory	<u>Trim or thin only trees that do not provide protection to monarch butterfly aggregation sites*</u> Thin smaller or unhealthy trees at 10 – 20 ft crown spacing (as determined by slope, tree size and type);Leave larger trees unless toppling hazard.** Reduce ladder fuels by pruning lower branches 6-15 ft up, or lower 1/3 of tree height on trees smaller than 18 ft..	<u>Trim or thin only trees that do not provide protection to monarch butterfly aggregation sites*</u> Thin smaller or unhealthy trees at approximately 10 ft crown spacing (as determined by slope, tree size and type);. Leave larger trees unless toppling hazard.** Reduce ladder fuels by pruning lower branches approximately 6 ft up, or lower 1/3 of tree height on trees smaller than 18 ft..
Trees Overstory with brush understory	<u>Trim or thin only vegetation that does not provide protection to monarch butterfly aggregation sites*</u> Thin small or unhealthy trees at 10-20 ft crown spacing (based on slope, tree size and type). Leave larger trees at 10 ft. crown spacing unless toppling hazard.** (Reduce ladder fuels by pruning lower branches 6-15 ft up, or lower 1/3 of tree height on smaller trees In understory: remove brush ladder fuel. Methods include masticating or hand-cutting.	<u>Trim or thin only vegetation that does not provide protection to monarch butterfly aggregation sites*</u> Thin small or unhealthy trees to approximately 10 ft. crown spacing. Leave larger trees unless toppling hazard.** Reduce ladder fuels by pruning lower branches approximately 6 ft up, or lower 1/3 of tree height on smaller trees. In understory remove brush ladder fuel. In non-canopied areas, noncontinuous patches of shrubs or small trees in openings is acceptable.. Methods include masticating or hand-cutting.

*As determined by the Goleta City Project Manager overseeing mitigation work in consultation with a City approved monarch butterfly specialist and a City approved wildland fire specialist.

**As determined by the Goleta City Project Manager and Goleta City arborist.

***For further information specific to homeowner/structure mitigation measures see Section 6.2.1.

6.3.9 Example Fuels Modification and Resultant Fire Behavior

The potential changes in fire behavior characteristics was assessed based on implementation of potential fuel treatments in the Ellwood Mesa VMU. All weather, fuel moisture, and topography parameters used in the original fire hazard assessment were used for this assessment. Utilizing the fuel treatment guidelines from Table 13 the fuel models were modified to reflect changes in fuel structure.

The outputs of this assessment show a significant drop in surface fire flame lengths. In grasses, flame lengths dropped from almost 12 feet to just over 2 feet. In eucalyptus, flame lengths drop from just over 8 feet to just over 2 feet. Based on the Fire Suppression Interpretation Table (Table 9), wildfires that exhibit these fire behavior characteristics can generally be attacked at the flaming front or flanks of the fire by firefighters using hand tools. The ability of firefighters to take a direct attack on a wildfire as a result of these fuel treatments enhances the protection of structures and reduces the threat to natural and cultural resources.

6.3.10 Fuel Treatment Implementation Timing - Seasonality

Once a site's prescription has been identified (including fuel treatment type and design tactics as well as knowledge of the priority ranking) 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. The hottest driest time-periods may also be a limitation for mechanical work due to hot machinery (i.e. exhaust systems) causing a wildfire ignition in dry grass, or metal scraping on a rock and sending sparks into dry grassy fuels potentially igniting a wildfire. In many cases, mowing type work may be necessary two to four times a year. Mowing after June would have to be carefully considered on a case-by-case basis depending on the growth, fire danger, and site conditions.

There are special operating circumstances in some of the designated ESHAs in Goleta. If a recommended fuel treatment falls within one of these areas, the project manager must strictly follow the guidelines specific to that ESHA. Regulatory information is found in the Goleta GP/CP and the City's newly developed Monarch Butterfly Management Habitat Plan. The monarch butterfly ESHAs are of significance regarding fuel treatment priority in this CWPP. All work near butterfly aggregations areas is to be conducted between April 1 and September 15, outside of monarch butterfly overwintering season. Implementation work in the grove and habitat locations should be closely coordinated with a City-approved butterfly expert representative (or designee) and input from the SBCFD or a City-approved wildland fire specialist. GP/CP policy also specifies that vegetation management (i.e. fuels reduction work) should not be conducted during active nesting season of raptor species.

6.4 EVACUATION

Evacuation is the responsibility of the Santa Barbara County Sheriff's Department. During an emergency the County Sheriff will order citizens, business owners, and visitors to evacuate because of a threatening wildfire - everyone should leave in an orderly manner. The evacuation order will identify the preferred evacuation routes and safe sites. However, the need for evacuation can occur without notice when extreme conditions exist. Having a home disaster kit and preparedness plan is recommended.

Additional information on evacuation can be found at:

- www.sbcfire.com
- <http://redcrossla.org/news/red-cross-offers-wildfire-evacuation-tips>

6.4.1 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 or place additional people at risk without the proper education or training in what to do during a wildfire.
- Have a transportation plan. 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.
- Preplan safe sites for these individuals for short and potential long term stays.

6.4.2 Pets

Preparedness planning for pet's life safety includes:

- 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.
- A pet evacuation plan 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; plan ahead to make sure pets will have a safe place to take refuge before a disaster strikes. If there is a no-pet policy, ask if this can be waived in the event of an emergency. Information for local shelters is available at www.petswelcome.com. For the potential for long-term stays, compile a list of boarding facilities. Additional information is available at www.redcross.org/www-files/Documents/pdf/Preparedness/checklists/PetSafety.pdf.

6.5 FISCAL RESOURCES AND CONSTRAINTS

The City is currently expending dollars to cover existing fuel treatments in the City's open spaces. Upon completion and approval of the CWPP, the City will evaluate and prioritize the recommended work with the existing list of projects. Funding of these additional projects will be determined at that time. It is anticipated that the City will seek external funding sources (i.e. grants, stewardships, etc) to assist in implementation of required fire treatments when available.

Budgetary constraints and uncertainty can make it difficult to reach the desired outcomes in a fuels management program. Although every agency is faced with budget constraints during difficult economic time-periods, it is during these times that managers can review program areas that touch on critical elements such as community safety. Goleta has a maintenance program in most developed park areas. The prescriptions recommended in the larger undeveloped areas are critical additions to this program. Staging of fuel treatments may be an approach that would allow progression toward the desired outcome even in a limited budget situation. This stages approach would be done working in high-priority designated areas first.

6.5.1 Grant and Stewardship Opportunities

Although limited, grant opportunities exist for communities to implement CWPP projects. The California Fire Safe Council grants include wildfire prevention grant funds through the U.S. Forest Service, the Bureau of Land Management, the U.S. Fish and Wildlife Service and the National Parks Service. Grant funding may be used for hazardous fuels reduction and maintenance projects on non-federal land; to develop community risk assessments and CWPPs; and to provide education and outreach opportunities for landowners and residents in at-risk communities. Additional information is available at www.grants.firesafecouncil.org.

Other grant and stewardship information is available at the following websites:

- Partnership Resource Center - www.partnershipresourcecenter.org
- California Stewardship Program - www.ceres.ca.gov/foreststeward/html/financial.html

7. MAINTENANCE AND MONITORING

To ensure that fuel treatment actions remain effective it is recommended that the City establish a monitoring regimen. The importance of a sustainable monitoring program is often overlooked due to factors such as budget constraints or agency priority changes. 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 or park areas, boundary changes, or other specific needs require a review of the CWPP. Flexibility is important in any review process to accommodate unexpected change or needs.

7.1 FUEL TREATMENT MONITORING

Monitoring and evaluation of a treatment site establishes significant baseline data to draw on for decisions about maintenance treatment intervals as well as determining whether changes are needed in a site prescription. The primary aspects to consider in a fuel treatment monitoring program are type of monitoring/evaluation and interval of site visitation.

7.1.2 Fuel Treatment Maintenance

A key component of the vegetation strategy is a reliable fuels treatment maintenance plan, which must be established in the planning phase of a treatment program. Success of fuel treatments is commonly measured by their long-term effectiveness. Due to consistent growth periods 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 fuel reduction benefits.

In all situations, dense stands of new brush and eucalyptus seedlings should be removed while they are small. The same tools - mechanical equipment, human-power, herbicide treatment, biological treatment, and prescribed fire 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 Goleta, primary factors to be considered 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 heritage sites), most area vegetation treatments can be broadly designated by fuel types, such as grasses/forbs, shrubs/brush, and trees.
 - 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 directly 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 of thinning or removal, mastication, trimming should be scheduled toward the end of the growing period (ie; mid to late summer). Sites should be visually monitored on an annual basis. Following initial treatment the interval may extend to 3 to 7 years depending on observed growth.
- Trees/Timber
 - Green-up or growing period is quite variable with different species and whether deciduous or evergreen; likely more similar to that of shrub type than grass
 - Annual amount of new growth directly dependent on precipitation
 - Most species not aggressively invasive, exception is eucalyptus. **
 - In driest season, overstocked or thick stands are susceptible to potential crown fire activity.
 - Treatments of thinning and pruning should be scheduled mid-summer. Sites should be visually monitored on an annual basis. Following initial treatment the interval may extend to 5 to 10 years depending on observed growth.

***Note: A useful fuel maintenance procedure that may be applicable to any of the above fuel types is herbicide applications. However, Goleta City Staff must be consulted on this procedure due to site/area specific environmental regulations or restrictions regarding herbicide use.*

- 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 attribute to maintenance issues due to potential factors that may limit operating procedures. Riparian ESHAs, monarch butterfly 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 needs 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 fuels treatment strategy. Substantial economic investments are necessary to establish fuels treatment areas, these investments can only be sustained if they are properly maintained on a regular basis. Establishing a fuels treatment program including a maintenance schedule is an important step forward for long-term community safety in Goleta. Fluctuating

economics will necessitate staging of treatments, reviewing and following priorities, and continuing to watch for grant opportunities.

7.1.3 How to Conduct Monitoring

There are numerous ways to conduct monitoring and evaluation of fuels treatments ranging from simple, straight-forward methods to more complex, elaborate techniques. In most cases, more complicated procedures are quickly abandoned and intricate equipment is more costly operation and upkeep. The recommendation is to incorporate a simple, easy-to-follow procedures utilizing simple inexpensive equipment.

The following is an example of recommended equipment in a very basic monitoring/evaluation kit:

- Map of Goleta's VMU's with Treatment Sites
- Prescription table & info on known treatment/site
- Clipboard with field notebook or writing pad
- Pen/pencil
- GPS (optional)
- Tape measure
- Digital Camera

The following is an example of a monitoring/evaluation procedure during a site visit.

- Mark their location on the map
- Start an entry in their notepad/book
 - Date
 - Site VMU - name - #
 - GPS coordinates (optional)
 - Fuel type
 - Treatment method used
- Take measurements of current growth heights (in grasses) or distances between sprouts in shrubs, seedling-trees,
- Take photos

All of this information should be saved in a file and is also recommended to be compiled in the electronic file system back at the office.

The recommended interval for site monitoring may fluctuate with site variables such as fuel types, rainfall amounts, or other needs. It is important to understand that a fuel treatment monitoring interval is not the same as that in treatment maintenance. For instance, the maintenance interval of grass may be 3 times in a year whereas a monitoring visit may only be once. In the early stages of an established site fuel treatment, an annual visit to the site for the first 3 to 5 years is recommended. This annual interval may continue as needed depending on amount and consistency of growth rates of the vegetation or if the growth rates have slowed then the interval may be reduced to a site visit every other year.

Developing a simple yet comprehensive monitoring and evaluation process in the vegetation management strategy is a very important and potentially useful step. There are several other avenues whereby the monitoring documentation can play a central part. The stored files of information become

a record of the hazard reduction work, which is helpful for 1) validating fuel treatment management strategies, 2) new city staff will have a historical perspective of fuel treatments in parks and open-spaces, 3) various educational forums, and 4) providing ground-based data for grant application processes.

7.2 CWPP REVIEW RECOMMENDATIONS

Change is inevitable. Any type of city planning document must be periodically reviewed and updated to maintain currency. This CWPP provides a solid informational foundation that supports a framework of science-based guidance and recommendations. In a routine review process, a plan's strength and accessibility are characteristics that will simplify implementation of updates and changes. At a minimum, it is advised to conduct some level of review on this CWPP at a minimum of every 2 years.

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8. CONCLUSIONS SUMMARY

This CWPP addresses all requirements in the City's General Plan/Coastal Land Use Plan and fulfills the goals and objectives in the City's Strategic Plan. Through careful planning and implementation of the strategies provided in this CWPP, the wildfire threat to the City of Goleta will be substantially reduced. Protection of life safety and other values at risk will be greatly enhanced while still providing for the sustainability of natural resources. The protection of existing and future local natural resources, such as butterfly habitat, have been carefully considered and balanced in the proposed fuel reduction measures while still reducing the wildfire threat in these areas. Additionally, this CWPP fully meets the requirements of HFRA and places the City of Goleta in a position to apply for funding from federal and state agencies for the planning and implementation of projects recommended in this Plan.

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10. APPENDICES

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Appendix A Glossary

1-Hour Timelag Fuels (a.k.a., one-hour fuels): Fuels consisting of dead herbaceous plants Fuels and roundwood less than about ¼ inch (6.4 mm) in diameter. Also included is the uppermost layer of needles or leaves on the forest floor.

10-Hour Timelag Fuels (a.k.a. ten-hour fuels): Dead fuels consisting of roundwood ¼ to 1 inch (0.6 to 2.5 cm) in diameter and, very roughly, the layer of litter extending from immediately below the surface to ¾ inch (1.9 cm) below the surface.

100-Hour Timelag Fuels (a.k.a., hundred-hour fuels): Dead fuels consisting of roundwood in the size range of 1 to 3 inches (2.5 to 7.6 cm) in diameter and very roughly the layer of litter extending from approximately ¾ of an inch (1.9 cm) to 4 inches (10 cm) below the surface.

1,000-Hour Timelag Fuels (a.k.a., thousand-hour fuels): Dead fuels consisting of roundwood 3 to 8 inches in diameter and the layer of the forest floor more than 4 inches below the surface.

Active Crown Fire: A fire in which a solid flame develops in the crowns of trees, but the surface and crown phases advance as a linked unit dependent on each other.

Adaptive management: An approach to management of natural resources that emphasizes how little is known about the dynamics of ecosystems and that as more is learned management will evolve and improve. Adaptive management proceeds despite this uncertainty by treating human interventions in natural systems as large-scale experiments from which more may be learned, leading to improved management in the future.

Aspect: Direction a slope faces.

Bioregion – A bio-geographical region or formation, a major regional ecological community characterized by distinctive life forms and principal plant and animal species.

Canopy Spacing: The distance from the edge of one tree canopy to another. Crown spacing varies from open (with 10 feet or more of space between tree canopies) to closed (where trees may be growing in very close proximity with little space between them).

Crown Fire: A fire that advances from top to top of trees or shrubs more or less independent of a surface fire. Crown fires are sometimes classed as running or dependent to distinguish the degree of independence from the surface fire.

Dead Fuels: Fuels with no living tissue in which moisture content is governed almost entirely by atmospheric moisture (relative humidity and precipitation), dry-bulb temperature, and solar radiation.

Direct Attack: A method of fire suppression where actions are taken directly along the fire's edge. In a direct attack, burning fuel is treated directly, by wetting, smothering, or chemically quenching the fire or by physically separating burning from unburned fuel.

Ecosystem: A community of organisms and their physical environment interacting as an ecological unit.

Fire Behavior: The manner in which a fire reacts to the influences of fuel, weather, and topography.

Fire Education: Activities to change behaviors and attitudes about fire ecology, wildland fire and the role of fire in natural resource management. Defines the purposes for actions that provide information about and improve understanding of wildland fire.

Fire Frequency: Temporal fire occurrence described as a number of fires occurring within a defined area within a given time period.

Fire Front: The part of a fire within which continuous flaming combustion is taking place. Unless otherwise specified, the fire front is assumed to be the leading edge of the fire perimeter. In ground fires, the fire front may be mainly smoldering combustion.

Fire Intensity: A general term relating to the heat energy released by a fire.

Fire Potential: The likelihood of a wildland fire event measured in terms of anticipated occurrence of fire(s) and management's capability to respond. Fire potential is influenced by a sum of factors that includes fuel conditions (fuel dryness and/or other inputs), ignition triggers, significant weather triggers, and resource capability.

Fire Regime: The characterization of fire's role in a particular ecosystem, usually characteristic of particular vegetation and climatic regime, and typically a combination of fire return interval and fire intensity (i.e., high frequency, low intensity/low frequency, high intensity).

Fire Return Interval: The length of time between fires on a particular area of land

Fire Weather: Weather conditions that influence fire ignition, behavior, and suppression.

Flame Length: The distance from the base to the tip of the flaming front. Flame length is directly correlated with fire intensity.

Flaming Front: The zone of a moving fire where combustion is primarily flaming. Behind this flaming zone combustion is primarily glowing. Light fuels typically have a shallow flaming front, whereas heavy fuels have a deeper front.

Foehn Wind: A dry wind associated with wind flow down the lee side of a plateau or mountain range and with adiabatic warming. Santa Ana, Sundowner and Mono winds are examples.

Fuel: Any combustible material, which includes but is not limited to living or dead vegetation, human-built structures, and chemicals that will ignite and burn.

Fuelbreak: A natural or constructed discontinuity in a fuel profile that is used to isolate, stop, or reduce the spread of fire. Fuelbreaks may also make retardant lines more effective and serve as control lines for fire suppression actions.

Fuel Loading: The amount of fuel present expressed quantitatively in terms of weight of fuel per unit area.

Fuel Model: Mathematical descriptions of fuel properties (e.g. fuel load and fuel depth) that are used as inputs to calculations of fire danger indices and fire behavior potential.

Fuel Moisture Content: The quantity of moisture in fuels expressed as a percentage of the weight when thoroughly dried at 212 degrees Fahrenheit.

Fuel Type: An identifiable association of fuel elements of a distinctive plant species, form, size, arrangement, or other characteristics that will cause a predictable rate of fire spread or difficulty of control under specified weather conditions.

Goals: A goal is a broad statement of what you wish to accomplish, an indication of program intentions.

Ground Fire: Fire that consumes the organic material beneath the surface litter ground, such as a peat fire.

Intensity: The level of heat radiated from the active flaming front of a fire, measured in British thermal units (BTUs) per foot.

Ladder Fuels: Fuels that provide vertical continuity between strata, thereby allowing fire to carry from surface fuels into the crowns of trees or shrubs with relative ease. Ladder fuels help initiate and ensure the continuation of crowning.

Live Fuels: Living plants, such as trees, grasses, and shrubs, in which the seasonal moisture content cycle is controlled largely by internal physiological mechanisms, rather than by external weather influences.

Mediterranean Climate: The climate characteristic of the Mediterranean region and much of California. Typically hot, dry summers and cool, wet winters.

Objectives: They contribute to the fulfillment of specified goals and are measurable, defined, and specific.

Passive Crown Fire: Also called torching or candling. A fire in the crowns of trees in which single trees or groups of trees torch, ignited by the passing front of the fire.

Riparian: Situated or taking place along or near the bank of a watercourse.

Spotting: Refers to the behavior of a fire producing sparks or embers that are carried by the wind and start new fires beyond the zone of direct ignition by the main fire.

Strategy: The general plan or direction selected to accomplish incident objectives.

Structure Triage: The process of identifying, sorting, and committing resources to a specific structure.

Surface Fire: Fire that burns loose debris on the surface, which includes dead branches, leaves, and low vegetation.

Surface Fuels: Fuels lying on or near the surface of the ground, consisting of leaf and needle litter, dead branch material, downed logs, bark, tree cones, and low stature living plants.

Topography: Referred to as “terrain.” The term also refers to parameters of the “lay of the land” that influence fire behavior and spread. Key elements are slope (in percent), aspect (the direction a slope faces), elevation, and specific terrain features such as canyons, saddles, “chimneys,” and chutes.

Understory: Term for the area of a forest which grows at the lowest height level below the forest canopy. Plants in the understory consist of a mixture of seedlings and saplings of canopy trees together with understory shrubs and herbs.

Values at Risk: People, property, ecological elements, and other human and other intrinsic values within the City. Values at Risk are identified by stakeholders as important to the way of life in the City, and are particularly susceptible to damage from undesirable fire outcomes.

Wildland Fire Environment: The surrounding conditions, influences, and modifying forces of fuels, topography, and weather that determine wildfire behavior.

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Appendix B

Public Questions, Issues, and Comments

Public comments were solicited at the beginning of the Community Wildfire Protection Plan and Monarch Butterfly Habitat Management Plan planning processes. The community was invited through numerous methods including post cards sent to each address in the City, media, and the City's website to provide those interested the opportunity to address issues, concerns, and offer suggestion for the development of the plan, a public workshop was scheduled for February 23, 2011 at 6:00 PM at the Goleta Valley Community Center. In addition, information and solicitation to garner input for both plans were presented on the City of Goleta's website.

The development of goals, objectives, and values for the CWPP were developed based on the issues important to stakeholders. All of the comments collected at the public meeting and emails sent to City Staff concerning issues relative to the proposed plan is summarized in tables below. A detailed discussion of these comments have been carefully considered and incorporated where appropriate into the plan.

Each individual in attendance at the public meeting were given 4 "dots" to place on a poster allowing them to identify their personal key issues. The following table summarizes the "dots" which identifies the issues for those in attendance.

"Communities Concern Dot Chart"

Topic	Number
Protection of Homes and Neighborhoods	27
Protection of Natural and Historic Resources	15
Protection of Critical Infrastructure	12
Protection of Environmentally Sensitive Habitat Areas	20
Protection of Municipal Property (Community Center, Hospitals, City Hall, Library, Open Spaces etc.)	11
Protection of Sensitive Species Habitats (Monarch Aggregation sites, wetlands etc.)	27
Protection of Vulnerable Populations (Senior Centers, Disabled)	5
Protection of Recreation Uses (Trails, Open Spaces. Parks, Picnic areas)	14
Protection of Commercial and Industrial Zones	3

Table 1. Emailed Comments:

Number	Comment	Response
EC-1	"We still have large piles of fire fuel right next to our houses from the trees that fell. That material is getting dryer and more hazardous every day. We, myself and the neighbors, would sincerely appreciate it if you would send a crew to chip the material and distribute the chips in a careful sort of way - probably as a kind of pathway material. In addition to safety we all (the neighbors) tend care about the appearance of the park in proximity to our properties. So foresightful plan on where to shoot the chips is appreciated."	The expressed issues and concerns have been forwarded to City Representatives and are outside the scope of work for the CWPP. Please contact the Goleta Community Services Department for additional information.
EC-2	"Most recently several very large trees have fallen in the heavy rains. Fortunately they angled south east rather than directly east. They still took out the electric lines with a hug spark and came close to my neighbor's house. The electric company only cleared enough to fix the power and left. The remaining rubble is a huge eye sore, it encumbers the path for people in the park - and it is rapidly drying out and adding to the fuel burden right adjacent to the neighborhood. Most of the large trees along the east boundary are such that they could easily fall directly east. This is of course, as you mention below a significant liability. I am sure there are many points of view."	This problem should be taken up with a representative of Goleta City Staff as it is outside the scope of the CWPP.
EC-3	"The completely unannounced clearing of the fire lane. People in the area were surprised, given your note below about keeping us informed, that there was no notice. My guess is that notice would have raised a cry against the clearing from some. However, I think that even the most resistant to any sort of management are glad that a fire truck can now get through. There is a problem with this though - it was done in such a way that the contractor left many places where prolific sprouts are blooming some at ground level some in the trees. So while the clearing is probably good, the remnants that increase the liability are not. Kindly let me know to what extent the downed trees will be removed AND, at that time can we please eliminate some of the mistakes of the earlier clearing."	In the fuel treatment prescriptions, any trees or shrubs that are removed would not be left on the ground as that would just add to the hazard fuel problem. Some options to consider for the waste material are utilization (if there is a viable market such as firewood, small wood materials, chips) or hauled to an off-site location for burning or disposal or chipped and spread on-site. Cleaning up waste material from earlier actions is a good idea that would need to be assessed by the project implementation manager. See CWPP, Chapter 6.3.5 – 6.3.8 for recommendations for fuel treatment activities.
EC-4	"I intend, and I think everyone in the area does too, to cooperate toward that necessary compromise. We don't think it is wise to wait in either the case of fire or in the case of falling trees. Several of the neighbors with small children have calculated that a falling tree would crush their child's bedroom. No one wants to see that eventuality. Others with experience with fire say that our houses would simply explode from the heat of a fire, even if no ember were to catch. That is pretty scary."	The support from yourself and surrounding neighbors of the community are an important step toward adopting a CWPP that provides guidance to assist homeowners, fire-fighters and natural resources. Your cooperation is appreciated by all involved. Please see CWPP, Chapter 1.4 CWPP Process and 1.4.1 Collaborative Approach.

EC-5	“There is a rumor that our insurance companies are going to refuse to insure our homes. That is a concern too.”	An approved CWPP and implementation of fuel treatments that meet the intent of California’s PRC-4291 could be beneficial in issues with home-owner’s insurance.
EC-6	“And, the US Geological Survey multi hazards demonstration project has now determined that more fire risk and the likelihood of large storms and wind have raised the liability in extent. Clearly, timely and proactive responsiveness will be in everyone’s interest.”	This CWPP is the first step in addressing these concerns but it is only a plan. The critical part of any plan is the implementation. Once approved, the community can begin implementing the vegetation/fuels treatment strategies to proactively reduce the high hazard/high risk wildfire potential in Goleta. See Chapter 1.2 for CWPP Goals and Objectives.
EC-7	“A resident whose dwelling backs up to Ellwood North has mentioned the City has plans to cut the existing (eastern) boundary back 100 feet from property lines. I want to know who to contact at the City about the whole issue of cutting, debris removal or any other fire-related changes contemplated for Ellwood’s eucalyptus stands.”	For questions regarding plans for work, please contact the Goleta Planning & Environmental Services Department at 805.961.7500.
EC-8	“This December, at least 5 of these trees fell down. By sheer luck, there was little property damage, but had other trees fallen, property and lives would have been at risk. As I write this, I look out at a similar tree that could smash right into my daughter’s room while she sleeps. She sees this tree swinging during the winds and is legitimately afraid (terrified). The dangerous trees are only along the edge of the large grove. Only at the edge are they within falling distance to our bedrooms, but they also grow unusually large and unstable from the gardening water they drink from our yards. (The unusually enhanced height of the edge-trees is easily visible by the width and shadows if you view 235 Pebble Beach Drive from zillow.com.) Eucalyptus trees have very shallow roots and become unstable at these abnormal heights. Each winter when the ground is moist, we’re at increased risk. Being shorter in the past, the trees didn’t pose this danger when many people purchased their homes, but without the rights to trim the trees, our safety is in your hands. I don’t mean to be dramatic by that, but this aspect of our safety really is in your hands, and any homeowner would trim similar trees on their own property to mitigate such an obvious and serious risk. “	Hazard tree safety is an important issue but should not be confused with wildland fire potential and those safety issues addressed in the CWPP objectives.” To report concerns of Hazard trees or to check the status of a submitted concern, please contact the Goleta Community Services Department at (805) 961-7500.
EC-9	“These highly flammable trees on the edge of the grove also pose the greatest fire hazard to our houses by blocking fire engine access, and at the same time bringing searing heat that much closer to our homes if a fire breaks out. My understanding is that regulations indicate that this fire hazard must be mitigated. All of us living here cherish this special land and seek the most environmentally sensitive solution. We have ideas we’d like to share, but the basic idea is to do the obvious - trim the trees along the edge.”	A careful assessment of the fire environment in this vicinity is part of the CWPP’s fuel treatment implementation process. Prescriptions have been developed that do involve some thinning, understory or ladder fuel removal and surface fuel clean-up in grove areas that are adjacent to development. In areas specified as being close to butterfly aggregation sites, Dr Meade or an appointed representative would be involved in review and monitoring of implementation stages. Please see CWPP, Chapter 6.3.5 – 6.3.11.

EC-10	<p>"1. Management -- Part of the "deal" when the new city of Goleta negotiated to "trade" land for a housing project between Pebble Beach and the Sand Piper Golf Course, there was to be a number of things included in the plan that have not been evident.</p> <p>Key Item 1 - there was to be a grove management plan and an open space management plan because the grove and surrounding area is a huge resource, location of numerous Monarch overwintering sites as well as lots of down wood and terribly unhealthy leaning trees that fall. Please address the status of the management for the grove and perhaps the surrounding open areas. We want to know what happened to that planning."</p>	<p>A management plan for Goleta's monarch butterfly habitat is currently being authored under the direction of Dr. Dan Meade who is the local expert. For further information on open space planning or plan approval timelines, contact the Goleta Planning & Environmental Services Department at 805.961.7500</p>
EC-11	<p>"2. The Fire Lane -- normal annual maintenance - It was good to have the fire lane cleared but the contractor who did it was fairly lacking in some skills so that many of the smaller trees were cut as much as 6 inches above the ground and they have robustly "bloomed" with suckers that are now a new fire hazard. These stumps should be managed at the time of the maintenance with known technologies for eliminating regrowth. The same is true of unprofessional cuts in larger trees that have now also got "sucker blooms" that are contributing to the hazard that was supposed to be limited. The company that did the work was actually dumping the cut material back in the woods and it required myself and other neighbors to complain so that they actually did the chipping portion of the job.</p> <p>Key Item 2: Please explore how to be sure that when routine maintenance is done that it be done well and supervised carefully - let the community know about the solution."</p>	<p>This type of work does require adequate oversight to ensure proper disposal or clean-up of any treated fuels. The city staff is aware of the potential sprouting problem that can develop after tree removal. Project management will address the potential on a site-by-site basis and evaluate the best solution (ie, utilizing a stump-grinder).</p> <p>This CWPP includes recommendations on what to do to resolve future issues. Please see Chapter 6.3.5 – 6.3.8.</p>
EC-12	<p>"3. The fire and wind hazard of the proximity of the treeline and a possible solution. Fire is an issue, but so is the problem of falling trees. We recently experienced the falling -- like dominoes -- of 5-6 huge trees which clipped power lines. They did not hit houses and no one was injured due to the fact that they fell mostly southward. Had they fallen eastward several people in proximal bedrooms would possibly be filing suits for injury or loss of life and property damage. It was pretty dramatic."</p>	<p>Hazard tree safety is an important issue but should not be confused with wildland fire potential and those safety issues addressed in the CWPP objectives." To report concerns of Hazard trees or to check the status of a submitted concern, please contact the Goleta Community Services Department at (805) 961-7500.</p>
EC-13	<p>"There are two camps on solving this --- "cut everything to create defensible space" and "don't you dare cut one of those trees ever". We already know that neither of these views is going to get 100% of its hoped for outcome. One solution is to split the difference and cut 1/2 of the material between the current edge and the most radical proposed new boundary. This would be an overly stark solution."</p>	<p>The vegetation/fuel treatment strategy contains prescriptions, by fuel type and location within the edge or boundary buffer of an area, that reduce potential wildfire severity in strategic locations. In most locations, the emphasis is on the removal of understory or ladder fuels and clearing the heavy pockets of downed fuels. Tree thinning is also a treatment to be utilized in areas where the stand density is a wildfire problem. Please see CWPP, Chapter 6.3.5 – 6.3.8.</p>

EC-14	<p>"There is another solution that is essentially the same idea - create a verigated border. Remove numerous trees however leave a few of the "heritage trees". Along that Eastern Boundary of the Park there are a number of really beautiful large trees. What makes them the most hazardous is the fact that there are so many PLUS all the dead/fuel that is around them. So to keep it simple for now I am advocating that the planning team investigate cutting some sections back to perhaps 75 ft from the houses, but that occasional larger trees be left nearer to the homes, but more isolated -- eliminating the challenge of a "wall of flames".</p> <p>In addition this same logic could be used regarding trees at risk for falling and damaging property or creating injuries. Of course the removal of trees at the East Border of the grove would need to be mitigated with the planing of new trees on the West Border."</p>	<p>The description given here is similar to the thinning, understory removal and ground clearing that does apply to some of the fuel treatment recommendation guidelines. It is important to understand that there are variations in the treatments depending on the locations, values at risk and sensitive habitat concerns. Please see CWPP, Chapter 6.3.5 – 6.3.8.</p> <p>The safety issue of falling trees is a separate 'hazard tree' issue. It might be attended to at the same time as the fuel treatments, but it must be identified, planned and cleared through Goleta city staff in advance.</p>
EC-15	<p>"Item 3 - Please let us know how the planning, for this will go and provide us with information which allows for reaching a collaborative decision on a compromise between the "cut all" and the "cut nothing" contingencies."</p>	<p>Part of the collaborative process will be a public review period. Once the completed draft CWPP has been reviewed by city officials, it will be posted on their website for a 30-day public review and comment period. Please see CWPP, Chapter 1.4 CWPP Process and 1.4.1 Collaborative Approach.</p>
EC-16	<p>"investigation of potential tire prevention and mitigation measures for the Santa Barbara Shores Park western eucalyptus grove (see previous correspondence below). A fire safety buffer zone is desperately needed between this dense eucalyptus grove (see attached photos) and the adjacent homes in the Santa Barbara Shores neighborhood. I have heard informally that one proposal has been to plant native oak trees (which apparently offer some fire resistance) between the grove and the adjacent homes. I encourage you to view this brief video clip that visualizes how eucalyptus groves can pose extreme fire dangers: http://www.youtube.com/watch?v=S1FWmHoEsiY Thank you, in advance, for your consideration of this important fire safety issue."</p>	<p>Good points are made in this description. Implementing fuel treatment measures that reduce fire severity potential will provide a buffered edge to portions of the eucalyptus groves allowing for safer fire-fighter access. The CWPP has a realm of recommendations that can improve the current scenario.</p>

EC-17	<p>“About a year ago I emailed you regarding an area of extreme fire hazard in Goleta: the western section of the Santa Barbara Shores Park eucalyptus grove. I am forwarding that email to you again (see below). To my knowledge, in the past year there have been no actions taken to mitigate this extreme risk to life and property.</p> <p>During the recent Gap Fire, had there been stronger sundowner winds, and if the south edge of the fire progressed further, there would have been a real possibility than a wind blown ember could have ignited the eucalyptus grove.</p> <p>As I noted a year ago, once a fire ignites in the grove, given the about of extremely flammable, densely packed fuel there, it seems likely that the entire grove would be on fire in a short amount of time. Given the density of the grove, and the inaccessibility of the interior portions of it, even a rapid response by firefighters would likely be to late to avoid a conflagration in the grove, and the likely loss at least several of the houses that are adjacent to it by only several feet.</p> <p>Again, I implore you to take preventative mitigation efforts to avoid such a scenario. At a minimum, the dry piles of duff and dead and fallen trees need to be removed. The grove itself needs to be trimmed back adjacent to the houses by at least 25 feet (or more), and an emergency vehicle access road between the houses and the grove needs to be created.</p> <p>We managed to "dodge a bullet" with the recent Gap Fire given the relatively calm wind conditions. I hope we can continue to do so with respect to the western eucalyptus grove by taking preventative measures now.”</p>	<p>Good points are taken in this descriptive account. The Gap Fire was a more recent ‘wake-up call’ as to the scary reality and potential destruction that accompanies a severe wildfire event. The hazard posed by thick flammable fuels adjacent to values at risk is a factor that can and should be mitigated to reduce the threat posed by wildfire. The old dead/down material should definitely be cleared during the implementation phase of fuel treatment measures in that vicinity. Please see CWPP, Chapter 6.3.5 – 6.3.8.</p>
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EC-18	<p>“Re: Request for an investigation of potential fire prevention and mitigation measures for an area of extreme fire danger in Goleta: the Santa Barbara Shores Park western eucalyptus grove.</p> <p>There is an area within Goleta city limits that appears to pose a very significant fire risk: the western section of the Santa Barbara Shores eucalyptus grove. My concern is that a fire there could rapidly escalate into a fire storm, which, depending on the wind direction, could result in a conflagration in the adjacent Santa Barbara Shores neighborhood, as well as the Ellwood neighborhood beyond to the east.</p> <p>If winds were blowing from the east, the new Bluffs neighborhood development might be showered with burning eucalyptus leaves. This grove is composed of very tall and densely packed eucalyptus trees, and within it are many fallen and dead trees (see attached photos). The floor of the grove has literally decades (or a century?) of accumulated dry undergrowth (or "duff") that appears to be a highly flammable carpet several inches deep.</p> <p>These eucalyptus trees are not indigenous to this area (it is my understanding that they were planted as a commercial lumber harvest). Also, this western grove is some distance away from the monarch butterfly preserve.</p> <p>The fire safety buffer zone between the houses along Pebble Beach Drive and the western grove appears extremely deficient -- it is perhaps only 10 - 15 feet in places. Some of the eucalyptus tree branches appear to extend over the backyards of some of the adjacent houses. I have heard from informal conversations with fire fighters that given this extreme fire threat a fire safety buffer zone should be at least 100 feet.</p> <p>Were a fire to occur in the grove it appears to me that it would be extremely difficult for fire fighters to get to the interior parts of the grove if the outer sections were also on fire. Fire suppression in the interior of the grove during an intense fire might require water dropping aircraft. I have been told that just the radiant heat from such a fire would be so extreme and that it would be sufficient to ignite fires in the adjacent houses.”</p>	<p>The wildfire modeling outputs in this area were at the very high to extreme end of the scale. This CWPP does acknowledge the hazards posed to adjacent residences as well as to the monarch butterfly habitat within the groves. The recommended treatment prescriptions take into consideration distances from values at risk as well as site specific variables and may require adjustment or specialist input. Clean-up of the dead-downed material is a basic and important step in reducing fire behavior characteristics. The CWPP guidance supports the 100 ft defensible space laws in PRC-4291. Please see CWPP, Chapter 5 and Chapter 6.3.5 – 6.3.8.</p>
EC-19	<p>“The grove is sometimes visited by homeless people, as well as beach-goers who park in the Santa Barbara Shores Park parking lot, and who walk along the side of, or into, the grove to access the bluffs and the beach. Sometimes they bring fireworks or discard cigarettes.”</p>	<p>Your observations are to be applauded as they show your awareness to potential ignition sources in the area. This type information should be reported to a Santa Barbara County Fire Department (SBCFD) fire prevention representative. Public use is addressed in the CWPP whereby addressing wildfire risk. Please see CWPP, Chapter 5.4.</p>

EC-20	I am a layperson with respect to fire prevention and suppression, however, the following actions would seem to me to be appropriate to investigate as possible ways to mitigate this fire risk: 1. Clean the decades worth of accumulated "duff" (undergrowth) from the floor of western grove. 2. Widen the fire buffer safety zone between the western grove and the adjacent houses."	You are right on target with your wildfire mitigation ideas. The fuel treatment recommendations in this CWPP reflect understory or ladder fuel removal and dead-downed fuel clean-up as well as some level of thinning adjacent to homes. Please see CWPP, Chapter 6.3.5 – 6.3.8.
EC-21	"3. Develop a fire department action plan should there be a report of a fire in the grove, which would include rapid deployment of water dropping air support."	This is outside the scope of the CWPP. Please contact the Santa Barbara County Fire Department who can address responses at (805) 681-5528. They can provide information on their response plans.
EC-22	"4. Inform the adjacent neighborhood residents of the serious potential fire danger, develop a reverse 911 resident notification plan, and develop a neighborhood evacuation plan."	The Santa Barbara County Sheriff is responsible for evacuation. Please see Chapter 6.1 Community Preparedness for information on Goleta City and Santa Barbara County Programs such as Goleta City Alert, Community Emergency Response Team, etc.
EC-23	"With respect to environmental issues: to my knowledge there are no monarch butterfly nesting sites in the western grove. It is also my understanding that the monarch grove located in San Luis Obispo has had its carpet of undergrowth removed as a fire prevention effort, with no adverse effects to the butterflys there. Of course, the worst possible environmental outcome imaginable would be the loss of the entire grove due to fire. In a balancing of competing interests -- environmental concerns vs. fire safety -- it seems to me that the possible loss of property, injuries, and even loss of life during what world likely be a firestorm in the grove should weigh heavily in decision-making regarding this issue."	These observations and information are well stated and comprise a foundational element of the CWPP – balancing competing interests while providing critical safety measures for all. Please see CWPP, Chapter 1.2 Goals and Objectives.
EC-24	"Another concern is possible legal liability by the city should losses occur due to significant fire risk factors that were known but remained unmitigated."	This is definitely a valid concern. Adopting the CWPP and initiating a program to implement a fuels strategy is the first step.
EC-25	"Perhaps an investigative committee might be formed to study these issues and report back to the Goleta Council and the SB County Fire Department with recommendations."	This CWPP and the Monarch Butterfly Habitat Management Plan will cover the above issues. Please review both plans during the 30-day comment period to ensure they have been addressed adequately.
EC-26	"Here are a few items that I think the Plan should include: 1. Protection and conservation for monarch butterfly overwintering and autumnal sites. Include an appropriate buffer to exclude encroaching disturbances to sites. The locations chosen for overwintering and autumnal sites are so specific that a protection measure against any pruning of trees or any tree removal in the entire grove would be beneficial to the longevity of a site. Pruning or removing even the trees along the periphery of an overwintering site could disrupt wind patterns through the grove and render the site unsuitable to monarch clusters. Several conditions need to be present for a grove to be suitable for an overwintering or autumnal site that more resources should go towards protecting known sites than creating new sites or mitigating for the removal of trees or a grove. Although planting trees is always a good thing to do."	Specific adjustments in fuel treatment parameters have been developed for the butterfly aggregation sites in the vicinity of developments. Maintaining the wind sheltering effect in the area of an aggregation site is a primary emphasis. These prescription adjustments were designed collaboratively with Dr. Meade who should also be involved in the implementation stages. Please see CWPP, Chapter 6.3.5 – 6.3.10.

EC-27	<p>“2. Include California native milkweed plants in City landscaping and habitat restoration projects. Caterpillar rearing habitat is an important element to monarch butterfly habitat management and conservation. This idea could be taken a step further to include the protection and conservation of native milkweed plants and native milkweed habitat. Include a mitigation ratio for acreage and habitat restoration requirements for disturbances, negative impacts and removal of caterpillar rearing habitat by future development projects.”</p>	This is outside the scope of the CWPP. Suggest taking this idea to Dr Meade.
EC-28	<p>“3. Annual study of monarch butterfly population at overwintering and autumnal sites in the area.”</p>	This is outside the scope of the CWPP. Suggest taking this idea to Dr. Meade.

Table 2. Public Meeting Comments from Stations/Tables:

Number	Comment	Response
PM-1	Leaning tress within the groves are a safety hazard	Hazard tree safety is an important issue but should not be confused with wildland fire potential and those safety issues addressed in the CWPP objectives.” To report concerns of Hazard tress or to check the status of a submitted concern, please contact the Goleta Community Services Department at (805) 961-7500.
PM-2	Is downed fuel a positive feature of butterfly habitat?	Per discussion with Dr. Meade on this subject, there lacks scientific evidence that the downed fuel plays a significant role in butterfly habitat. Further inquiry on this subject should be directed to Dr Meade.
PM-3	Edge and understory vegetation should be retained as part of the plan	Through careful work with Dr. Meade, some treatment adjustments are prescribed for focused areas near aggregation sites to maintain the wind-sheltering effect on the edges. In most cases ladder fuels or understory vegetation in the first 30+ ft. buffer poses the biggest wildfire hazard to the grove and to incoming suppression personnel. Please see CWPP, Chapter 6.3.4 – 6.3.10.
PM-4	No removal of vegetation within the monarch ESHA. Action is prohibited by the Goleta General Plan.	Questions regarding the Goleta General Plan regulations should be posed to City Staff. Throughout this process, we have worked closely with Dr Meade who is a well-respected authority on monarch butterflies and is authoring the Monarch Butterfly Habitat Management Plan. The recommended treatment is primarily within the edges of the groves near developed areas. The prescribed treatments could potentially protect the grove as well as nearby homes from a destructive wildfire situation. The recommendations have been reviewed collaboratively with butterfly expertise. Please see CWPP, Chapter 6.3.4 – 6.3.10.
PM-5	Large trees along the edge of the habitat areas are falling into homes, onto private property and through Edison power lines	Hazard tree safety is an important issue but should not be confused with wildland fire potential and those safety issues addressed in the CWPP objectives.” To report concerns of Hazard tress or to check the status of a submitted concern, please contact the Goleta Community Services Department at (805) 961-7500.
PM-6	What is defensible space?	Defensible space is the space between a structure and the wildland area or neighboring structures that, under normal conditions, 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. In California, citizens are required to follow 100’ defensible space guidelines specified in PRC-4291.
PM-7	A 40 to 50 foot set-back from property lines abutting Ellwood eucalyptus grove is adequate. Currently there is no set-back requirement	The fuel treatment prescription guidelines in the vicinity of the Ellwood eucalyptus grove are designed to reduce fire behavior characteristics adjacent to homes/property boundaries. Please see CWPP, Chapter 6.3.4 – 6.3.8.

PM-8	Is the native grassland restoration area next to a home a fire hazard? Should this area be mowed?	If this grassland area goes right up to the residential property, it could pose a wildfire threat. A mowing treatment following the defensible space guidelines would be advisable. Please see CWPP, Chapter 6.3.4 – 6.3.8.
PM-9	What is the contribution of downed fuel in maintaining the ideal butterfly habitat?	Per discussion with Dr. Meade on this subject, there lacks scientific evidence that the downed fuel plays any significant role in ‘ideal’ butterfly habitat. Further inquiry on this subject should be directed to Dr Meade.
PM-10	Does the habitat need to be eucalyptus?	Good question; it would best be deferred to the butterfly expert, Dr. Meade.
PM-11	Is expansion of the current habitat necessary to enhance the positive characteristics of the area	This question appears to be of a subjective nature and would depend on the perspective of ‘positive characteristics’. If the intent of the question is science-based, it should be directed to Dr. Meade.
PM-12	Lack of eucalyptus woodland management is creating dense, overgrown trees that are dying and posing a fire threat. How can the groves be managed and still protect butterfly habitat?	The fuel treatment recommendations in eucalyptus groves identified as butterfly habitat focus primarily on sections that are a direct threat to adjacent developments. This strategy supports PRC-4291 defensible space law, reducing structure ignitability (CWPP, Chapter 6.2), and recommends treatments that reduce potential fire severity in critical locations and promote fire-fighter safety. Safer access into an area can facilitate successful suppression action to protect homes and resources/habitat. Please see CWPP, Chapter 6.3.4 – 6.3.10.
PM-13	Expand on the weather parameters used to generate the fire modeling information displayed during the meeting	The fire modeling weather was calculated at the 90 th percentile and included temperature, relative humidity, wind speed & direction, and fuel moistures. These parameters were based off actual data from the Montecito RAWS. Please see Chapter 5 and Appendix C for additional information.
PM-14	Fire history along the immediate coastal strip may be different from what was presented at the meeting. The grove location is only a few hundred feet from the water.	The fire history layer was from a comprehensive statewide database that covered the entire California landmass including the coastal strip. Please see the Fire History Map, in Chapter 5.
PM-15	Leaning trees along the edge of the grove presents a hazard of falling into the homes immediately adjacent to the grove	Hazard tree safety is an important issue but should not be confused with wildland fire potential and those safety issues addressed in the CWPP objectives.” To report concerns of Hazard trees or to check the status of a submitted concern, please contact the Goleta Community Services Department at (805) 961-7500.
PM-16	Feathered edge with “heritage trees” along the edges of the grove would be a preferred vegetation treatment style	Both factors, feathered edges and leaving larger trees, are incorporated into the CWPP treatment prescription design. Please see CWPP, Chapter 6.3.4 – 6.3.8.
PM-17	The stakeholder group should acknowledge the citizens of Goleta	Good point. The citizens of Goleta are definitely community stakeholders; the plan includes all stakeholders including citizens.
PM-18	Land stewardship requirements based on how the area was acquired by the city needs to be researched as it could effect what can be done with the area	This type information should be reflected in the Goleta General Plan and should be reviewed prior to treatment implementation. Site-specific limitations or guidance may require some treatment prescription adjustment measures.
PM-19	Expand the grove westerly to compensate for any loss of habitat next to the homes. That way all Edison tree trimming and defensible space work can be accomplished without impacting the overall size of the grove	This has been suggested and has been part of an ongoing cooperative discussion between the butterfly and wildfire experts are occurring but is outside the scope of the CWPP.
PM-20	Develop specific “urban” defensible space standards which would be different from a wildland standards or interface standards. Integrate these “urban” standards within the urban forest management plan	“Defensible Space” protocol is specifically defined in PRC-2491 and is an enforced by law. These standards are incorporated in the CWPP as well as treatment recommendations for undeveloped areas. The city staff is the contact for integrating these standards into other plans. Please see CWPP, Chapter 6.3.4 – 6.3.8.

PM-21	Consider clearing debris from water channels to assure water flow through the groves and prevent flooding from damaging/killing trees.	Debris clearing is included in the plan fuel treatment prescriptions. If a water channel falls within the prescribed treatment zone area it may be considered for clearing. Please see CWPP, Chapter 6.3.4 – 6.3.8.
PM-22	Butterflies are as important as “structures”	The CWPP is developed to assess wildfire potential and prescribe mitigation strategy that will reduce wildfire threat to values at risk. It is not a comparison of the values at risk.
PM-23	Clear high risk areas along Ellwood Mesa 40 to 50 feet from the edge of private property	Fuel reduction measures are recommended for the high risk areas, including Ellwood Mesa. The prescribed treatments are designed to reduce fire behavior, specifically where the wildland vegetation is adjacent to developed areas. Please see CWPP, Chapter 6.3.4 – 6.3.8.
PM-24	Concerned the property owners adjacent to open space areas won't have an equal voice concerning development of treatments. Adjacency equals high potential for fire impacts.	There will be a review/comment period prior to plan approval. You are encouraged to review the recommendations regarding treatments. Basically the plan follows defensible space laws. In areas near developments that have higher severity fire potential, the plan recommends expanding the treatment buffer. Please see CWPP, Chapter 6.3.4 – 6.3.8.
PM-25	City should consider selling wood to generate revenue.	This is a good idea and viable option that should be considered if/when there is removal of trees large enough to generate revenue. This has been forwarded to City staff for review.
PM-26	Consider using tree trimming companies to do the “work” in exchange for the wood generated from the fire treatment activity.	This may be a viable consideration and depends on budget constraints. City management has knowledge as to how well this would work as they already have a tree maintenance program.
PM-29	Edison should be required to bury the power lines along Ellwood Mesa to limit the potential of an ignition caused by a tree falling through their wires.	Recommend bringing this up with City Staff and the local power company.

Appendix C

Fire Behavior Modeling Methodology

The landscape file: The .lcp file was obtained from the Wildland Fire Decision Support System using the California the 08/27/2010 update to capture the effects of wildfires on fuels through December 2009. This .lcp file captures all recent significant wildland fire activity in the vicinity of the city. Data resolution for this landscape is 30 meters.

While representing the best available data, the landscape was not wholly correct. A field visit was conducted on 01/17/2011 to determine where and how to modify the .lcp file to better reflect conditions on the ground. The following is a list of substantive changes, which were incorporated into the landscape. Some minor modifications (5 or less pixels) were made which are not deemed important to the overall fire behavior outputs yielded by the .lcp.

Substantive changes

- Many eucalyptus groves especially in the Ellwood Mesa region were miss classified as ‘*Urban – unburnable FM 91*’ even though these features are clearly identifiable on Google Earth and other imagery. These groves of eucalyptus were reclassified using the FARSITE landscape editor to Timber Understory 5 (TU5 or Fuel Model 165). This fuel model provides the best opportunity to capture crown fire activity and the associated spotting with the fire behavior models used. The following stand characteristics were build into the .lcp file for the eucalyptus groves:
 - Canopy cover - 60%
 - Canopy height - 20 meters
 - Canopy base height – 0.1 meters
 - Canopy bulk density – 0.625 kg/m^3
- Avocado orchards on the north of the city had significant leaf litter which could under more severe weather conditions support fire spread. The original .lcp file classified the orchards correctly as “*Agricultural – unburnable – FM 93*”. However, in order to account for the flammable nature of the leaf litter. Google Earth imergy was used to identify the orchard locations and approximately 40% of the orchards were reclassified to FM 162, TU2. This change had little observable change to the modeled fire behavior, as the fuel type does not support significant fire activity. No spotting from this fuel type occurred during the modeling.

- Stow Grove Park was classified as “*Urban – unburnable*”, the area was mostly changed to 181 - TL1, to reflect the Redwood litter and other tightly compacted surface litter (chipped material). Grass areas within the Park were retained as unburnable.
- Minor changes were made to pockets of fuels near north Fairview and Goleta Way to capture grassy fields (FM104) and scattered pocket of eucalyptus (FM165). Both areas had been classified Urban FM 91 or Agricultural FM93.

Weather: Based on weather records obtained from the Montecito RAWS, 90th percentile weather was developed for use in the fire behavior analysis. This RAWS has continuous weather records dating back to 1996. This dataset was evaluated in Fire Family Plus based on the height of the fire season, June 1 and November 15. Additional records from the Glen Annie RAWS were considered for use in developing the 90th percentile data, however, data for this station only exists for the time period May 1, 1992 to February 1, 1995. These records were disregarded in the weather analysis due to the limited extend of the data available.

90th percentile weather used in the analysis was

Max Temp	Min Temp*	Max RH	Min RH	Fuel Moistures	Windspeed
94°F	77°F	77%	17%	5%/6%/7%/76%	6 mph

*50th percentile minimum temperature was used (64⁰ F) for modeling fire behavior purposes

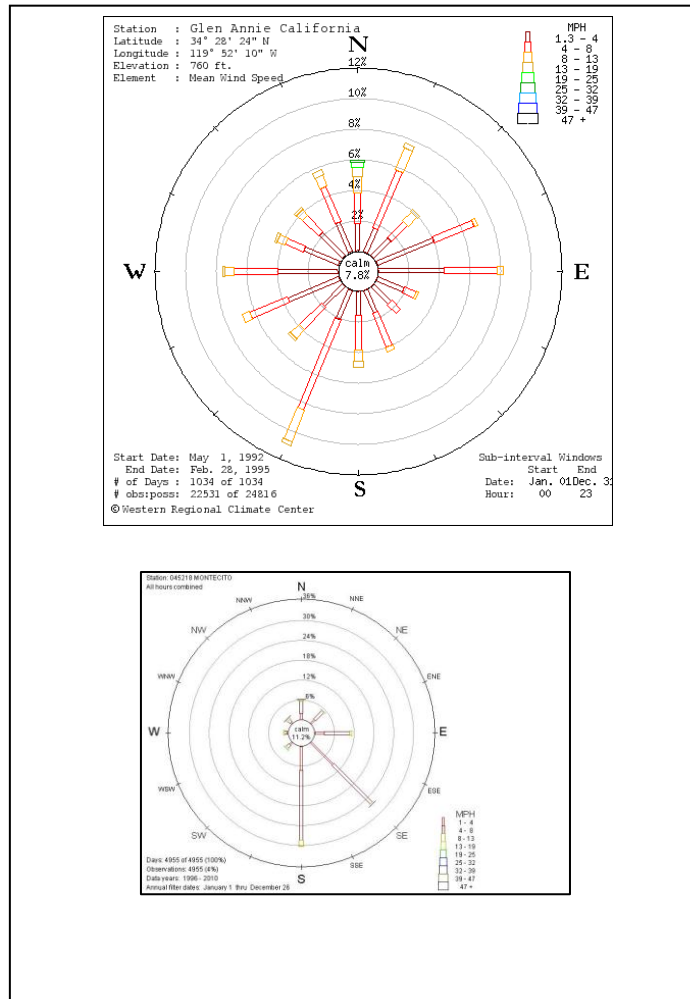
Winds recorded at the Montecito RAWS range between 0 and 8 mph 81.6% of the time, with wind direction Southeast to South on 57% of the weather records. The wind direction at Montecito is different than that recorded at the Glen Annie RAWS during it short operational life. The Glen Annie RAWS trends more West to Southwest with these directions reported on 37% of the recordings. Wind roses for the two locations are presented below.

A second weather dataset based on observations from the Santa Barbara Airport during the 2009 Jesusita Fire was developed for use in a FARSITE simulation in order to model the potential effects of a sundowner wind on fire spread. Airport records for the time period immediately before, during and after the fire were used to build the wind and weather files used in the modeling. The weather data for this period of time lead to slightly lower fuels moistures than the historic 90th percentile. This “dry” fuel moisture scenario (3%, 4%, 5%) was used represent dead fuel moisture in FARSITE modeling runs. The live fuel moisture was set at 113% in the model as it was reported during the Jesusita fire. This information is based upon the San Marcos sampling station of the USFS.

Montecito Wind Data

MPH	Direction																Total
Range	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	
1-4	2.1	0.0	1.8	0.0	2.8	0.0	9.5	0.0	7.3	0.0	0.9	0.0	0.6	0.0	0.6	0.0	25.7
4-8	3.8	0.0	3.7	0.0	7.9	0.0	16.6	0.0	21.2	0.0	1.2	0.0	0.7	0.0	0.9	0.0	55.9
8-13	0.5	0.0	0.4	0.0	0.7	0.0	0.7	0.0	1.9	0.0	0.5	0.0	0.4	0.0	0.5	0.0	5.5
13-19	0.3	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.3	0.0	0.1	0.0	0.1	0.0	0.4	0.0	1.4
19-25	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2
25-32	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32-39	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
39-47	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
47 +	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total (%)	6.7	0.0	6.0	0.0	11.5	0.0	27.0	0.0	30.6	0.0	2.7	0.0	1.7	0.0	2.6	0.0	88.8
Calm (<1)																	11.2
Ave Speed	2.0	0.0	4.7	0.0	4.7	0.0	4.2	0.0	4.8	0.0	5.1	0.0	5.5	0.0	8.1	0.0	4.3

Wind Roses for Glen Annie (top) and Montecito RAWS (bottom)



FlamMap

FlamMap outputs for Flame Length, Rate of Spread and Crown Fire Activity were generated for the landscape area. The model was run using the “dry” fuel moisture scenario (3%,4%,5%,30%,80%) developed primarily for the FARSITE simulations. This moisture scenario is met to represent mid-summer conditions when live herbaceous fuels have fully cured and live woody fuels are approaching their minimums for the fire season. The California custom fuel models were applied within FlamMap to allow the use of the Burgan Scott 40 fuel models.

Winds in FlamMap were set at 210⁰ azimuth to reflect the wind direction associated with the Glen Annie RAWS. Wind speed in the model was set to 6 mph representing the 90th percentile for the Montecito RAWS.

A fuel moisture scenario was used in FlamMap and therefore a fuel moisture-conditioning period was assigned by the model, as the use of a fuel model dataset overrides this model function.

FlamMap Outputs - Reflects the outputs for the entire landscape area. Additional GIS will be required to determine outputs at a more refined scale.

FlamMap Outputs – Entire Landscape									
Flame Length				Rate of Spread (ft/min)			Crown Fire Activity*		
0-4	4-8	8-11	11+	0-25	25-50	50+	Surface	Passive	Active
33%	27%	8%	32%	74%	22%	4%	55%	44%	1%

*Based on burnable fuel type only. Excludes urban and agricultural fuel types

BEHAVE PLUS

In order to capture the flame lengths associated with the fuels within or immediately adjacent to the city boundary, BehavePlus 5.0.4 was run for these fuel models using a static set of inputs to the model. Not all fuel models required all inputs and only the required inputs to generate the flame length outputs were utilized. The environmental conditions used mirror the 90th percentile weather used in the FlamMap fire modeling scenario.

The conditions are:

Fuel Moistures:

- 1-hr – 3%
- 10-hr – 4%
- 100-hr – 5%
- Live herbaceous – 30%
- Live woody – 80%

Canopy Characteristics:

- Canopy cover – 60%
- Canopy height – 65 feet
- Live-crown ratio – 0.9

Other environmental factors:

- Slope – 0%
- 20' wind speed – 6 mph

Table 1. Model Outputs – Flame Length

	Fuel Model													
	101	104	121	122	141	142	145	147	165	181	182	183	184	188
Flame Length (feet)	1.4	7.7	2.6	4.0	1.1	3.5	13.0	12.3	3.9	0.3	0.4	0.6	0.7	1.8

Vegetation Treatment Unit – Ellwood Mesa

Based on prescription parameters provided by the Geo Elements team, an analysis of the changes in fire behavior characteristics associated with treating the Vegetation Management Unit was conducted using BehavePlus, version 5.0.4. BehavePlus provides a means of modeling wildland fire and its effects. Inputs into this model are user defined with each calculation based on the assumption that conditions are uniform and constant for the time period being modeled.

BehavePlus was used as the modeling tool in this analysis because the resolution of the fuels data layer used in the FlamMap analysis is not fine enough to capture the fuels treatments being proposed. The resolution of the fuels data used in the FlamMap analysis is 30 square meters, with all fuels characteristics held constant within that area. This scale is too coarse to reflect the prescriptions proposed by the Geo Elements Team.

Modeling Assumptions:

Fuel Models: The existing digital fuels layers was queried to determine the fuel models used in the original FlamMap fire behavior simulations. Two fuel models were determined to dominate the Ellwood Mesa area; these are Fuel Model 104, "*Moderate Load Dry Climate Grass*" and 165, "*Very High Load Dry Climate Timber-Shrub*". Fuel model 165 is the best representation of the Eucalyptus groves on the mesa.

For modeling purposes, the fuel models were changed to reflect the changes in vegetation associated with treating the fuels within the VMU. By changing the fuel models while holding all other environmental parameters constant, changes in fire behavior directed related to modifying the existing fuels can be determined. For this analysis Fuel Model 104 as changed to both fuel models 102 "*Low Load Dry Climate Grass*" and 101, "*Short, Sparse, Dry Climate Grass*". The shortness of the grass after mowing will determine which model best fits the modified conditions. Fuel model 101 will best represent the shortest/sparsest grass.

The treatments proposed for with the Eucalyptus groves allow the fuel model to change from fuel 165 for the existing condition to 163, "*Moderate Load Dry Climate Broadleaf Litter*". No modifications were made to the canopy characteristics of the Eucalyptus stands.

Fuel Moisture: The same assumptions regarding fuel moistures are used in both the FlamMap and BehavePlus analysis. The "dry" fuel moisture scenario is applied in both models, with fuel moistures classified as:

- 1-hour fuels = 3%
- 10-hour fuels = 4%
- 100-hour fuels = 5%
- Herbaceous Fuels = 30%
- Live woody fuels = 80%
- Foliar moisture = 100%

Winds: A range of 20' winds (0-12 mph) were used in the BehavePlus analysis to cover a variety of environmental conditions that may be associated with the analysis area. This range includes 6 mph, the wind speed used in the FlamMap analysis. BehavePlus was enabled to select the most appropriate wind reduction factor for converting 20' winds into the mid-flame winds, which are utilized in the model. For the grass fuel types the reduction factors are, 104 - 0.42; 102 – 0.36; 101 – 0.31. In the Eucalyptus groves the reduction factors are 165 – 0.36 and 163 – 0.29.

Wind direction was set to upslope to represent an onshore flow which is most common to the analysis area. This matches the wind direction of 210⁰ used in FlamMap

Slope: The digital files in FlamMap were queried to assign the slope used in the BehavePlus analysis. The analysis area is dominated by slopes less than 10%, with isolated areas of slopes up to 20%. Steeper slopes associated with the bluffs are outside of the proposed VMU and were not included when determining an overall slope to use in BehavePlus. For modeling purposes the slope was set at 10%

Model Outputs: Grass Fuel Types

BehavePlus was run with multiple inputs for fuel models and 20' windspeed. Fuel model 104 represents the existing condition, while fuel model 102 represents grass mowed to approximately 1-foot height and fuel model 101 represents grass mowed to the lowest level possible. All grasses are considered to be fully cured. The model yields the following outputs for Rate of Spread (ROS) and Flame Length (FL).

Table 1. Rate of Spread (chains/hr)

Windspeed (20 foot)							
Fuel Model	0	2	4	6	8	10	12
104	5.7	15.0	31.3	51.9	76.0	102.9	132.5
102	2.9	6.7	13.2	21.6	31.3	42.2	54.1
101	1.3	2.4	4.5	7.2	10.6	14.4	18.7

Table 2. Flame Length (feet)

Windspeed (20 foot)							
Fuel Model	0	2	4	6	8	10	12
104	2.8	4.4	6.1	7.1	9.2	10.6	11.9
102	1.5	2.2	3.0	3.8	4.5	5.2	5.8
101	0.6	0.8	1.1	1.4	1.7	1.9	2.2

Model Outputs: Eucalyptus

The fuel model for treated areas of the Eucalyptus groves was changed to reflect the reduction in dead fuel loading and thinning from below within the stands. The reduction in the surface fuel loadings associated with the treatment creates a physical environment best represented by fuel model 163. Fuel model 165 represents the existing condition and was the fuel model assigned to the groves during the initial FlamMap simulations.

Table 3. Rate of Spread (chains/hr)

Windspeed (20 foot)							
Fuel Model	0	2	4	6	8	10	12
165	1.2	2.3	3.7	5.2	6.8	8.4	10.2
163	0.8	1.1	1.7	2.4	3.2	4.1	5.1

Table 4. Flame Length (feet)

Windspeed (20 foot)							
Fuel Model	0	2	4	6	8	10	12
165	3.1	4.1	5.1	6.0	6.8	7.5	8.2
163	1.2	1.4	1.6	1.9	2.2	2.5	2.7

Model Validation

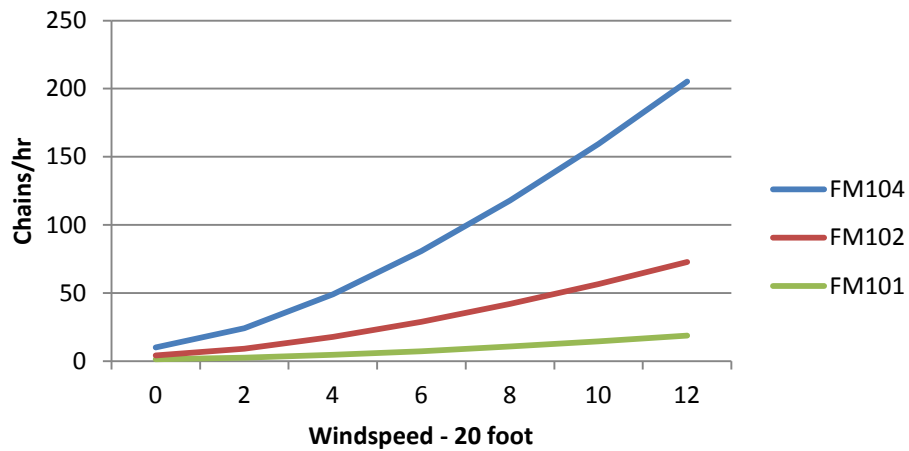
A check of outputs obtained from the original FlamMap analysis and the BehavePlus analysis was completed to validate that the models were reflecting similar fire behavior characteristics under static environmental conditions. The two models are in relative agreement as to the fire behavior outputs for the existing condition. The comparison of the two models indicated:

Table 5. FlamMap/BehavePlus Model Comparison

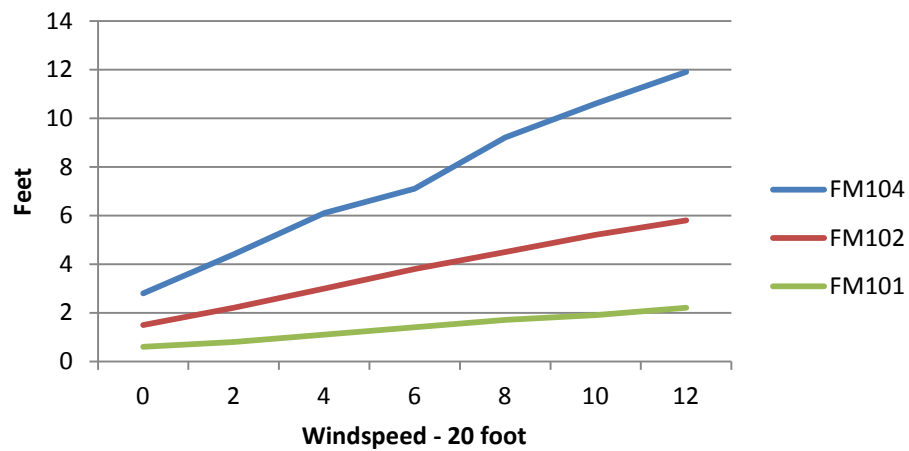
	Rate of Spread (chains/hr)		Flame Length (feet)	
	FlamMap	BehavePlus	FlamMap	BehavePlus
Grass Model (104)	41.0	51.9	7.0	7.1
Eucalyptus Model (165)*	4.0 to 8.0	5.2	6.0	6.0

*Fire behavior characteristics were compared where FlamMap modeled surface fire within the Eucalyptus groves. Where FlamMap modeled crown fire activity, the fire behavior characteristics greatly exceeded the flame lengths and rates of spread modeled in BehavePlus. As a fire behavior model, BehavePlus is not robust enough to be used for validation purposes when analyzing crown fire spread and intensities.

Rate of Spread - Grass Fuel Models



Flame Length - Grass Fuel Models



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Appendix D Building Standards

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PRIVATE ROAD AND DRIVEWAY STANDARDS

Development Standard #1

I. DRIVEWAYS

A. DEFINITION: Driveway – A private right-of-way that provides the principal means of vehicular access from a public right-of-way to four or fewer parcels.

1. A driveway serving residences on one parcel shall have a minimum width of 12 ft. See example on Page 8.
2. A driveway serving residences on two parcels shall have a minimum width of 16 ft. See example on Page 8.
3. A driveway serving residences on three to four parcels shall have a minimum width of 20 ft. See example on Page 8.
4. Access for five or more parcels shall meet Private Road Standards.
5. 12 ft wide and 16 ft wide driveway sections in excess of 500 ft shall have turnouts approximately every 500 ft. Line of sight issues, topography, or physical constraints may indicate shorter or longer intervals. Driveway dimensions at turnout locations shall be 22 ft wide by 50 ft long inclusive of the driveway. See example on Page 7.

B. Approved turnaround (large enough to accommodate fire trucks) shall be required for driveways longer than 150 ft. See examples on Pages 9 and 10 (CFC 503.2.5).

1. Turnarounds must not exceed 5% in slope.

C. Minimum dimensions for driveway switchbacks shall conform to example as shown on Page 11. (CFC 503.2.4)

D. Driveways may require civil engineering design and certification as deemed necessary on a case-by-case basis.

E. The minimum standard structural section for an all-weather driveway is 6 in. of Class II Aggregate Base (95% relative compaction) (Cal-Trans specifications) over 6 in. of compacted sub-grade soil (95% relative compaction), with adequate drainage control.

NOTE: Multi-family development projects may have additional requirements beyond what is in this standard.

II. PRIVATE ROAD

This section applies to access roads serving residences on five or more parcels.

A private road is a road over which the County has no maintenance responsibilities. The private road may be located in either a publicly or privately owned easement.

NOTE: Developments that require multiple access roads shall comply with the "ACCESS ROAD" DEFINITION. All required access roads shall be able to be used routinely for access into and out of an area.

A. DEFINITIONS:

1. PRIVATE ROAD: A street which is not a public road and does not meet the definition of a driveway.
2. ACCESS ROAD: A private or public road (but not a driveway) used routinely for access into and out of an area for the public and for emergency equipment.

Planned Unit Development of 30 homes or more located in High Fire Hazard areas are required to have multiple access roads.

NOTE: For Planned Unit Developments, road widths shall be established as outlined in the Santa Barbara County Engineering Design Standards Manual.

3. ALTERNATE ACCESS ROAD: An alternate access road provided for the public and for emergency equipment, to be used only when the primary access point is impaired by vehicle congestion or other emergency conditions.

Construction standards for an alternate access road shall be the same as those for primary access roads except that the width for the alternate access road need not exceed 24 feet when there is no on-street parking.

NOTE: The use of alternate access must be approved by the Fire Chief or designee.

4. EMERGENCY ACCESS: An access that does not serve buildings and is being provided for emergency vehicles only, such as access into wildland areas. This type of access is not intended for public use.

B. Access roads serving residences on five or more parcels shall have a minimum width of 24 ft.

C. All access roads shall require civil engineering design and certifications.

- D. All dead-end access roads shall terminate with either a 40 ft or 48 ft radius bulb turnaround or as approved by the Fire Chief or designee. See examples on Pages 14 and 15 (CFC 503.2.5).
- E. Two separate and approved access roads (not alternate access) shall be provided when it is determined by the Fire Chief that access by a single road, in excess of 600 ft, might be impaired by vehicle congestion, condition of terrain, climatic conditions or other factors that could limit access (CFC Appendix D107.1 & 503.1.2)
- F. Minimum curve radius for access roads is 50 ft from centerline.

III. GENERAL REQUIREMENTS FOR DRIVEWAYS AND PRIVATE ROADS

Fire department access ways shall be provided and maintained in accordance with the California Fire Code (CFC) and as provided herein.

- A. Adhere to all Santa Barbara County Public Works and Flood Control grading and drainage requirements.
- B. The minimum standard structural section shall be designed and constructed to be capable of supporting a 20-ton vehicle. (CFC 503.2.3)
- C. A minimum easement shall be provided sufficient to provide appropriate shoulders.
 - 1. 2 foot minimum shoulders on both sides of the paved roadway shall be required unless waived by the Fire Chief or designee.
- D. The standard structural section per Santa Barbara County Public Works, Road Division, may be modified by engineering design or certifications.
- E. Surface Standards (CFC 503.2.3)

Paving is defined as:

- 1. Asphaltic concrete pavement
- 2. Poured concrete
- 3. Chip seal, allowable for grades less than 10%
- 4. Interlocking pavers over approved compacted sub-grade

NOTE: "Grass-Crete" or "Turf Block" is not an acceptable method of paving on an access road but may be authorized for a driveway on a case-by-case basis.

- F. An approved all-weather road surface is allowed where grades do not exceed 10% on driveways and private roadways.
- G. An approved all-weather road / driveway surface is defined as: Suitable aggregate material over compacted subgrade soil.
- H. Paving as defined in III.E. is required on road grades exceeding 10% in slope. A minimum of 2-1/2 in. of asphalt concrete pavement shall be provided over Class II aggregate base, or alternative, as approved.
- I. Maximum allowed grade shall not exceed 15% unless approved by the Fire Chief or designee. Gradients up to 20% may be allowed with extenuating circumstances. Any gradient approved above 15% in slope must consist of a concrete structural section designed by a civil engineer. At no time shall any Fire Department access exceed 20% in slope.
- J. Angles of approach and departure shall be less than 12 degrees combined, e.g., driveway encroachments, drainage crossings.
- K. Minimum access road widths of 24 ft provided in this standard assume no parking on either side of the roadway. Minimum access road width with parking on one side is 28 ft, curb face to curb face. Minimum access road width for parking on both sides of road is 36 ft, curb face to curb face. See examples on Page 16. (Parking Lane = 8 ft)
- L. No stopping fire lane signage, red curbs, stenciling of "FIRE LANE" and striping may be required. See Pages 17 and 18. (CFC Appendix D103.6) (California Vehicle Code, Section 22500.1)
- M. Access
 - 1. The furthest projection of the exterior wall of a building shall be accessible from within 150 ft of a public or private road or private driveway as measured by an unobstructed route around the exterior of the building. (CFC 503.1.1)
 - 2. Gated access shall be provided with an approved Fire Department locking system. Minimum clear width of gate opening shall be the same as required of the road served. Please refer to Santa Barbara County Fire Department Development Standard #7. (CFC 503.6)

3. All weather access shall be provided prior to construction of structure. A fire engine must be able to access the building site during construction. (CFC 501-4)
 - a. **Bridges, culverts, cattle guards serving driveways** shall be constructed and maintained in accordance with AASHTO HB-17 (Standard Specification for Highway Bridges) or Standard Cal Trans Bridge Design Specifications and shall have a minimum H-20 rated capacity (refer to Page 12); certified by a registered structural engineer. Capacity shall be posted at bridge approaches. A copy of such certification shall be on file with the Fire Department. Minimum clear width of bridge shall be the same as required of the driveway served unless waived by the Fire Chief or designee. See example on Page 12. (CFC 503.2.6)
 - b. **Bridges, culverts and cattle guards serving roadways** shall be constructed and maintained in accordance with AASHTO HB-17 (Standard Specification for Highway Bridges) or Standard Cal Trans Bridge Design Specifications and shall have a minimum HS-20 rated capacity (refer to Page 13); certified by a registered structural engineer. Capacity shall be posted at bridge approaches. A copy of such certification shall be on file with the Fire Department. Minimum clear width of bridge shall be the same as required of the road served unless waived by the Fire Chief or designee. See Example on Page 13. (CFC 503-2.6)

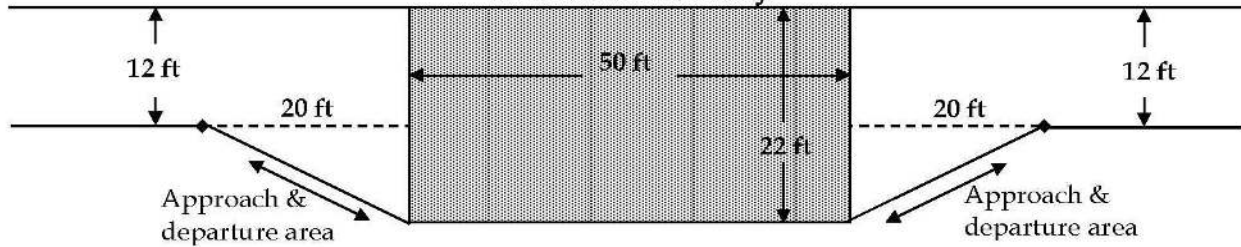
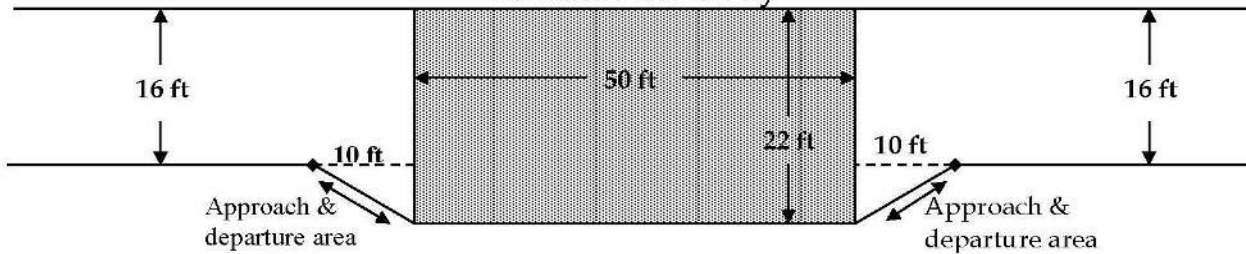
N. Vegetation Clearance

1. Vertical clearance of 13 ft 6 in. shall be maintained. (CFC 503.2.1)
2. Horizontal clearance of up to 10 ft on each side of the driveway or private road shall be maintained as required by the Fire Chief or his designee.
3. Additional clearance may be required in high fire hazard areas.

O. Street Name Signs and Building Addressing

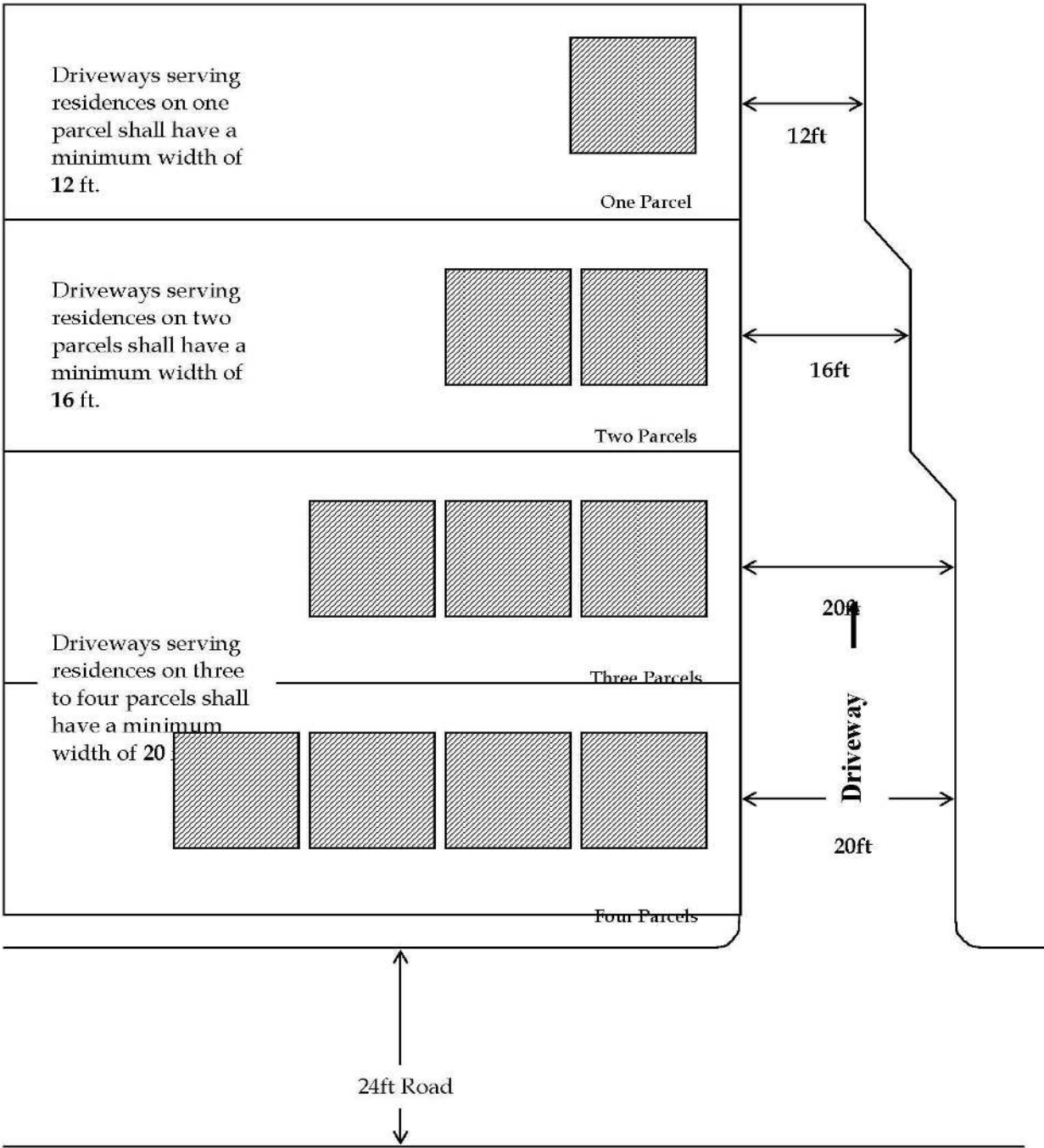
1. Street signs shall be installed on private roads. (CFC 503.3)
2. Address numbers shall be installed on the residence prior to occupancy. (CFC 505.1)
3. Residential addresses must be a minimum of 3 in. high on a contrasting background. (County Code, Chapter 15)

4. Commercial addresses must be a minimum of 6 in. high on a contrasting background. (County Code, Chapter 15)
 5. Addresses must be readily visible from the street or private road. At road forks or down long driveways, it must be obvious to any emergency vehicle where the house is located by direction and numerical signs. (CFC 505.1)
 6. Addresses are assigned by the Fire Department.
- P. Individual review of each proposed road section may disclose that a higher standard of design is warranted by potential future or additional use of the road section or by the existence of special circumstances. (CFC 503.2.2)
- Q. The Fire Chief or designee is authorized to approve alternate materials or methods provided the Fire Chief or designee find the proposed design, use or operation satisfactorily complies with the intent of the California Fire Code and the method of work performed or operation is for the purpose intended, at least equivalent to that prescribed in this standard in quality, strength, effectiveness, fire resistance, durability and safety.

Turnout Examples for 12-Foot and 16-Foot Driveways**12-Foot Driveway****16-Foot Driveway**

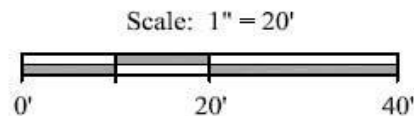
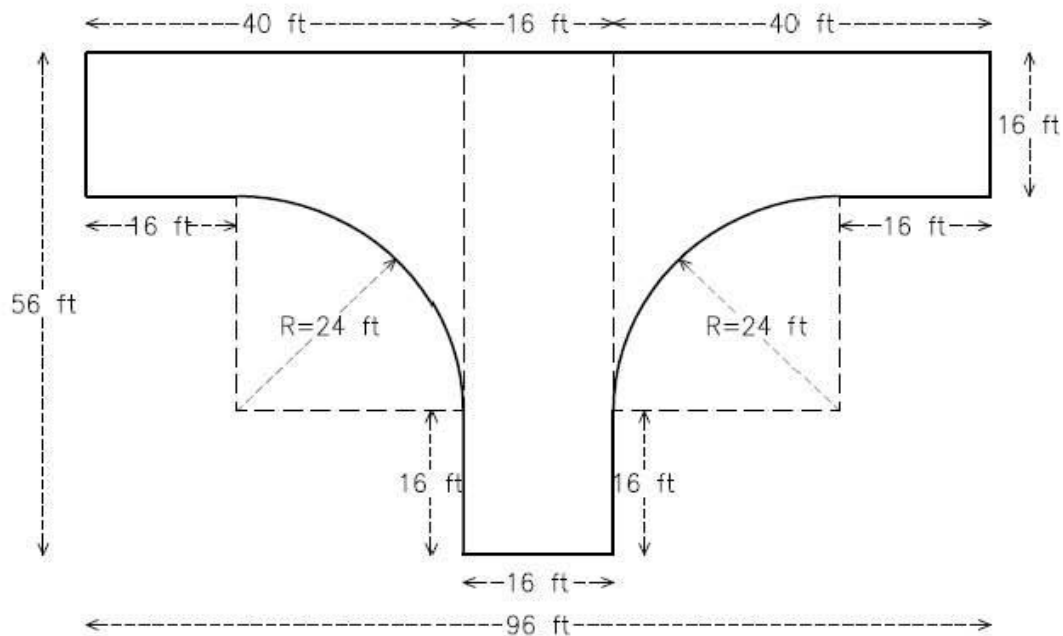
***Required length of turnout area does not include approach and departure areas.

**Minimum Widths for Driveways Serving Residences From
One to Four Parcels**



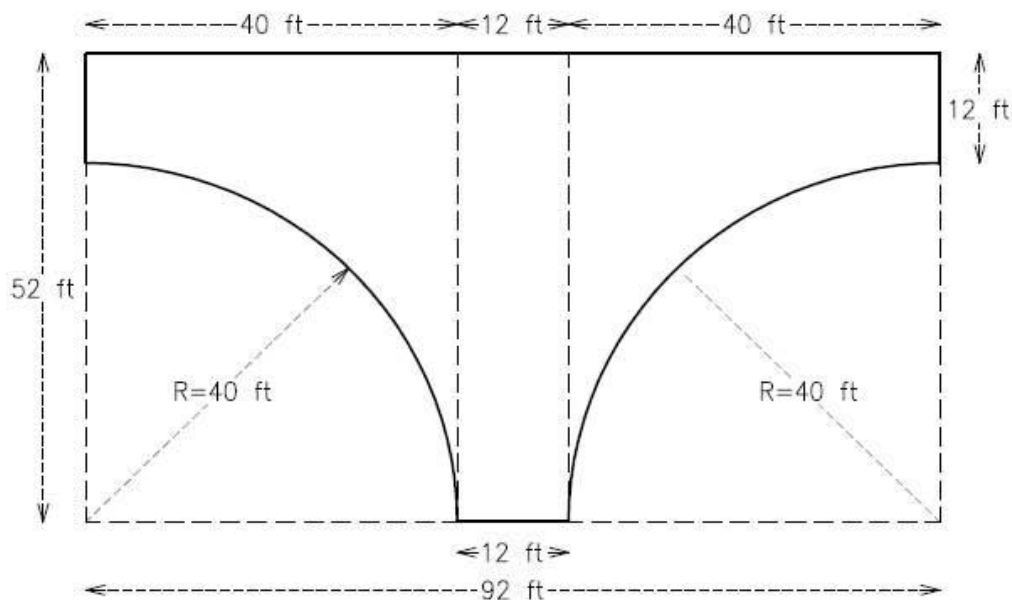
Option 1

Hammerhead Style Turnaround For Driveways

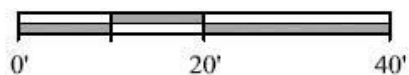


Option 2

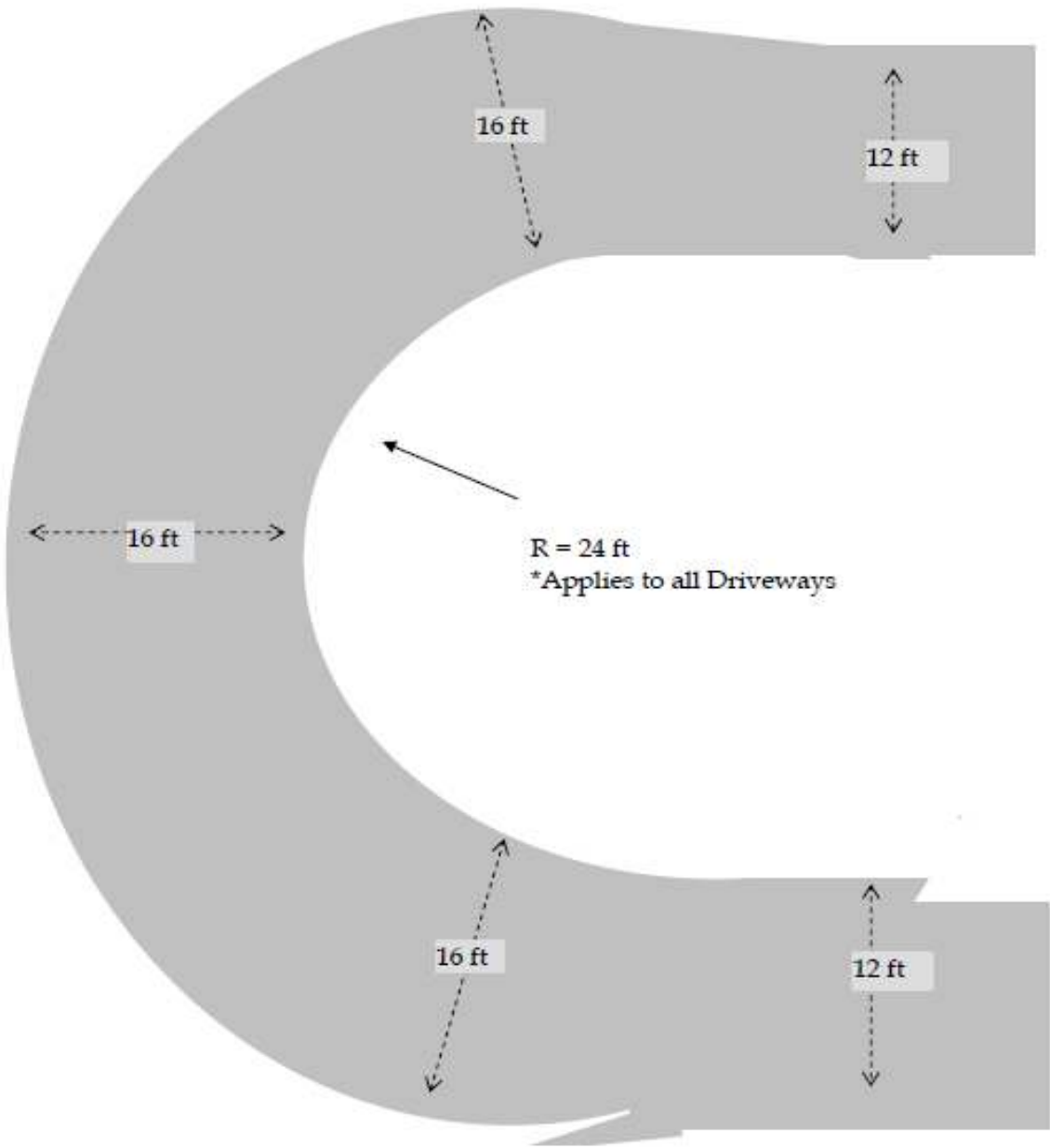
Hammerhead Style Turnaround For Driveways



Scale: 1" = 20'



Minimum Dimensions for Driveway Switchbacks
12-Foot Driveway Example



Minimum Bridge Requirements for Driveways



BRIDGE DESIGN SPECIFICATIONS • FEBRUARY 2004

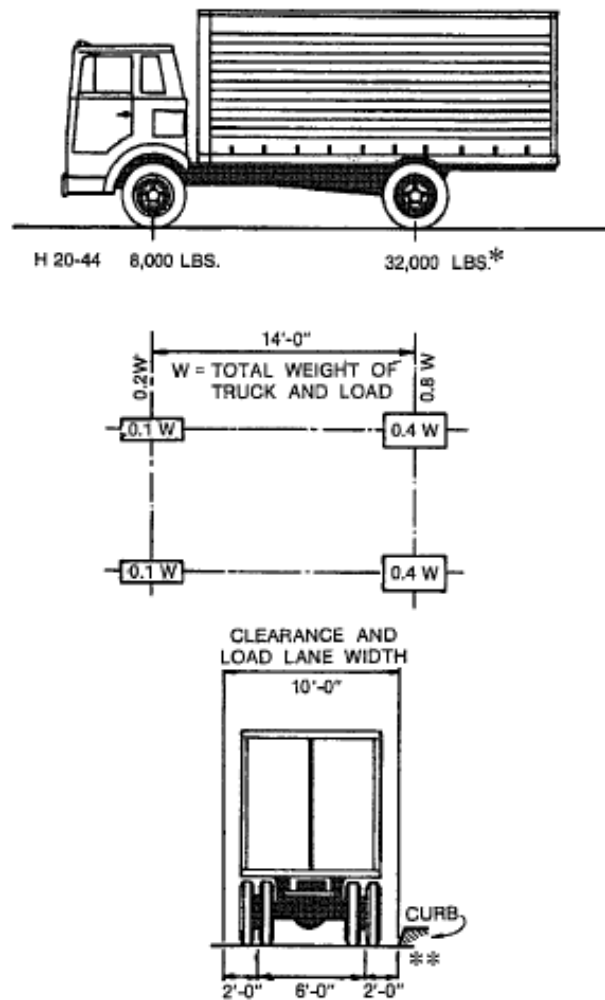


FIGURE 3.7.6A Standard H Trucks

* In the design of timber floors and orthotropic steel decks (excluding transverse beams) for H 20 loading, one axle load of 24,000 pounds or two axle loads of 16,000 pounds each spaced 4 feet apart may be used, whichever produces the greater stress, instead of the 32,000-pound axle shown.

** For slab design, the center line of wheels shall be assumed to be 1 foot from face of curb. (See Article 3.24.2)

Minimum Bridge Requirements for Roadways



BRIDGE DESIGN SPECIFICATIONS • FEBRUARY 2004

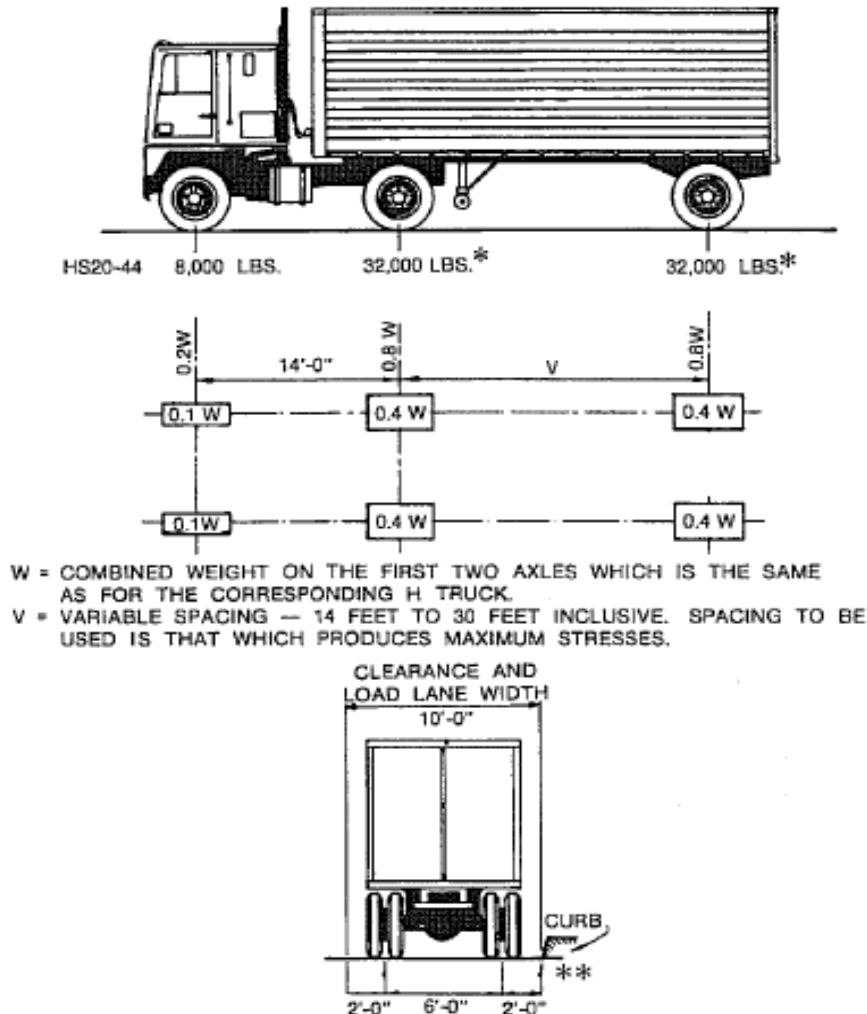
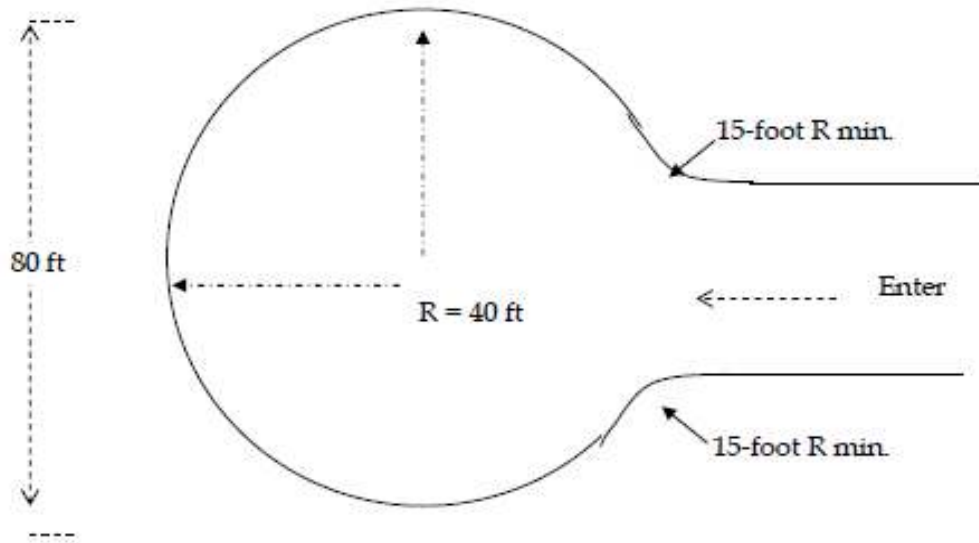


FIGURE 3.7.7A Standard HS Trucks

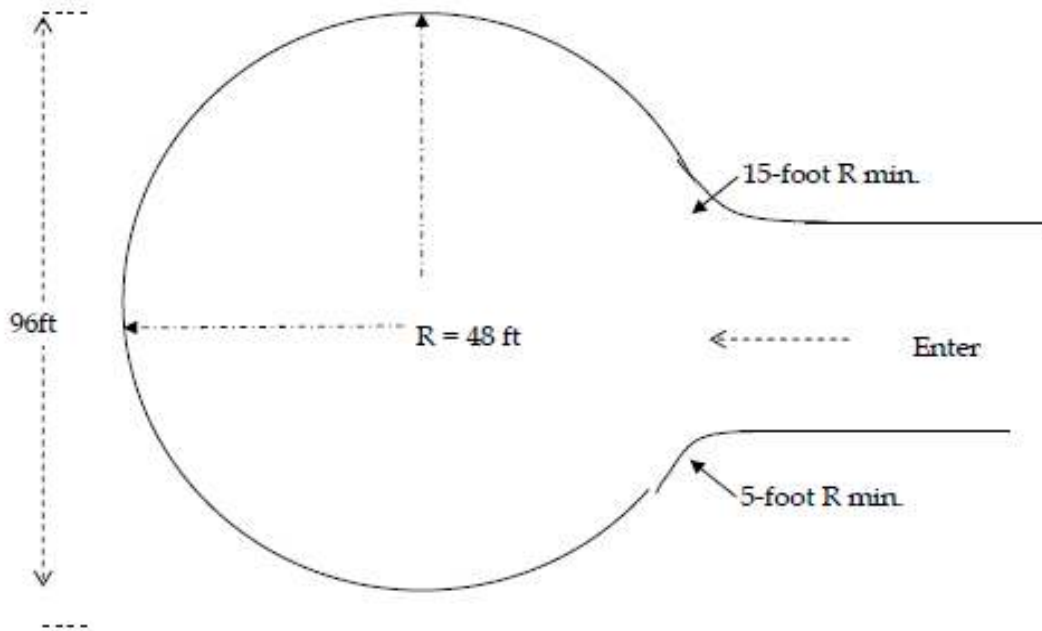
* In the design of timber floors and orthotropic steel decks (excluding transverse beams) for H 20 loading, one axle load of 24,000 pounds or two axle loads of 16,000 pounds each spaced 4 feet apart may be used, whichever produces the greater stress, instead of the 32,000-pound axle shown.

** For slab design, the center line of wheels shall be assumed to be 1 foot from face of curb. (See Article 3.24.2)

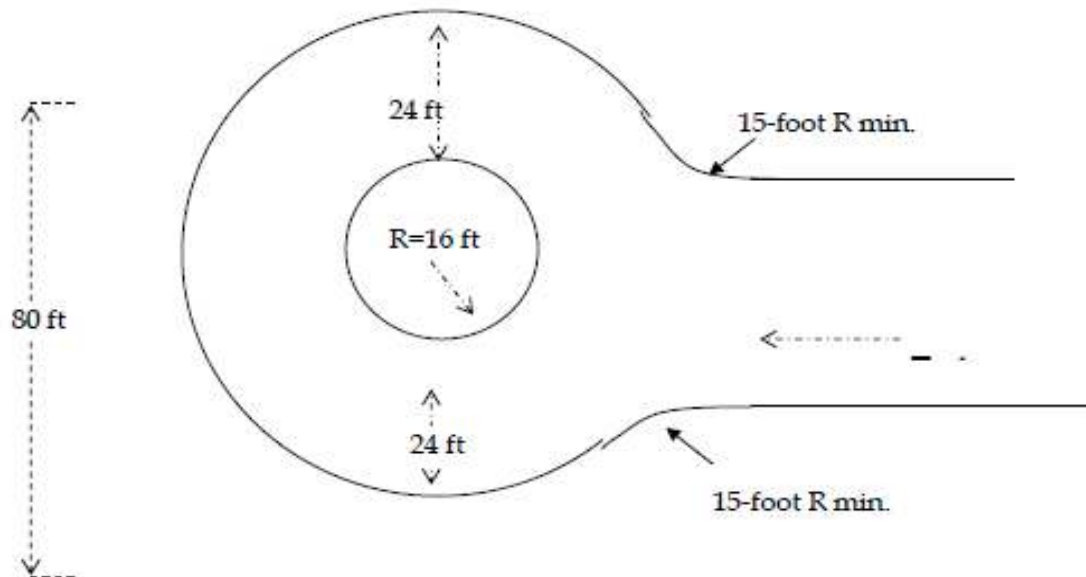
**Bulb Turnaround With No Parking Allowed
Red Curbs and Signage Will Be Required**



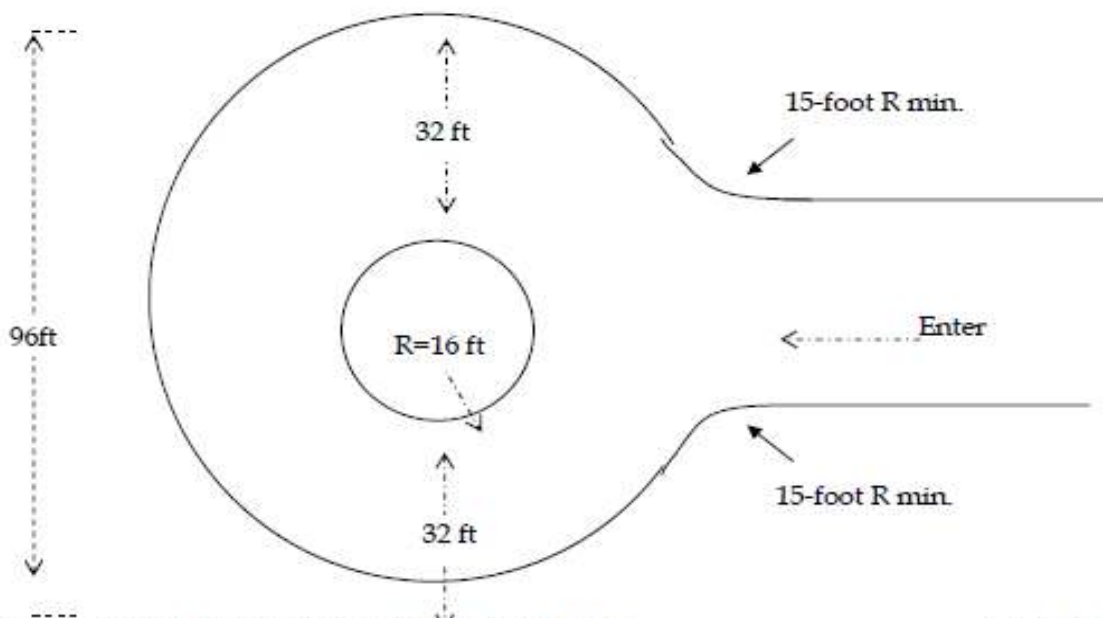
Bulb Turnaround With Unrestricted Parking



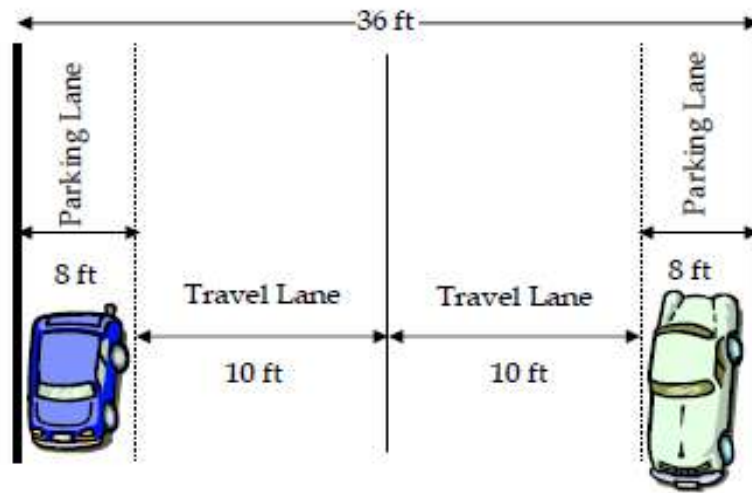
**Bulb Turnaround Including Center Planter With No Parking Allowed
Red Curbs and Signage Will Be Required**



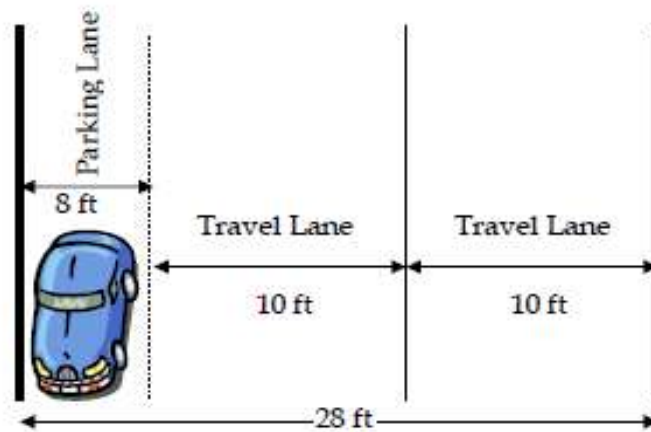
**Bulb Turnaround Including Center Planter
With Parking Allowed on Outside Perimeter Only**



Minimum Unobstructed Road Width for Residential Development With Parking Allowed on Both Sides of the Street

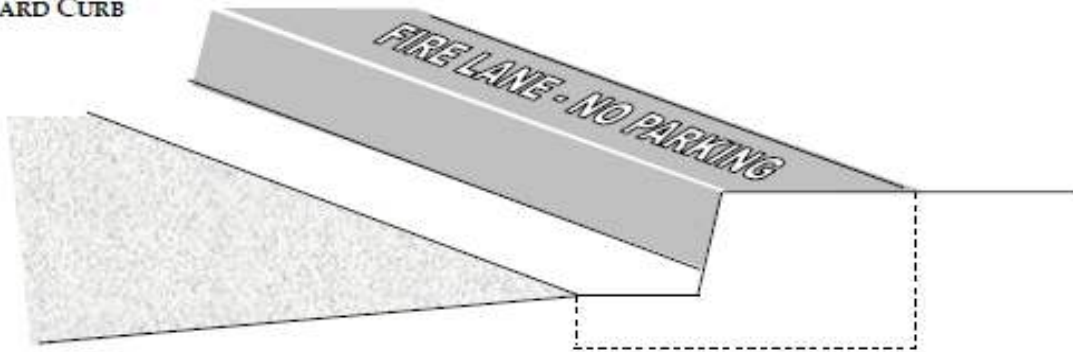


Minimum Unobstructed Road Width for Residential Development With Parking Allowed on One Side of Street Only

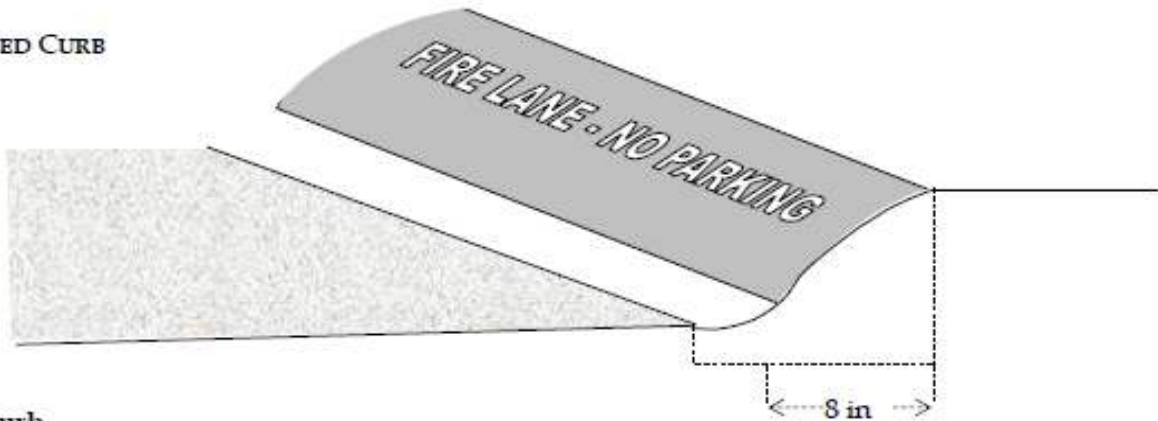


Fire Lane Identification - Red Curbs

STANDARD CURB

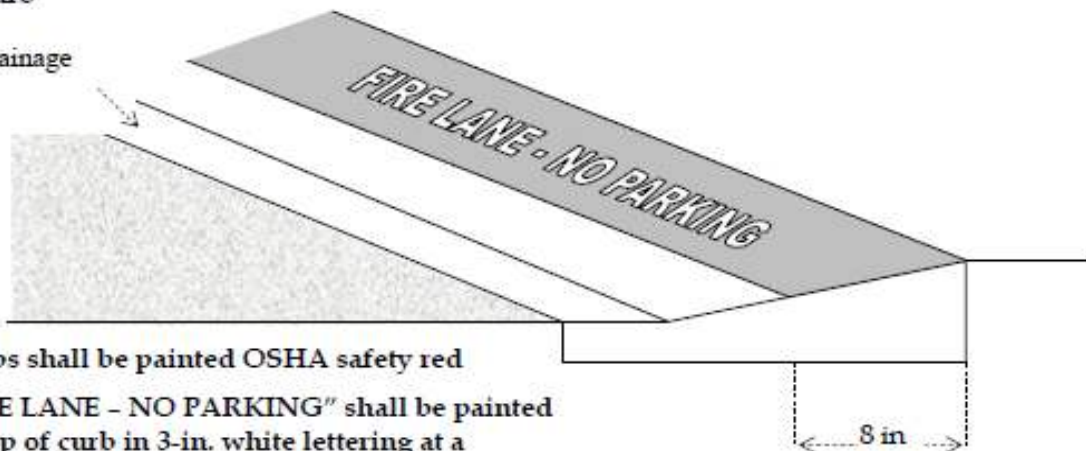


ROLLED CURB



No Curb

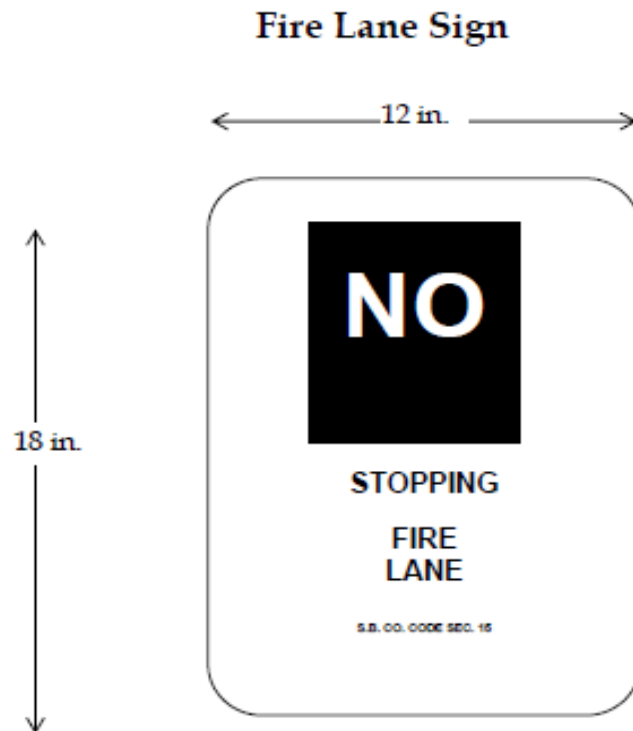
2% Drainage
Swale



1. Curbs shall be painted OSHA safety red
2. "FIRE LANE - NO PARKING" shall be painted on top of curb in 3-in. white lettering at a spacing of 30 ft or portion thereof.

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1. Metal reflectorized
2. Size: Minimum 12 in. by 18 in.
3. Lettering size: Minimum 3 in. high
4. Background: White with red lettering
5. Bottom of sign shall be no less than 7 ft above ground
6. Posting: Post at the beginning and end of control zone and every 150 ft

FIRE HYDRANT SPACING AND FLOW RATES

Development Standard #2

This standard shall apply to Fire Hydrant requirements for development inside of a water purveyor's district. All development inside of a water purveyor's district boundaries is required to have their fire water infrastructure provided by that purveyor. A private stored water system is not allowed when a development is served by a water purveyor unless approved by the Fire Chief or designee.

Exception: If the water purveyor notifies the Fire Department in writing that it cannot provide service to the proposed development, the Fire Department may allow a stored water system.

I. FLOW RATES

A. Individual hydrant flow rates for buildings having a fire area which does not exceed 3,600 sq ft shall be determined according to Table I (below) of this standard. Flow rates for all other structures shall be determined according to fire flow requirements found in Appendix B, and Table B105.1 of the California Fire Code.

B. All flows are measured at 20 psi residual pressure.

TABLE I.

Area Type / Acres	Hydrant Spacing	Minimum Hydrant Flow Rate
Commercial	300 ft	1,250 gpm
Urban & Rural Developed Neighborhood	500 ft	750 gpm
Rural 5 to 10 Acres	600 ft	500 gpm
Rural Over 10 Acres	800 ft	500 gpm

Exception: Tier I Commercial Wineries less than 5000 net square feet in size, that are not located in a Water Purveyor's district, shall be required to meet Development Standard #3 for stored water.

II. SPACING POLICY (CFC, Appendix C)

- A. Spacing for one- and two-family dwellings shall be according to Table I (above) of this standard. Spacing for other than one- and two-family dwellings shall be provided in accordance with Appendix C of the California Fire Code for the protection of buildings, or portions of buildings, hereafter constructed.
- B. Spacing is based on the distance between hydrants along an approved access road. Specific locations to be determined by the Fire Department prior to project approval.
- C. Irrespective of distances provided in the referenced tables, additional hydrants may be required at intersections and near driveways serving buildings at risk.
- D. Regardless of the average spacing, fire hydrants shall be located such that all points on streets and access roads adjacent to a building are within the distances listed in Table C105.1 of the California Fire Code.
- E. Fire hydrants shall be required on both sides of the roadway whenever:
 - 1. Roadway easement widths are greater than 60 ft.
 - 2. A center median strip exists.
 - 3. The roadway has four or more traffic lanes.
 - 4. In the opinion of the Fire Chief or designee, the use of fire hydrants on the opposite side of the roadway may prove operationally difficult, or may create unsafe working conditions.
- F. Where new water mains are extended along streets where hydrants are not needed for protection of structures or similar fire problems, fire hydrants shall be provided at spacing not to exceed 1,000 feet to provide for transportation hazards.

III. HYDRANT REQUIREMENTS

- A. When required, a fire hydrant shall be installed no closer than 50 ft and no further than 150 ft traveled path distance to the dwelling. Specific location to be determined by the Fire Department.
- B. Water mains for fire hydrants shall be installed in accordance with National Fire Protection Association (NFPA) Standard #24 and shall be a minimum of 6 inches in diameter.
- C. All fire hydrants shall be equipped with a shut-off (street) valve.
- D. Curb faces shall be painted red to 7.5 ft on both sides of the hydrant. (California Vehicle Code Section 22514).

- E. Maintenance of private hydrants is the responsibility of the property owner. Fire Department shall have unrestricted access to on-site fire hydrants for inspection and testing purposes.

IV. GENERAL REQUIREMENTS

- A. Fire Hydrant Discharge Outlet Configuration
 - 1. One- and Two-Family Dwellings (Residential Standard)
 - a. One 4 in. discharge outlet and one 2-1/2 in. discharge outlet.
 - 2. Other than One- and Two-Family Dwellings (Commercial Standard)
 - a. Minimum one 4 in. discharge outlet and two 2-1/2 in. outlets.
- B. All outlets shall have national standard threads and metal caps to protect threads (NFPA 24, section 7.1.2).
- C. The center of the lowest outlet shall be a minimum of 18 in. above grade and a maximum of 24 in. above grade.
- D. The fire hydrant shall have pentagonal operating nuts.
- E. Plans and specifications for fire hydrant systems shall be submitted to the fire department for review and approval prior to construction (CFC 501.3).
- F. Fire hydrants shall be installed and made serviceable prior to and during the time of construction (CFC 501.4).
- G. Hydrant locations shall be identified by the installation of approved blue reflective markers located in the roadway 90 degrees to the hydrant. Markers shall be installed per Public Works Standards.
- H. A 3-foot clear space shall be maintained around the circumference of fire hydrants except as otherwise required or approved. Posts, fences, vehicles, growth, trash, storage and other materials or things shall not be placed or kept near fire hydrants. (CFC 508.5.5).

STORED WATER FIRE PROTECTION SYSTEMS

Development Standard #3

I. STORAGE

Fire department stored water requirements for residential units outside of a water purveyor's district shall comply with the Santa Barbara County Fire Department Development Standard #3. For projects served by a water purveyor, stored water will not be allowed unless approved by the Fire Chief or designee.

NOTE: For commercial designated structures, see Development Standard #2.

- A. For non-sprinklered buildings, the tank shall have a capacity of 500 gals plus 1 gal per sq ft of building floor area (minimum of 2,500 gals) in addition to the domestic storage requirement. This amount shall be reserved for fire protection purposes exclusively. The domestic supply outlet from the tank must be located above the minimum capacity required by the fire department. (See Example, Page 3)
- B. For sprinklered buildings, the tank shall be 2,500 gals in addition to the domestic storage requirement. This amount shall be reserved for fire protection purposes exclusively. The domestic supply outlet from the tank must be located above the minimum capacity required by the fire department. (See Example, Page 3)
- C. For NFPA 13 sprinklered Tier I Wineries less than 5000 net square feet in size, stored water is required to be a minimum of 10,000 gallons and shall comply with all other aspects of this standard.
- D. Tanks shall be set on a three (3) inch compacted crushed stone or granular base, or on a concrete foundation (NFPA Chapter 11).
- E. The tank shall be maintained full at all times by an automatic refilling device.
- F. In designated High Fire Hazard areas, 30' brush clearance shall be maintained at all times around water tanks.
- G. When the fire service connection outlet is directly on the tank, the tank outlet and the approved control valve shall have a minimum inside diameter of 4 inches. The fire connection outlet shall have National Standard threads and be protected by a threaded metal cap.
- H. The outlet on the tank shall be located on the side of the tank, at the base, and shall face the road/driveway. The outlet shall be accessed by a fire department approved all weather road located within 10 ft of the outlet and situated in such a manner that fire apparatus will be able to connect to the outlet without blocking the roadway.

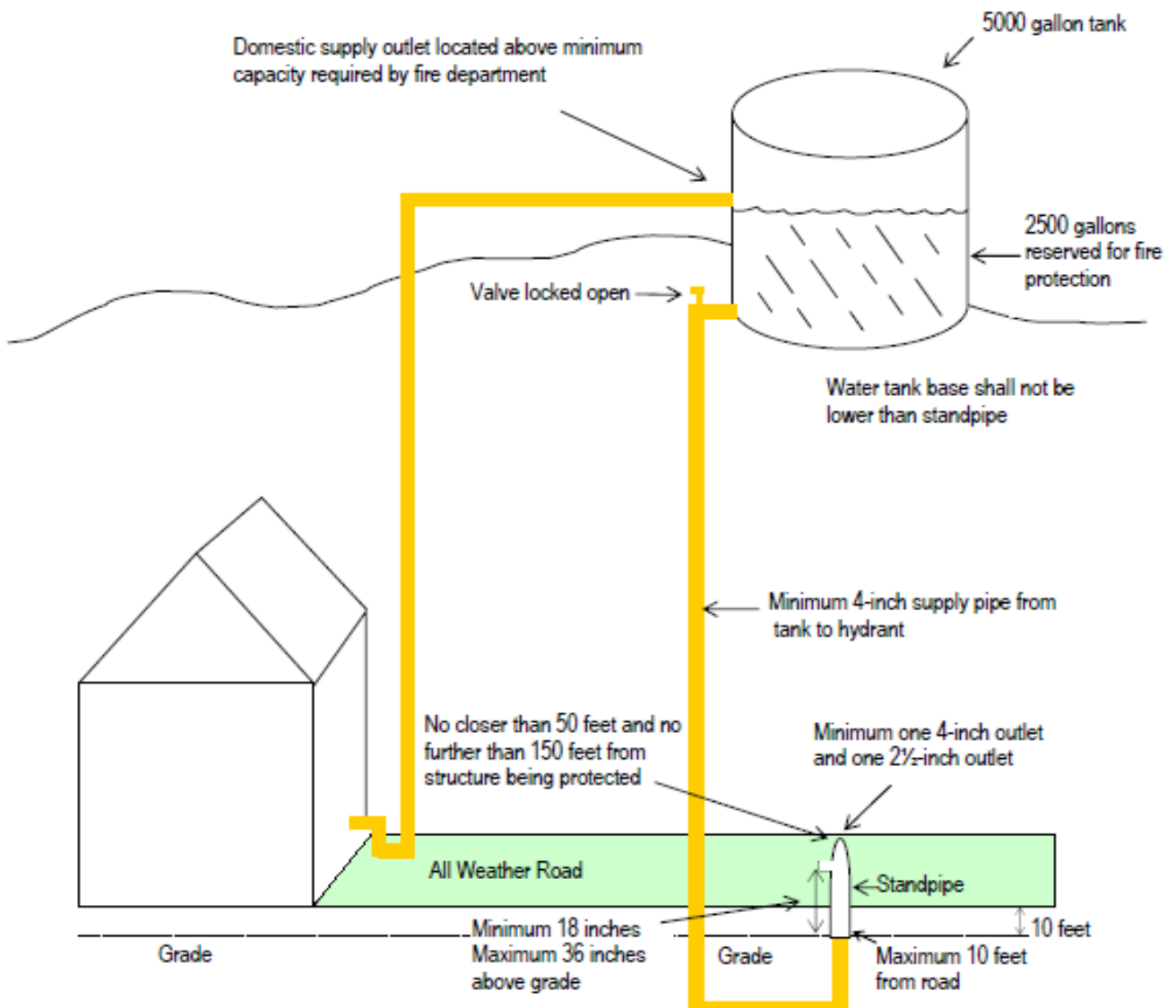
- I. When a standpipe or other fire service connection outlet is remote from the tank, an approved shutoff valve, locked in the open position, must be provided on the tank (See Example, Page 3)
- J. An underground cistern may also be used for a stored water fire protection system (SWFPS). An approved fire service connection and water main shall be installed and the base of the cistern shall be higher than the fire service connection outlet.
- K. For projects located in a designated High Fire Hazard Area, all above ground piping, including all pipes at the water tank as well as hydrant location(s), shall consist of galvanized metal.

II. STANDPIPE

- A. The standpipe shall have a minimum of one 4 in. and one 2 ½ in. discharge outlet. For a SWFPS providing in excess of 2,500 gals, other outlet configurations are acceptable subject to fire department approval. (See Example, Page 3)
- B. All SWFPS piping shall be no less than 4 in. (See Example, Page 3)
- C. The standpipe valve shall be mounted on a supported 4 in. galvanized riser.
- D. The standpipe shall be located no closer than 50 ft and no further than 150 ft from the structure being protected along the path of approach. (See Example, Page 3)
- E. The standpipe valve shall be a minimum of 18 in. and a maximum of 36 in. above grade and shall in no case be higher than the tank base. (See Example, Page 3)
- F. The standpipe and riser shall be painted red.
- G. The standpipe shall have national standard threads, a pentagonal operating nut and metal caps to protect threads.
- H. The standpipe shall be accessed by a fire department approved all weather road located within 10 ft of the standpipe and situated in such a manner that fire apparatus will be able to connect to the standpipe outlet without blocking the roadway. (See Example, Page 3)
- I. The water main shall be a minimum of 4 in. inside diameter. (See Example, Page 3)
- J. A SWFPS for multiple residential parcels may have cumulative water storage in a central location with mains and fire connections to each parcel.
- K. Plans for any SWFPS shall be submitted to the fire department for approval prior to project construction.

EXAMPLE:

Elevated water tank with automatic refill device, 2,500 gallons minimum capacity. Domestic storage outlet shall be located above the 2,500 gals minimum capacity.



DEFENSIBLE SPACE STANDARDS

Development Standard 6

6.0 DEFINITIONS

6.0.1 COMBUSTIBLE MATERIALS are weeds, stubble, brush rubbish, litter, dry grass, dry leaves or other flammable materials that are readily ignitable and endanger the public safety.

6.0.2 DEFENSIBLE SPACE is an area surrounding a building or structure where basic wildfire protection practices are implemented, providing the key point of defense from an approaching wildfire or escaping structure fire. The area is characterized by the establishment of fuel modification measures.

6.0.3 FIRE HAZARD is anything or act that increases or could cause an increase of the hazard or menace of fire to a greater degree than that customarily recognized as normal by persons in the public service regularly engaged in preventing, suppressing or extinguishing fire or any thing or act that could obstruct, delay, hinder or interfere with the operations of the fire department or the egress of occupants in the event of fire. When a fire hazard has been determined to exist by the Fire Marshal, or his or her designee, the fire hazard shall be considered to be a nuisance.

6.0.4 PARCEL is a portion of land of any size, the area of which is determined by the assessor's maps and records and may be identified by an assessor's parcel number whether or not any buildings or structures are present.

6.0.5 REDUCED FUEL ZONE is a fuel break within 30 feet to 100 feet from each building or structure and is created by disrupting the vertical and horizontal continuity of flammable and combustible vegetation with the goal of reducing fire intensity, inhibiting fire in the crowns of trees, reducing the rate of fire spread and providing a safer environment for firefighters to suppress wildfire.

6.0.6 The Santa Barbara County Fire Department (SBCFD) is the Authority Having Jurisdiction (AHJ) to ensure the minimum defensible space is maintained for all buildings and structures within the unincorporated areas of the Santa Barbara County, private lands inside the United States Forest as well as the incorporated areas overseen by the SBCFD.

6.1. DEFENSIBLE SPACE

6.1.1 Prior to erecting or modifying any building or structure, defensible space requirements shall be completed. A defensible space of 100 feet minimum around all buildings or structures is required. The goal is to create an area to assist in the protection of lives, the environment and property.

6.1.2 Defensible space shall be maintained for all buildings and structures located in the State Responsibility Area as required in *Public Resources Code 4291* and *California Code of Regulations Title 14 – Natural Resources, Division 1.5 – Department of Forestry, Chapter, “Fire Protection,” Subchapter 2 “SRA Fire Safe Regulations,” Articles 1-5.*

6.1.3 Defensible space shall be maintained for all buildings and structures within all zones of the Santa Barbara County Local Responsibility Area, the owner shall maintain defensible space as outlined in *Government Code 51175 – 51189, Santa Barbara County Code of Ordinances, Chapter 15 section 15-3* and this standard.

6.1.4 Final approval of work shall be at the discretion of the Fire Marshal or his or her designee.

6.2. DEFENSIBLE SPACE FOR BUILDINGS AND STRUCTURES

6.2.1 A defensible space of 100 feet minimum around all buildings or structures shall be maintained for the life of the property. For the purposes of this standard, a defensible space consists of two zones (0 - 30 feet and an additional 70 feet totaling 100' minimum) from all buildings or structures. A greater distance may be required on a case-by-case evaluation.

6.2.1.1 In the 30 foot zone (zone 1) or to the property line, whichever is nearer, all vegetation must be well maintained. No flammable vegetation shall exist in this zone. Large trees may occupy the zone if they are trimmed, well maintained and free of diseased, dead or dying material.

6.2.1.2 In the 70 foot zone (zone 2) or to the property line, whichever is nearer, flammable vegetation shall be spaced as to reduce plant-to-plant, plant-to-tree and tree-to-tree transfer of fire both vertically and horizontally.

6.2.1.3 Horizontal clearance will depend on height of plants and steepness of slope. Large trees may remain in this zone if the vegetation below each tree meets the minimum vertical clearance calculation. Refer to 6.4.3 Figure 1.

6.2.1.4 The defensible space requirement shall be maintained throughout the year. Property owners may have to cut vegetation multiple times a year to maintain the standard for clearance.

6.2.2 Removal of a portion of any tree or plant that extends within 10 feet of the outlet of a chimney or stovepipe is required. This standard requires that any tree, shrub or other plant adjacent to or overhanging a building be well maintained and free of diseased, dead or dying wood.

6.2.3 The roof of all buildings and structures and their appurtenances shall be maintained free of leaves, needles or other dry vegetative materials for the life of the property.

6.3 DEFENSIBLE SPACE FOR DRIVEWAYS AND ROADWAYS

In order to maintain access for fire department operations, the following shall apply.

6.3.1 For all driveways and private roadways leading to and/or from buildings and structures on a private property, flammable vegetation shall be reduced to a maximum of four inches stubble height or completely removed for a distance not less than 10 feet from both shoulders of the roadway or driveway.

6.3.2 Trees shall be well maintained, spaced to reduce the chance of tree-to-tree spread of fire and the branches shall not overhang the driveway and roadway from the edge of the required access lower than 13 feet 6 inches for the life of the property.

6.4 DEFENSIBLE SPACE WITH CONTINUOUS TREE CANOPY

To achieve defensible space while keeping a larger stand of trees with a continuous tree canopy, the following shall apply.

6.4.1 Prune lower branches of trees to a minimum height of six feet above ground level. For trees under ten feet in height, prune the lower 1/3 of branches. Properties with greater fire potential shall require evaluation on a case-by-case evaluation. Refer to 6.4.3 Figure 2.

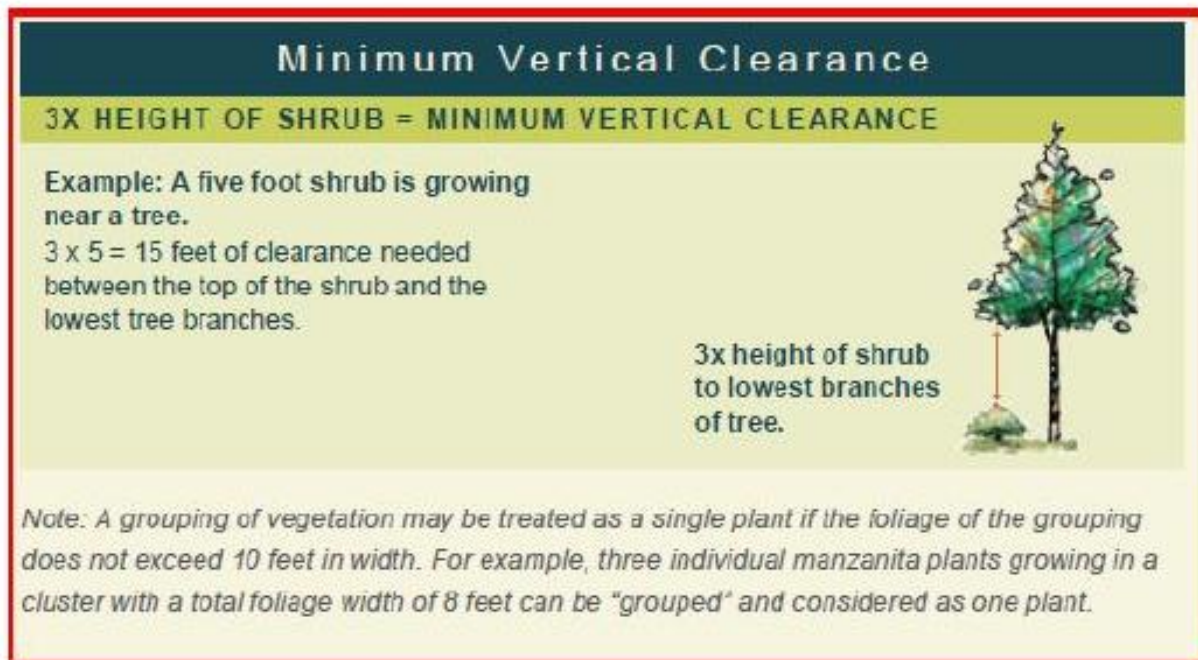
6.4.2. Reduce all ground fuels to no greater than four inches in height. Single specimens of trees or other vegetation may be kept if they are well-spaced, well-pruned and create an overall condition that avoids the spread of fire to other vegetation or to buildings or structures.

6.4.3 Figure 1

Horizontal clearance between shrubs should be four to 40 feet depending on the slope of the land and size and type of vegetation.



6.4.3 Figure 2



6.4.3 Figure 3



ACCESS GATES

Development Standard #7

SCOPE

This standard outlines the requirements for gates on private roads and private driveway access points.

The intent is to allow gates but not compromise safety. This standard makes provisions for the public to leave even though they do not have a gate pass or key and to provide a standard format for emergency crews to enter.

Gate plans shall be submitted and approved prior to construction. Permits may be required by the Building and Safety Division. Gates shall be maintained in accordance with this standard and the approved design. This is the responsibility of the property owners' whether individual or corporate (ie: a Homeowners Association (HOA)).

NOTE: Pay Close attention to the definitions and requirements. Problems have occurred in the past with assumptions that a second access may be locked to avoid routine traffic.

DEFINITIONS

1. **ACCESS ROAD:** A road used routinely for access into and out of an area.

NOTE: Developments that require multiple access roads shall comply with the "ACCESS ROAD" definition. All required access roads shall be able to be used routinely for access into and out of an area.

2. **ALTERNATE ACCESS:** An alternate road provided for the public and for emergency equipment, to be used only when the primary access point is impaired by vehicle congestion or other emergency conditions.

Construction standards of alternate access shall be the same as primary access except the width need not exceed 24 feet when there is no on-street parking.

NOTE: The use of alternate access must be approved by the Fire Prevention Division. Planned Unit Developments of 25 homes or more located in High Fire Hazard areas are required to have multiple access points.

3. **EMERGENCY ACCESS:** An access that does not serve buildings and is being provided for emergency vehicles only, such as access into wildland areas. This type of access is not intended for public use.

1. GENERAL

A. Plan Submittal

- 1) Two copies of legible, scaled site and elevation plans which include:
 - a) Identification of gates and setbacks, Knox switches and boxes, automatic exit loops and nearby fire hydrants, fire department connections and fire sprinkler valves.
 - b) Gate construction details and identification of the type of material used. (Wrought iron, chain link, wood, etc.)
 - c) Details of locking devices, electric operators and battery back-up (if required).
 - d) Exiting spikes or similar devices require a submittal with details and must be approved by the Fire Prevention Division.
 - e) Provide Emergency Release Information should main power fail.

B. Knox System

A Fire Department "Knox System" enables emergency responders to access locked gates during emergencies and is required on all gates whether public or private.

- 1) All orders for Knox system key switches, locks and boxes must be on a current official Knox Company Application/Order form signed by the fire district.
- 2) Applications may be obtained from the Fire Prevention Division, or by calling (805) 681-5523.

C. Parking

- 1) Parking shall not obstruct any of the requirements of this Standard. No parking signs may be required.

D. Easements

- 1) All gate components must be in recorded easements, including location of any gate in the open position.

****Exception:** Gates serving a Single Family Dwelling on private property where no easements are recorded.

2. REQUIREMENTS

A. Private Driveway (Serving One to Four Family Dwellings)

- 1) When a driveway is serving 4 or fewer single family dwellings and the driveway is required for fire department access, all gates shall have a minimum clear open width of not less than the required driveway width.
- 2) Gates may be of the lift, swing, or sliding type.
- 3) Electric gates shall be equipped with a Knox electric switch (with dust cover) in an approved location.
- 4) Locking device must operate in a "fail safe" mode so that the gates unlock and can be operated manually when electrical service is interrupted.
- 5) Manual gates may be equipped with a Knox padlock or private padlock. The key to a private padlock shall be located in a Knox key box in an approved location.
- 6) Gates for private driveways shall be situated to provide a minimum of 30 feet from the intersecting road. (See Exhibit A.)
- 7) Gates shall be constructed to allow manual operation by one person.
- 8) Battery backup is not required but is strongly recommended.

B. Access Gate for Gated Communities

- 1) When a single road is provided for ingress and egress, the minimum clear open gate width shall not be less than the required road width. (See Exhibit B.)
- 2) When there is one road for ingress and one for egress, each gate shall have a minimum clear open width of 15 feet. (See Exhibit C.) Note: Depending upon number of homes served, increased widths may be required.
- 3) Gates shall be electrically operated and may be of the swing or sliding type. Manual gates are not allowed.
- 4) Each gate shall be provided with a Knox electric switch (with dust cover) on the ingress side, in an approved location, for emergency personnel use.

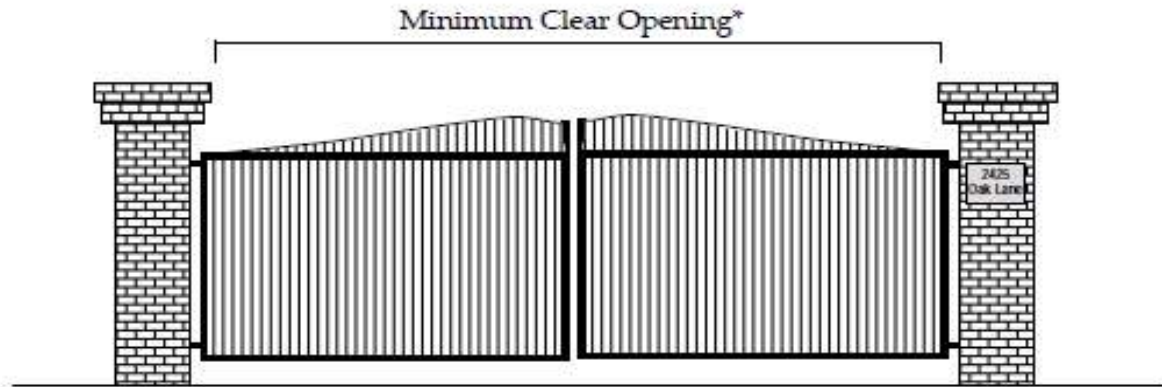
- 5) An automatic exit loop shall be provided for the egress side of the gate.
- 6) No other locks or latches shall be installed on gates.
- 7) Gates (both ingress and egress sides) shall be equipped with a battery back-up. In the event of a power failure, the gates shall open and remain open until power is restored.
- 8) Gate placement shall not encroach into the required 40 foot turning radius or interfere with the use of fire protection equipment; i.e. fire hydrants, fire department connections, fire sprinkler valves, etc.
- 9) Entry gates shall be situated to provide a minimum of 40 feet of storage for entering vehicles to stack without interfering with through traffic from the intersecting road.
- 10) Provisions for turning around vehicles must be provided when entry is denied.
- 11) All gate components shall be maintained in an operative condition at all times and shall be replaced or repaired when defective.
- 12) A semi-annual test of the battery back-up system shall be performed and a record kept on file.

C. Emergency Access Gates(s)

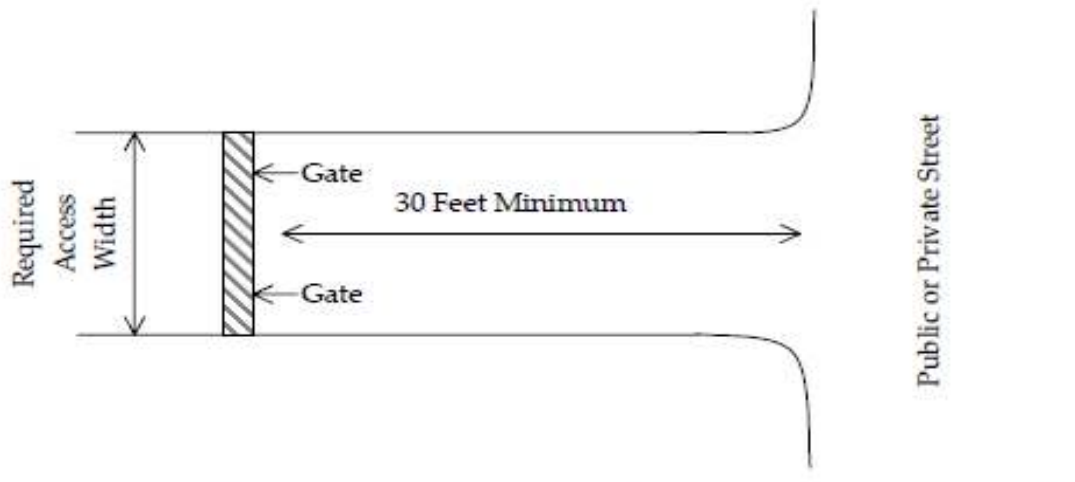
- 1) Minimum clear open gate width shall be 15 feet.
- 2) Gates may be of the swing or sliding type.
- 3) Electric gates shall be equipped with a Knox electric switch (with dust cover). A Knox switch shall be installed on both sides of the gate in an approved location.
 - a) Electric gates must operate in a "fail safe" mode so that the gates unlock and can be operated manually when electrical service is interrupted.
- 4) Manual gates shall be locked with a Knox padlock (weather proofed).
- 5) Gates shall be constructed to allow manual operation by one person.

NOTE: The Fire Chief is authorized to approve alternate materials or methods provided that the Chief finds that the proposed design, use or operation satisfactorily complies with the intent of the Fire Code.

PRIVATE DRIVEWAY - SINGLE FAMILY DWELLINGS



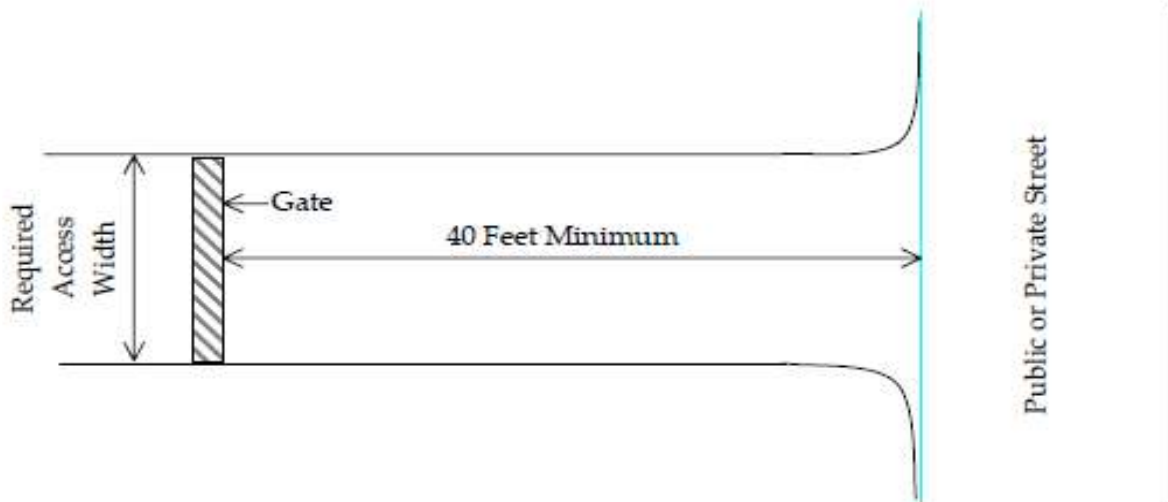
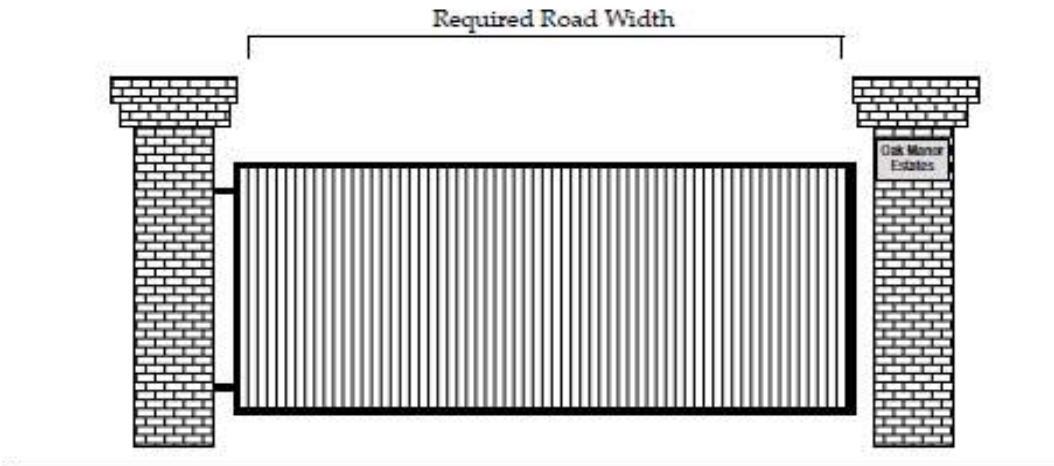
Driveways serving one residential dwelling are required to have a minimum width of 12 feet. Driveways serving two residential dwellings are required to have a minimum width of 16 feet. Driveways serving three to four residential dwellings are required to have a minimum width of 20 feet.



1. Minimum clear opening gate width shall not be less than the required driveway width.
2. Entry gates shall be set back from the nearest curb line of any public or private street to provide a minimum 30 feet of storage for a fire engine to stage without interfering with through traffic.

EXHIBIT A

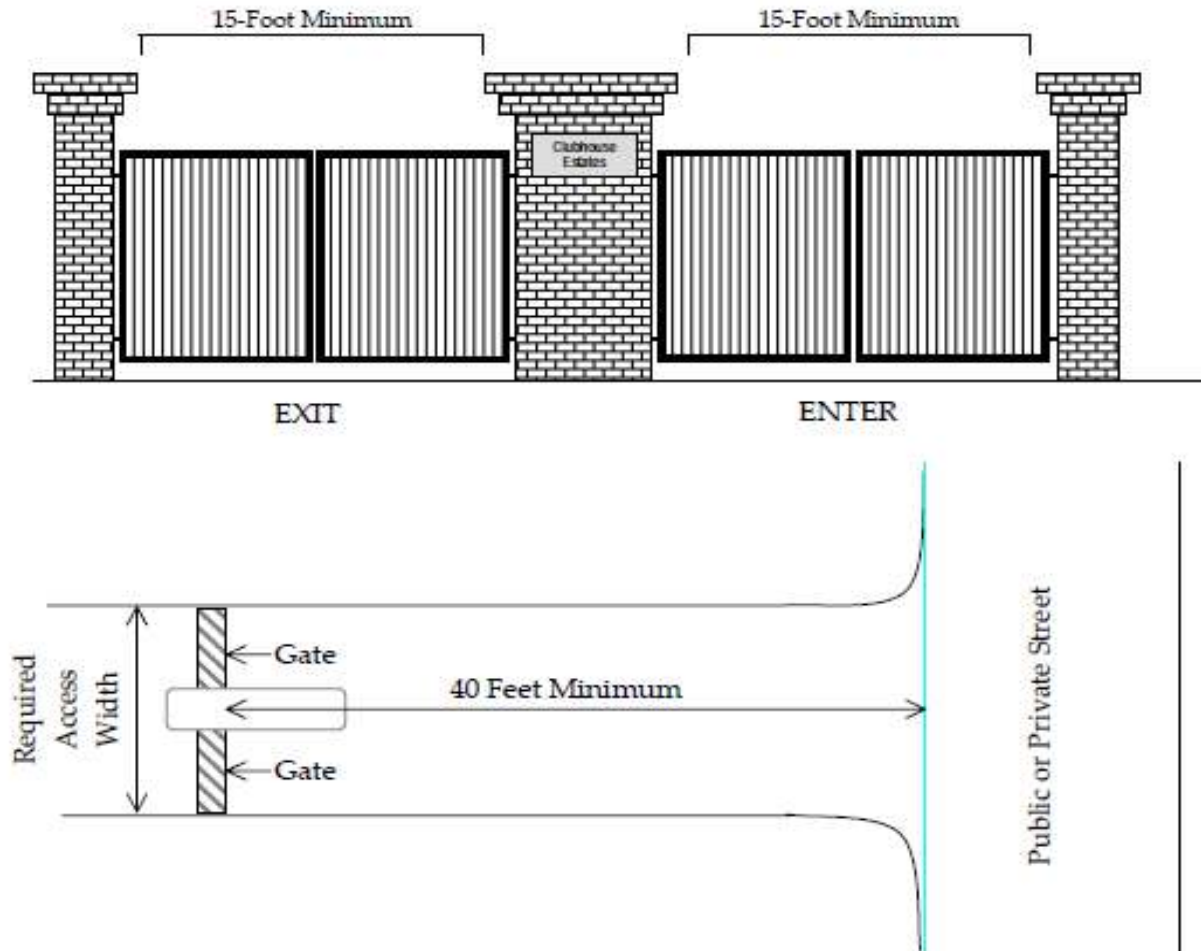
SINGLE GATE EXAMPLE FOR GATED COMMUNITIES (SUBDIVISIONS)



1. Minimum clear opening gate width shall not be less than the required road width.
2. Entry gates shall be set back from the nearest curb line of any public street to provide a minimum 40 feet of storage for entering vehicles to stack without interfering with through traffic.

EXHIBIT B

DOUBLE GATE EXAMPLE FOR GATED COMMUNITIES (SUBDIVISIONS)



1. Minimum gate width of 15 feet. The gate shall be constructed so that there is 15 feet of clear access width when the gate is in the open position.
2. Entry gates shall be set back from the nearest curb line of any public street to provide a minimum 40 feet of storage for entering vehicles to stack without interfering with through traffic.

EXHIBIT C

Appendix E General Guidelines for Creating Defensible Space

General Guidelines for Creating Defensible Space

State Board of Forestry and Fire Protection (BOF)
California Department of Forestry and Fire Protection

Adopted by BOF on February 8, 2006
Pending Filing with Office of Administrative Law



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A. Purpose of Guidelines

Recent changes to Public Resources Code (PRC) 4291 expand the defensible space clearance requirement maintained around buildings and structures from 30 feet to a distance of 100 feet. These guidelines are intended to provide property owners with examples of fuel modification measures that can be used to create an area around buildings or structures to create defensible space. A defensible space perimeter around buildings and structures provide firefighters a working environment that allows them to protect buildings and structures from encroaching wildfires as well as minimizing the chance that a structure fire will escape to the surrounding wildland. These guidelines apply to any person who owns, leases, controls, operates, or maintains a building or structure in, upon, or adjoining any mountainous area, forest-covered lands, brush-covered lands, grass-covered lands, or any land that is covered with flammable material, and located within a State Responsibility Area.



Effective defensible space

The vegetation surrounding a building or structure is fuel for a fire. Even the building or structure itself is considered fuel. Research and experience have shown that fuel reduction around a building or structure increases the probability of it surviving a wildfire. Good defensible space allows firefighters to protect and save buildings or structures safely without facing unacceptable risk to their lives. Fuel reduction through vegetation management is the key to creating good defensible space.

Terrain, climate conditions and vegetation interact to affect fire behavior and fuel reduction standards. The diversity of California's geography also influences fire behavior and fuel reduction standards as well. While fuel reduction standards will vary throughout the State, there are some common practices that guide fuel modification treatments to ensure creation of adequate defensible space:

- Properties with greater fire hazards will require more clearing. Clearing requirements will be greater for those lands with steeper terrain, larger and denser fuels, fuels that are highly volatile, and in locations subject to frequent fires.
- Creation of defensible space through vegetation management usually means reducing the amount of fuel around the building or structure, providing separation between fuels, and or reshaping retained fuels by trimming. Defensible space can be created removing dead vegetation, separating fuels, and pruning lower limbs.
- In all cases, fuel reduction means arranging the tree, shrubs and other fuels sources in a way that makes it difficult for fire to transfer from one fuel source to another. It does not mean cutting down all trees and shrubs, or creating a bare ring of earth across the property.
- A homeowner's clearing responsibility is limited to 100 feet away from his or her building or structure or to the property line, whichever is less, and limited to their land. While individual property owners are not required to clear beyond 100 feet, groups of property owners are encouraged to extend clearances beyond the 100 foot requirement in order to create community-wide defensible spaces.
- Homeowners who do fuel reduction activities that remove or dispose of vegetation are required to comply with all federal, state or local environmental protection laws and obtain permits when necessary. Environmental protection laws include, but are not limited to, threatened and endangered species, water quality, air quality, and cultural/archeological resources. For example, trees removed for fuel reduction that are used for commercial purposes require permits from the

California Department of Forestry and Fire Protection. Also, many counties and towns require tree removal permits when cutting trees over a specified size. Contact your local resource or planning agency officials to ensure compliance.

The methods used to manage fuel can be important in the safe creation of defensible space. Care should be taken with the use of equipment when creating your defensible space zone. Internal combustion engines must have an approved spark arresters and metal cutting blades (lawn mowers or weed trimmers) should be used with caution to prevent starting fires during periods of high fire danger. A metal blade striking a rock can create a spark and start a fire, a common cause of fires during summertime.

Vegetation removal can also cause soil disturbance, soil erosion, regrowth of new vegetation, and introduce non-native invasive plants. Always keep soil disturbance to a minimum, especially on steep slopes. Erosion control techniques such as minimizing use of heavy equipment, avoiding stream or gully crossings, using mobile equipment during dry conditions, and covering exposed disturbed soil areas will help reduce soil erosion and plant regrowth.

Areas near water (riparian areas), such as streams or ponds, are a particular concern for protection of water quality. To help protect water quality in riparian areas, avoid removing vegetation associated with water, avoid using heavy equipment, and do not clear vegetation to bare mineral soil.

B. Definitions

Defensible space: The area within the perimeter of a parcel where basic wildfire protection practices are implemented, providing the key point of defense from an approaching wildfire or escaping structure fire. The area is characterized by the establishment and maintenance of emergency vehicle access, emergency water reserves, street names and building identification, and fuel modification measures.

Aerial fuels: All live and dead vegetation in the forest canopy or above surface fuels, including tree branches, twigs and cones, snags, moss, and high brush. Examples include trees and large bushes.

Building or structure: Any structure used for support or shelter of any use or occupancy.

Flammable and combustible vegetation: Fuel as defined in these guidelines.

Fuel Vegetative material, live or dead, which is combustible during normal summer weather. For the purposes of these guidelines, it does not include fences, decks, woodpiles, trash, etc.

Homeowner: Any person who owns, leases, controls, operates, or maintains a building or structure in, upon, or adjoining any mountainous area, forest-covered lands, brush-covered lands, grass-covered lands, or any land that is covered with flammable material, and located within a State Responsibility Area.

Ladder Fuels: Fuels that can carry a fire vertically between or within a fuel type.

Reduced Fuel Zone: The area that extends out from 30 to 100 feet away from the building or structure (or to the property line, whichever is nearer to the building or structure).

Surface fuels: Loose surface litter on the soil surface, normally consisting of fallen leaves or needles, twigs, bark, cones, and small branches that have not yet decayed enough to lose their identity; also grasses, forbs, low and medium shrubs, tree seedlings, heavier branches and downed logs.

C. Fuel Treatment Guidelines

The following fuel treatment guidelines comply with the requirements of 14 CCR 1299 and PRC 4291. All persons using these guidelines to comply with CCR 1299 and PRC 4291 shall implement General Guidelines 1., 2., 3., and either 4a or 4b., as described below.

General Guidelines:

1. Maintain a firebreak by removing and clearing away all flammable vegetation and other combustible growth within 30 feet of each building or structure, with certain exceptions pursuant to PRC §4291(a). Single specimens of trees or other vegetation may be retained provided they are well-spaced, well-pruned, and create a condition that avoids spread of fire to other vegetation or to a building or structure.
2. Dead and dying woody surface fuels and aerial fuels within the Reduced Fuel Zone shall be removed. Loose surface litter, normally consisting of fallen leaves or needles, twigs, bark, cones, and small branches, shall be permitted to a depth of 3 inches. This guideline is primarily intended to eliminate trees, bushes, shrubs and surface debris that are completely dead or with substantial amounts of dead branches or leaves/needles that would readily burn.
3. Down logs or stumps anywhere within 100 feet from the building or structure, when embedded in the soil, may be retained when isolated from other vegetation. Occasional (approximately one per acre) standing dead trees (snags) that are well-space from other vegetation and which will not fall on buildings or structures or on roadways/driveways may be retained.
4. Within the Reduced Fuel Zone, one of the following fuel treatments (4a. or 4b.) shall be implemented. Properties with greater fire hazards will require greater clearing treatments. Combinations of the methods may be acceptable under §1299(c) as long as the intent of these guidelines is met.

4a. Reduced Fuel Zone: Fuel Separation

In conjunction with General Guidelines 1., 2., and 3., above, minimum clearance between fuels surrounding each building or structure will range from 4 feet to 40 feet in all directions, both horizontally and vertically.

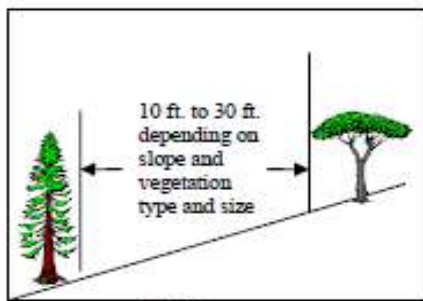
Clearance distances between vegetation will depend on the slope, vegetation size, vegetation type (brush, grass, trees), and other fuel characteristics (fuel compaction, chemical content etc.). Properties with greater fire hazards will require greater separation between fuels. For example, properties on steep slopes having large sized vegetation will require greater spacing between individual trees and bushes (see Plant Spacing Guidelines and Case Examples below). Groups of vegetation (numerous plants growing together less than 10 feet in total foliage width) may be treated as a single plant. For example, three individual manzanita plants growing together with a total foliage width of eight feet can be "grouped" and considered as one plant and spaced according to the Plant Spacing Guidelines in this document.



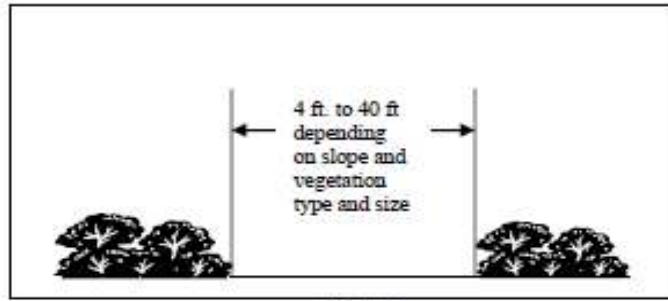
Grass generally should not exceed 4 inches in height. However, homeowners may keep grass and other forbs less than 18 inches in height above the ground when these grasses are isolated from other fuels or where necessary to stabilize the soil and prevent erosion.

Clearance requirements include:

- Horizontal clearance between aerial fuels, such as the outside edge of the tree crowns or high brush. Horizontal clearance helps stop the spread of fire from one fuel to the next.



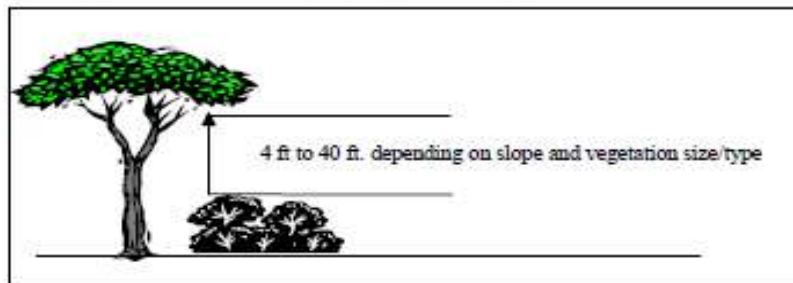
Trees



Shrubs

Horizontal clearance between aerial fuels

- Vertical clearance between lower limbs of aerial fuels and the nearest surface fuels and grass/weeds. Vertical clearance removes *ladder fuels* and helps prevent a fire from moving from the shorter fuels to the taller fuels.



Vertical clearance between aerial fuels



*Effective vertical and horizontal fuel separation
Photo Courtesy
Plumas Fire Safe Council*

Plant Spacing Guidelines

Guidelines are designed to break the continuity of fuels and be used as a "rule of thumb" for achieving compliance with Regulation 14 CCR 1299.

Trees	Minimum horizontal space from edge of one tree canopy to the edge of the next	
	Slope	Spacing
	0% to 20 %	10 feet
	20% to 40%	20 feet
	Greater than 40%	30 feet
Shrubs	Minimum horizontal space between edges of shrub	
	Slope	Spacing
	0% to 20 %	2 times the height of the shrub
	20% to 40%	4 times the height of the shrub
	Greater than 40%	6 times the height of the shrub
Vertical Space	Minimum vertical space between top of shrub and bottom of lower tree branches: 3 times the height of the shrub	

Adapted from: Gilmer, M. 1994. California Wildfire Landscaping

Case Example of Fuel Separation: Sierra Nevada conifer forests

Conifer forests intermixed with rural housing present a hazardous fire situation. Dense vegetation, long fire seasons, and ample ignition sources related to human access and lightning, makes this home vulnerable to wildfires. This home is located on gentle slopes (less than 20%), and is surrounded by large mature tree overstory and intermixed small to medium size brush (three to four feet in height).

Application of the guideline under 4a. would result in horizontal spacing between large tree branches of 10 feet; removal of many of the smaller trees to create vertical space between large trees and smaller trees and horizontal spacing between brush of six to eight feet (calculated by using 2 times the height of brush).



Case Example of Fuel Separation: Southern California chaparral

Mature, dense and continuous chaparral brush fields on steep slopes found in Southern California represents one of the most hazardous fuel situations in the United States. Chaparral grows in an unbroken sea of dense vegetation creating a fuel-rich path which spreads fire rapidly. Chaparral shrubs burn hot and produce tall flames. From the flames come burning embers which can ignite homes and plants. (Gilmer, 1994). All these factors results in a setting where aggressive defensible space clearing requirements are necessary.



Steep slopes (greater than 40%) and tall, old brush (greater than 7 feet tall), need significant modification. These settings require aggressive clearing to create defensible space, and would require maximum spacing. Application of the guidelines would result in 42 feet horizontal spacing (calculated as 6 times the height of the brush) between retained groups of chaparral.

Case Example of Fuel Separation: Oak Woodlands

Oak woodlands, the combination of oak trees and other hardwood tree species with a continuous grass ground cover, are found on more than 10 million acres in California. Wildfire in this setting is very common, with fire behavior dominated by rapid spread through burning grass.

Given a setting of moderate slopes (between 20% and 40%), wide spacing between trees, and continuous dense grass, treatment of the grass is the primary fuel reduction concern. Property owners using these guidelines would cut grass to a maximum 4 inches in height, remove the clippings, and consider creating 20 feet spacing between trees.



4b. Reduced Fuel Zone: Defensible Space with Continuous Tree Canopy

To achieve defensible space while retaining a stand of larger trees with a continuous tree canopy apply the following treatments:

- Generally, remove all surface fuels greater than 4 inches in height. Single specimens of trees or other vegetation may be retained provided they are well-spaced, well-pruned, and create a condition that avoids spread of fire to other vegetation or to a building or structure.
- Remove lower limbs of trees ("prune") to at least 6 feet up to 15 feet (or the lower 1/3 branches for small trees). Properties with greater fire hazards, such as steeper slopes or more severe fire danger, will require pruning heights in the upper end of this range.

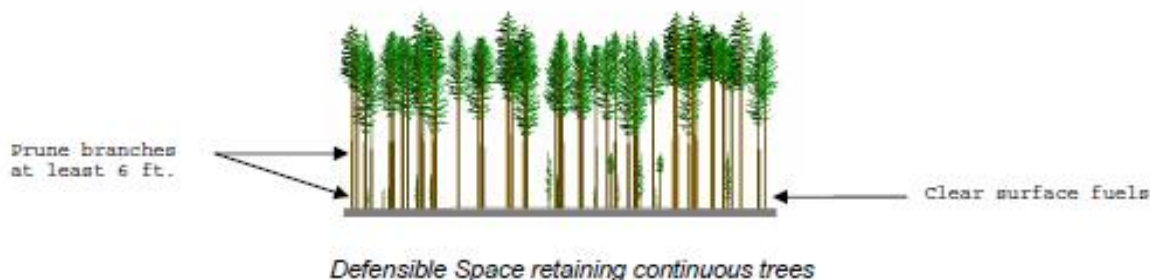


Photo Courtesy Phumas Fire Safe Council.



Defensible space with continuous tree canopy by clearing understory and pruning

Authority cited: Section 4102, 4291, 4125-4128.5, Public Resource Code. Reference: 4291, Public Resource Code; 14 CCR 1299 (d).

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**Appendix F
City of Goleta
Existing Fuel Treatments**

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TABLE 1
GOLETA PARKS AND OPEN SPACE AREAS – FUEL TREATMENT ACTIVITIES (FEBRUARY 2011)
 Table prepared and maintained by Anne Wells, Goleta Advance Planning Manager and Bill Millar, Goleta Manager of Parks & Open Space.

Assessor's Parcel Number	Map#	Name	Park Type	Acres	Description	Fuel Treatment Description
079-570-046	1	San Miguel	Neighborhood Park	2.71	0.52-acre lawn; timber play structure; picnic areas	N/A
079-600-061 079-600-060	1	San Miguel Open Space	Neighborhood Open Space	3.07	Creek with bridge crossing; picnic areas	<u>Timing:</u> March/April & June* <u>Treatments Types:</u> Mowing adjacent to creek, pruning for clearance. <u>Treatment Locations:</u> All
079-344-014	2	Winchester II	Neighborhood Park	1.20	0.7-acre lawn; swing set; softball backstop; play field; 2 picnic tables	N/A
079-371-005	3	Winchester I	Neighborhood Park	1.14	0.20-acre lawn; playground; merry-go-round; 2 picnic tables; footbridge	N/A
079-383-013 079-120-036	4	Winchester I Open Space	Neighborhood Open Space	3.9	Undeveloped	<u>Timing:</u> March/April & June* <u>Treatments Types:</u> Mowing & Shrub/ Tree Maintenance <u>Treatment Locations:</u> All
079-382-005	5	Blandon	Neighborhood Open Space	2.22	Undeveloped field	<u>Timing:</u> March/April <u>Treatments Types:</u> Mowing
079-121-011 079-121-012 079-121-013	6	Evergreen Acres	Community Park	28.72	3.47-acre lawn; 2 tennis courts; 18-hole disc golf course; 1 bench; 3 foot- bridges; playing field; softball backstop; walkways; playground; 2 picnic tables; 1 portable restroom	<u>Treatment Locations:</u> 3.0 Acres <u>Timing:</u> March/April and June* <u>Treatments Types:</u> Mowing, Tree Maintenance <u>Treatment Locations:</u> 25 Acres
079-560-008 079-560-009	7	Koarts Apartments	Neighborhood Open Space	6.60	Open field	<u>Timing:</u> March/April and June* <u>Treatments Types:</u> Mowing, Minor Tree Work <u>Treatment Locations:</u> All
079-110-045	8	Koarts Apartments	Neighborhood Open Space	0.34	Undeveloped sloping hillside	N/A
077-391-011	9	Bella Vista III	Neighborhood Park	0.77	Undeveloped road shoulder	N/A
077-351-001	10	Bella Vista I & II	Neighborhood Park	3.50	2.87-acre lawn; playground; 2 foot- bridges; 8 picnic tables; walkway; bench	N/A
077-121-022 077-121-023	11	Glen Anne at Del Norte	Neighborhood Open Space	0.99	Undeveloped	<u>Timing:</u> March/April <u>Treatments Types:</u> Mowing <u>Treatment Locations:</u> All
077-160-061	12	Lake Los Carreros Natural	Regional Open Space	139.99	22-acre lake; hiking paths; elevated boardwalk over lake; 3 benches; 2	<u>Timing:</u> March/April

TABLE 1
GOLETA PARKS AND OPEN SPACE AREAS – FUEL TREATMENT ACTIVITIES (FEBRUARY 2011)

Table prepared and maintained by Anne Wells, Goleta Advance Planning Manager and Bill Millar, Goleta Manager of Parks & Open Space.

Assessor's Parcel Number	Map#	Name and Historical Preserve (Including Slow House)	Park Type	Acres	Description	Fuel Treatment Description
077-160-009	13	Slow Grove Park	Community Park	11.10	portable toilets; George Adams picnic area with 3 tables; 1 bench, earth dam; Slow House Museum; Goleta Train Depot Railroad Museum	<u>Treatments Types:</u> Mowing, Tree and Shrub Maintenance <u>Treatment Locations:</u> All
077-381-011	14	Stonebridge	Neighborhood Open Space	2.80	0.45-acre lawn; soccer field; ball diamond, volleyball courts; horseshoe pits; swing sets; reservation group BBQ areas; children's picnic tables; asidwood groves	N/A
077-331-017	15	Slow Tennis Courts	Community Park	2.88	Parallais San Pedro Creek; undeveloped; hiking trail	<u>Timing:</u> March/April & June* <u>Treatments Types:</u> Mowing, Tree and Shrub Maintenance <u>Treatment Locations:</u> All
077-470-052 077-470-051 077-480-082 077-480-084	16	La Goleta	Neighborhood Open Space	6.13	0.74-acre lawn; 2 tennis courts; 1 bench	N/A
069-391-001 069-380-001 069-401-001	17	Oro Verde	Neighborhood Open Space	2.85	Parallais Las Vegas Creek; undeveloped	<u>Timing:</u> Mow 4 times a year and trees in June* <u>Treatments Types:</u> Mowing, Tree and Shrub Maintenance <u>Treatment Locations:</u> 6.0 Acres
069-380-011 069-392-008	18	Oro Verde	Neighborhood Open Space	4.70	Undeveloped	<u>Timing:</u> 4 times a year <u>Treatments Types:</u> Weed Wack, Tree and shrub Maintenance <u>Treatment Locations:</u> All
069-382-001 069-483-003	19	Andamar	Neighborhood Park	2.45	Undeveloped	<u>Timing:</u> Mowing 4 times a year, June* <u>Treatments Types:</u> Mowing, Tree & Shrub Maintenance <u>Treatment Locations:</u> All
069-322-011 069-413-010	20	Emerald Terrace Tennis Courts	Community Park	4.20	1.0-acre lawn; play equipment; 1 picnic table	<u>Timing:</u> March/April & June* <u>Treatments Types:</u> Mowing <u>Treatment Locations:</u> 1.45 acres
069-142-038 069-142-039 069-153-001	21	San Jose Creek	Neighborhood Open Space	4.97	1.49-acre lawn; 2 handicap-accessible tennis courts; swings; 2 picnic tables; 4 benches	N/A
071-090-080	22	Armillos Park	Neighborhood Park	1.53	Parallais San Jose Creek; undeveloped	<u>Timing:</u> Mow 4 times a year and trees in June* <u>Treatments Types:</u> Mowing, Tree & Shrub Maintenance <u>Treatment Locations:</u> All
					Parallais San Jose Creek; undeveloped	<u>Timing:</u> March/April

TABLE 1
GOLETA PARKS AND OPEN SPACE AREAS – FUEL TREATMENT ACTIVITIES (FEBRUARY 2011)

Table prepared and maintained by Anne Wells, Goleta Advance Planning Manager and Bill Miller, Goleta Manager of Parks & Open Space.

Assessor's Parcel Number	Map#	Name	Park Type	Acres	Description	Fuel Treatment Description
						<u>Treatments Types:</u> Mowing <u>Treatment Locations:</u> City Defined Areas
071-130-009	23	Community Center	Community Center	9.84	Various adult and children's classes, Headstart, Rainbow Preschool, Boys & Girls Club, lawn with gazebo	N/A
071-081-023	24	Nadarine	Mini Park	0.13	Sandlot with toddler playground equipment and bench	N/A
073-080-050	25	Willow Springs Open Space (private)	Neighborhood Open Space	2.37	For protection of cultural resources	N/A
073-440-020 073-440-021	26	Gresh Park ² (private)	Community Park	24.90	Soccer, soccer, and basketball facilities, grassy open space, community meeting room, play equipment, barbecue-picnic areas	N/A
073-196-023	27	Armstrong	Mini Park	0.46	0.2-acre lawn; swing set; 1 toddler picnic table; 1 picnic table; 2 benches	N/A
073-260-058 073-230-049 073-240-058 073-260-021	28	University Village	Neighborhood Park	3.16	1.74-acre lawn; footbridge over drainage ditch.	N/A
Lot 7, Ellwood Acres No.2	29	Malibita	Mini Park	0.20	Play equipment; picnic table	N/A
079-210-051 079-210-024	30	Ellwood Mesa Open Space/Sparting Preserve	Regional Open Space	136.60	136.6 acres of open space; monarch butterfly habitat sites; extensive trails w/ beach access to Ellwood Beach	<u>Treatment:</u> Work occurs outside the bird nesting/butterfly aggregation season and preferably prior to the first soaking rain unless bird surveys accompany the work. Some limited work occurs in the early part of the rainy season (after the first rain, through mid-December provided that at least one week of dry weather occurs). Working from mid-December through the end of February occurs at locations lacking sensitive herbaceous plant species with pre-work biological surveys to determine absence of sensitive species. <u>Treatments Types:</u> Yard Waste Removal; Flammable Invasive Vegetation Removal; Mowing Annual Herbaceous Growth; Removal of Decadent/Dead Shrubs/Tree Stumps; Chipped Material; Tree Pruning
079-396-015 079-210-050 079-445-001 079-491-016 079-442-023 079-491-016	31	Campus Glen	Regional Open Space	7.21	Eucalyptus groves	<u>Treatment Locations:</u> City Defined Areas <u>Treatment Types:</u> Mowing, weed wack for Trail Clearance, Tree Maintenance <u>Treatment Locations:</u> All
079-210-045	32	Coronado	Regional Open	6.83	Monarch butterfly informational markers;	N/A

TABLE 1
GOLETA PARKS AND OPEN SPACE AREAS – FUEL TREATMENT ACTIVITIES (FEBRUARY 2011)
 Table prepared and maintained by Anne Wells, Goleta Advance Planning Manager and Bill Millar, Goleta Manager of Parks & Open Space.

Assessor's Parcel Number	Map# ¹	Name	Park Type	Acres	Description	Fuel Treatment Description
079-322-001 079-332-014	33	Preserve ^a (private) Ellwood Mesa Open Space (North 1)	Space Neighborhood Open Space	4.83	small circular theatre sitting area 0.15-acre lawn; playground; 1 picnic table	<u>Timing:</u> March/April & June ^a <u>Treatments Types:</u> Mowing, weed wack for Trail Clearance, Tree Maintenance <u>Treatment Locations:</u> All
079-321-001 079-355-009	33	Ellwood Mesa Open Space (Campus Glen North 2)	Neighborhood Open Space	1.24	Eucalyptus groves	<u>Timing:</u> March/April & June ^a <u>Treatments Types:</u> Mowing, weed wack for Trail Clearance, Tree Maintenance <u>Treatment Locations:</u> All
079-210-067	34	Ellwood Mesa Open Space	Regional Open Space	91.7	91.7 acres of open space; coastal vista, trails; bluff top, shoreline, and public parking lot	<u>Timing:</u> Work occurs outside the bird nesting/butterfly aggregation season and preferably prior to the first soaking rain unless bird surveys accompany the work. Some limited work occurs in the early part of the rainy season (after the first rain, through mid-December provided that at least one week of dry weather occurs). Working from mid-December through the end of February occurs at locations lacking sensitive herbaceous plant species with pre-work biological surveys to determine absence of sensitive species. <u>Treatments Types:</u> Yard Waste Removal; Flammable Invasive Vegetation Removal; Mowing Annual Herbaceous Growth; Removal of Decadent/Dead Shrubs/Tree Stumps; Chipped Material; Tree Pruning <u>Treatment Locations:</u> City Defined Areas.
NA	35	Haskell's Beach	Regional Open Space	NA	Pacific shoreline and beach	<u>N/A</u>
079-200-013	36	Haskell's Beach Access (private)	Regional Open Space	0.89	50 space public parking lot with beach access walkway	<u>N/A</u>

Footnote 1: The map identification number corresponds to Figure 3-2 Parks and Recreation Plan Map of the General Plan Open Space Element.

- * Tree or shrub maintenance may occur earlier than June after a determination that protected species will not be affected consistent with the City's General Plan/Coastal Land Use Plan.