COMMUNITY WILDFIRE PROTECTION PLAN FOR FORESTA, CA

Prepared by
Wildland Fire Associates
Rangely, Colorado

Community Wildfire Protection Plan

For

Foresta, California

"...Foresta is a state of mind; a solid core of refuge, beauty and peace where heart, spirit and body are content. It is beckoning woods in which to lose one's troubles and, maybe, one's self. It is a breezy, grassy meadow green as heaven. It's a limpid pool with limpid, yet elusive trout. It is picturesque barns and rail fences. It is blue-green mountains, horizons and infinity. It is the real world."

- Shirley Sargent, from her book, "Yosemite's Rustic Outpost: Foresta - Big Meadow."

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Disclaimer

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Community Wildfire Protection Plan

For

Foresta, California

Submitted by: _____ Date: _____
Dan O'Brien, Project Leader
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Concur: _____ Date: _____
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Mariposa County Fire Safe Council

Concur: _____ Date: _____
Mariposa County Sheriff's Department

Concur: _____ Date: _____
USDA Forest Service, Stanislaus National Forest

Concur: _____ Date: _____

Concur: _____ Date: _____

Accepted: _____ Date: _____
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1.0 Executive Summary

Foresta, located in Mariposa County, is a small community situated in Yosemite National Park to the west and somewhat north of Yosemite Valley.

Prior to the arrival of European-Americans, wildland fire played a significant role in determining stand composition and in the perpetuation of native plant communities. The influence of wildland fire was disrupted with the arrival of early settlers into the area. The consequences of logging, grazing, and fire suppression have lead to a more or less even-aged stand of mixed conifer, an accumulation of forest fuels on the ground, and an increase in tree stand density. Another consequence is the forest composition has changed from one that was adapted to wildland fire to one that is more prone to catastrophic wildfire.

As demonstrated by the A Rock and the Steamboat Fires that occurred in 1990, under the right set of conditions Foresta is susceptible to a large-scale, stand-replacing wildfire that is capable of consuming all in its path. A wildfire of the magnitude experienced during 1990 has the potential to place firefighters and the public at risk, and destroy homes, businesses, and other public and private property.

The National Park Service has taken action to treat fuels within and create a shaded fuel break around Foresta. This action and proposed future actions will decrease the threat to the community from wildland fires originating outside of the developed area.

Most of the homeowners in the community are actively practicing the mitigation measures recommended by Fire Safe[1]. However, other homeowners have taken little or no action to protect their properties from wildland fire. The inconsistent application of *Fire Safe* mitigation measures places the entire community at increase risk from wildfire.

In recognition of these and other factors, Yosemite National Park issued a contract to Wildland Fire Associates of Rangely, Colorado, to conduct an analysis of the wildland fuels and other pertinent factors in the area and to recommend a course of action. A key element of the planning process was to enlist the participation of the community and other stakeholders. To initiate the process, the Park scheduled a series of meetings, which were attended by a contingent of homeowners from the community. The contractor also contacted stakeholders and potential partners in person or by telephone.

The purpose of this document is to provide the community and stakeholders with an overview of existing wildland fuel conditions, share preliminary findings, and recommend a possible course of action that will lessen the impacts of a wildland fire to the community. The overall goal is to provide for the safety and well being of the public and wildland firefighters and to provide a wildland fire community protection plan that will be supported and implemented by the stakeholders**.**

[1] To learn more about Fire Safe go to http://www.firesafecouncil.org/

2.0 Introduction

2.1 Policy Guidance

Though wildland fires play an integral role in many forest and rangeland ecosystems, decades of efforts directed at extinguishing every fire that burned on public lands have disrupted the natural fire regimes that once existed. Moreover, as more and more communities develop and grow in areas that are adjacent to fire-prone lands in what is known as the *w*ildland-urban interface, wildland fires pose increasing threats to people and their property (USDI/USDA FS 2000).

The National Fire Plan (NFP) was developed in August 2000, following a landmark wildland fire season, with the intent of actively responding to severe wildland fires and their impacts to communities while ensuring sufficient firefighting capacity for the future. The NFP addresses five key points: Firefighting, Rehabilitation, Hazardous Fuels Reduction, Community Assistance, and Accountability (USDI/USDA FS 2000).

Congress, the Administration, States, Tribes, local governments, and many others throughout the country recognized that achieving the key points outlined in the NFP was a long-term challenge. A series of strategy documents, the Healthy Forests Imitative, and the Healthy Forests Restoration Act provided the framework necessary to lessen risks to people, and restore forest and rangeland health by addressing hazardous fuel build up on public lands and reducing the risks of unwanted impacts of wildland fire.

Reducing risks of unwanted impacts of wildland fires requires a mix of actions as set out in the May 2002 plan, *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy*. This comprehensive strategy includes 1) improving targeted fire prevention and suppression; 2) reducing hazardous fuels; 3) restoring fire-adapted ecosystems; and 4) involving communities in reducing risks from wildland fires. Three key principles: prioritization, collaboration, and accountability guide the efforts to achieve these four goals.

A fourth principle, coordination, was added when the U.S. Department of the Interior and the U.S. Department of Agriculture (USDA) prepared a joint strategy for addressing hazardous fuels to reduce the risk of catastrophic wildland fires on more than 180 million acres of public forests, woodlands, and rangelands. The 60-page report, *Protecting People and Natural Resources – A Cohesive Fuels Treatment Strategy*, outlines a coordinated approach to fuels treatment adopted by the five major federal land management agencies: Bureau of Indian Affairs, Bureau of Land Management, U.S. Fish and Wildlife Service, National Park Service, and USDA Forest Service (USDI/USDA FS 2006). It describes practices that have worked since the agencies began collaborating on the strategy and establishes a framework for future priority-setting, accountability, and

partnership to reduce the fuel buildup that leads to fires. Four principles guide the strategy:

1. **Prioritization**: first priority should be given to the wildland urban interface (WUI) and second, areas outside the WUI. Priority treatments must concentrate on sites where vegetation is most likely to support catastrophic fires that threaten vital resources or locations of particular value to local communities. In addition, non-WUI treatments must be applied to areas where fuel loads could quickly increase to dangerous levels without active management.

2. **Coordination**: coordinating land management activities, including fuels reduction, timber sales, insect and disease eradication, habitat improvement, watershed improvement and other vegetation management activities, is key to maximizing their combined benefits toward overall fuels management objectives and achieving a well coordinated fuels management program.

3. **Collaboration**: each year's federal program should increasingly reflect input from, and priorities of, local, Tribal and State interests.

4. **Accountability**: the strategy builds in accountability through an approved monitoring plan and state-of-the-art geographic information system, assuring continued improvement in the ability of federal land managers to systematically track and support program planning, implementation, and effectiveness.

The strategy outlined in the document provides a strategic and realistic approach for reducing fuels on federal lands by focusing on specific goals that address the multiple factors that influence fuels treatments and by working collaboratively to achieve them. This plan incorporates these key principles.

The Cohesive Fuels Treatment Strategy aims to lessen risks from catastrophic wildland fires by reducing hazardous fuels build-up in forest and woodlands, and by reducing threats from flammable invasive species in rangelands, with an emphasis on protecting communities.

2.2 Background and History of Accomplishments

Foresta was platted and developed prior to the creation of Yosemite National Park (Park), serving primarily as a wilderness retreat. During the summer of 1990, Foresta and the surrounding area were heavily impacted by a catastrophic, stand-replacing wildland fire, which destroyed the majority of the homes in this small, predominately recreational and residential community. Many of the homes that were lost in the fire have been rebuilt. The once tall stand of mixed conifer that dominated the area has been replaced with stands of immature pine and brush as the land begins to recover from the fire.

Starting in the late 1990's, in an effort to provide defensible space for the community, the Park initiated and completed fuels reduction projects totaling 210 acres. The Park treated

stands of trees along the main access road and created at least a 300-foot buffer around buildings and structures. The work was accomplished primarily by using chainsaws to thin the dense stands of conifers and brush and piling and burning the residue. The Park also contracted with a private company in 2005 to evaluate the effectiveness of two types of masticators to treat dead and downed trees and other ground fuels. The Mariposa Chapter of the Fire Safe Council thinned brush along both sides of the entrance road, and individual homeowners have worked to remove brush and other debris from around their buildings and structures and are working to meet the new State defensible space requirements. Maps (Figures 7 and 8) indicating the location of the projects completed by the Park and others can be found in section 8.4 On-Going Fuel Treatment Projects.

The process to develop a Community Wildfire Protection Plan (CWPP) for Foresta was initiated by the Park and kicked off with a series of meetings attended by officers of the Foresta Preservation Association and a community meeting held July 2, 2006, at Foresta that was facilitated by Wildland Fire Associates.

The A-Rock Fire (1990) changed the vegetation composition from a closed stand of mature mixed conifer to one of immature pine seedlings and brush, with dead and down materials. Photo: Wildland Fire Associates.

2.3 Group Mission

The area is served by the Mariposa County Fire Safe Council, an umbrella organization that serves the entire county. Currently, there is not a local chapter of the Fire Safe Council that serves Foresta. The president of the Foresta Preservation Association was approached by the Park to determine their interest in developing a Community Wildfire Protection Plan for Foresta. The Park and the Association agreed to jointly participate in the development of this document. As part of the Association's annual summer meeting held July 2, 2006, the contractor proposed a framework for the plan and suggested a set of goals and objectives to achieve an adequate level of protection for people and property from the impacts of unwanted wildland fires.

The goals of this plan are to:

1. Identify stakeholders, encourage their participation, and define the roles they will play in the protection of the community from the impacts of a wildland fire;

2. Identify wildland fuels management projects in priority order and recommend methods of managing wildland fuels that are both beneficial and acceptable to the community and other stakeholders;

3. Identify other issues and projects that must be addressed to ensure the safety and well being of members of the community and wildland fire fighters; and

4. Provide a wildland fire community protection plan that will be supported and implemented by the stakeholders.

In order to accomplish these goals, the contractor used a uniformly applied assessment method to identify tools and projects for the community that will:

- Reduce hazardous fuel accumulations on wild lands within and adjacent to the community;
- Restore the health and natural processes in forest ecosystems within the project area;
- Reduce the risk of wildland fire impacting the community originating on adjacent federal lands and from within the community;
- Address wildland/urban interface issues on a landscape scale that is consistent across jurisdictional boundaries;
- Include broad representation and input from affected stakeholders; and
- Support future hazard fuel treatment efforts by identifying, analyzing and summarizing wildland fuels, fire hazards, ignition risks, economic/resource values, and past, current, and future fuel treatment projects in the vicinity of Foresta.

The analysis based on the following elements:

- A wildland fire ignition risk assessment and cause analysis;
- A wildland fuels hazard assessment;
- A description of wildland fuels, fuel models, fire regime and condition class;

- Natural resource values and economic assets at risk to wildland fire; and
- The vulnerability of structures to wildland fire.

2.4 Methodology

This plan was initiated by the Park to determine what actions should be taken to better protect Foresta from the impacts of a catastrophic wildland fire. The Park issued a contract to Wildland Fire Associates, LLC (WFA) of Rangely, Colorado, to conduct an analysis of the wildland fuels and other pertinent factors in the area and recommend a course of action.

Over the course of the summer and fall of 2006 and the first 6 months of 2007, wildland fire specialists from WFA conducted a series of meetings, and telephone conversations were held with various stakeholders to gain information relating to the project. Team members spent several days during the summer of 2006 in the field to become familiar with vegetation composition and arrangement, terrain, wildland fire history, and gather other pertinent data.

The data gained from the fieldwork were used to adjust existing fuel data sets in order to more accurately model fire behavior and to develop a prescription to treat the vegetation in the vicinity of the community. The recommended prescription will reduce the stand density so that the forest canopy would be less likely to support a crown fire, and as a result, a crown fire would revert to a surface fire. Also, spot fires ignited in advance of a crown fire would remain a surface fire, which could be more easily and safely attacked by wildland firefighters.

When fully implemented, the desired future conditions identified in the fuels management section of this plan can be expected to afford fire suppression personnel a ninety percent success rate when defending the community against a high-intensity wildland fire. The project will provide for safe and effective fire suppression actions while also considering the esthetic values important to the community and the commercial value of timber in the undeveloped, privately held areas to be treated.

The publication *Preparing a Community Wildfire Protection Plan* (ASF 2004) recommends the development of a community wildfire risk assessment process to help the core team and community members more effectively prioritize areas for treatment and identify highest priority uses for available financial and human resources.

In order to complete a meaningful community assessment, factors such as wildland fuel type and arrangement, risk of wildland fire occurrence, infrastructure and other community values at risk, and local preparedness and firefighting capabilities must be evaluated. RedZone® software, which addresses these key factors, was used by WFA to complete the structural hazard rating assessment of Foresta.

Wildland Fire Associates personnel also facilitated and participated in community meetings to present key elements of the plan and to establish the level of communication necessary to gain support for the plan and to build the consensus necessary to develop a

collaborative fuels treatment program, provide educational opportunities to fully inform homeowners about the *Fire Safe* Program, and finalize and fully implement the community wildfire protection plan for Foresta.

The over-all planning process used by WFA and resulting recommendations recognized the importance of the following premises when developing this plan:

- It is important that the communities and stakeholders fully support the analysis. To successfully compete for and receive grants, the community must be willing and ready, to the extent necessary, to actively participate in each identified project.

- Actions must be taken within the community by individual landowners to improve the safety of firefighters and the public in the event of a wildland fire, and to reduce the likelihood of a fire originating in the community escaping initial attack and threaten nearby structures or other private or public lands.

- The analysis will identify near term and intermediate actions, as well as future treatments and follow-up maintenance activities. It is necessary to recognize the importance of properly sequencing treatments on the landscape by working first around and within the community, and then moving further out into the surrounding landscape.

- It is quite likely, due to limited availability of funding, that the projects or needs identified through this process will be implemented in stages and completed based on established priorities.

- Mitigation measures should be cost effective to the extent possible.

- Treatments initiated by the community and private landowners should complement the fuels treatment work that has been completed to date by others.

This plan is intended to identify landscape-scale hazardous fuel conditions and proposed actions that will mitigate these hazards. The assessment should be reviewed annually or as needed to address demographic and other changes.

3.0 Wildland Fire Safety

3.1 Before the Fire

Certain projects related to wildland fire safety may be included in the listing of recommended projects identified in Chapter 8.

3.1.1 Defensible Space

Defensible space is the area between a house and an oncoming wildland fire where the vegetation has been modified to reduce the wildland fire threat and provide an opportunity for firefighters to effectively defend the house. Creating defensible space means clearing all dry grass, brush, dead leaves, and other flammable material away from one's home. When maintaining the landscape around a house, keep trees and shrubs properly spaced and pruned, remove needle cast, leaves, dead and overhanging branches, maintain the ground cover, mow the lawn regularly, and dispose of cuttings and debris promptly. Additional general information can be found in Appendix B. Specific information can be found in the following sections.

3.1.1.1 Legal Requirements

Recently, California defensible space regulations changed and the area around a house that must be treated has been expanded. An explanation of the new requirements and overview of the program that was adapted from *In the West* April 2006 can be found in Appendix B.

3.1.1.2 Fire-Resistant Landscaping

When landscaping, install fire resistant, drought-tolerant plants that have high moisture content. Use plants that do not accumulate dead leaves or twigs. Add variety to your landscape but avoid the use of exotic plant species or those that are not native to the area.

Keep the landscape healthy and clean. Remove dead branches, leaves and pine needles on a regular basis from around homes. They can serve as added fuel to a fire.

3.1.1.3 Relocation of Flammable Materials

Moving flammable materials such as woodpiles, and locating gas tanks away from structures increases the chance of structures surviving a wildland fire. It is also a good idea to cover woodpiles with tarps, which will prevent embers from blowing into the pile and igniting it. The worst possible location to store firewood is under an open wooden deck. Pine straw should not be allowed to accumulate on roofs and gutters should be cleaned on a regular basis.

3.1.1.4 Recommended Building Materials/FIREWISE (*Fire Safe*) Construction

There are many building materials that will resist a fire far better than others. Replacing wood shingle roofs with metal or composite roof is an example of a common first step. Additional guidance can be found on the Internet at
http://www.firewise.org/resources/files/fw_brochure.pdf

3.1.2 Water Sources

There is no municipal water system or fire hydrants in Foresta. There is a small tank next to the firehouse, which holds approximately 2,000 gallons and a permanent site on the bank of Crane Creek to mount a portable pump to fill the tank. There are additional sites suitable for drafting water from Crane Creek to fill fire engines or fold-a-tanks and other water storage devices. Depending on long-term weather conditions, the stream may have a reduced flow during certain times of the year. Care must be taken to protect fisheries and wildlife. Therefore, the Park should fill the tank in the spring when water levels are high or during other periods of high water.

3.1.3 Neighborhood Emergency Response Teams

Due to the relatively small size of the community and demographics, Foresta does not have a Neighborhood Emergency Response Team. However, at times there may be trained firefighters living in the community.

3.1.4 Personal Tools, Equipment, Fire Protection Clothing

Homeowners should have garden hoses, garden rakes, and shovels handy in the event a wildland fire starts that they could safely suppress in its early stages. The Park should stage a portable pump and kit, such as a Mark III, at the fire house, and train interested homeowners in its use. The pump would be used to fill the tank next to the Fire House.

3.2 During a Wildland Fire Event

Homeowners throughout California and the remainder of the West are learning there are no guarantees that humans or structures will survive a rapidly moving wildland fire. Therefore, it is important to become informed of the various ways to improve the chances for survival during a wildland fire. This information should be discussed with every family member and guest.

Every homeowner should have a plan drawn up well in advance of any emergency. In the plan identify what every family member and guest should do and where they are to go to be safe. Remember to include pets in the planning exercise. Know how to report emergencies and keep emergency numbers near the phone. Knowing what one would do in an emergency prevents undo panic that wastes time or places one in harm's way.

Fish Lake Fire, White River NF, Colorado Photo: Rick Barton

3.2.1 Actions to Take When a Wildland Fire Approaches

There are certain actions that can be taken in the event of a wildland fire that will provide for the safety of the public.

1. Call for help. Dial 911 to report a fire.

2. Close all doors, windows, and other openings to protect the interior from blowing embers during a wildland fire. This includes exterior doors, garage doors, windows, vents, and any other entrances to a residence or garage. Close shutters, heavy drapes, Venetian blinds, or other widow coverings.

3. Have tools and water accessible. Have a shovel, rake, and long water hose readily accessible. If time permits, fill buckets and other bulk containers with water.

4. Wet down the roof. If the roof is combustible, wet it down with a hose. Place the ladder used for this task on the side of the roof opposite the fire and leave it there for fire suppression personnel.

5. Turn off residential fuel at the tank and electricity at the breaker box, if possible.

6. Prepare automobiles. Back as many vehicles as possible into the garage. Then close the garage door. If there is no garage or if the garage is full, park vehicles unlocked with the keys in the ignition so they are heading in the direction of the evacuation route. In the event of evacuation, close the garage door.

7. Evacuate, if conditions or authorities determine it is necessary. If you don't feel comfortable, don't wait for the evacuation order.

3.2.2 Emergency Communications

The Yosemite National Park Emergency Communications Center (ECC) coordinates all emergency response activities for situations occurring within the park boundary and has established procedures for a variety of situations, including structural and wildland fire. Fires can be reported by dialing 911. Cell phone users may want to dial 209.379.1998 or 209.379.1999.

In the event a wildland fire was threatening Foresta, the ECC would request the Reverse 911 system managed by Mariposa County Sheriff's Office be activated for the 379-prefix service area. The Sheriff's Office Dispatch Center is capable of notifying those at Foresta with traditional phone service of the situation (Note: Only 37 of the 47 homes at Foresta have conventional telephones). Park Rangers and members of the Mariposa County Sheriff's Office will also be dispatched to ensure that everyone at Foresta is notified.

Cell phone technology has improved greatly over the past several years; the majority of 911 calls made by cell phone callers are now routed to the closest dispatch center. However, in remote areas in California, 911 calls are sometimes routed to the California Highway Patrol. Foresta Preservation Association should include a message periodically in the association's newsletter reminding residents that when they use their cell phones to reach a 911 operator to report a fire or other emergency, their call may be routed to a dispatch center at another location. In those cases, care must be taken to explain where the caller is located and the agency they are trying to reach.

3.2.3 Evacuation Plan

Part 5 of the *Mariposa County Emergency Operation Plan* spells out the procedures to be followed in the event the Mariposa County Sheriff orders an evacuation. No specific procedures for the evacuation of Foresta have been included by the Sheriff in the current county emergency operations plan. However, there are standard procedures for evacuations listed in the countywide evacuation plan that have been adapted and incorporated into this plan.

3.2.3.1 Evacuation Order

The authority to evacuate an area rests with the Mariposa County Sheriff. The decision to recommend that the area be evacuated is usually made by the Incident Commander in charge of the fire. The request is conveyed to the Sheriff. The Mariposa County Sherriff will determine the method of notice, which may be direct contact and/or reverse 911. Any evacuation order will balance the liability of possible loss of life or property with a desire to warn but not unnecessarily displace residents.

3.2.3.2 Evacuation Procedures

If an evacuation order is issued for Foresta, all residents and guests will assemble at the staging area located at or near Big Meadow, to be accounted for and informed of the evacuation route. The Park should assign a Public Information Officer to assist at the staging area.

3.2.3.3 Emergency Evacuation Route

The Oak Flat Road, which is known to all, is a relatively short distance from Foresta and provides a paved escape route to the north and to the east. Using the Oak Flat Road to escape a wildland fire is much preferable than driving on a primitive road that is unfamiliar to most, especially at night or during the confusion and chaos of a rapidly spreading wildland fire.

3.2.3.4 Safety Zone

Due to ingress and egress issues and the location of the community, it may be necessary for the inhabitants to move to a designated safety zone within the community. A suitable site for a safety zone is located just north of Foresta in Big Meadow. The Park has scheduled a prescribed fire for that area that is expected to improve the site and increase the amount of area available to provide a reasonable expectation of protection during a high-intensity, long-duration wildland fire.

3.2.4 Shelter-in-Place Plan

In addition to moving to a safety zone, there are ways to protect yourself if you have to stay where you are and a fire is rapidly approaching. One of these is staying in your own home. However, many of the houses in Foresta may not be particularly well sited or suited to shelter-in-place. Currently, no shelter-in-place procedures have been established for Foresta. For now, this practice should be discouraged and all residents are encouraged to evacuate the area well in advance of a fire. If evacuation is not a viable option, those still in the community should move to the Safety Zone in Big Meadow.

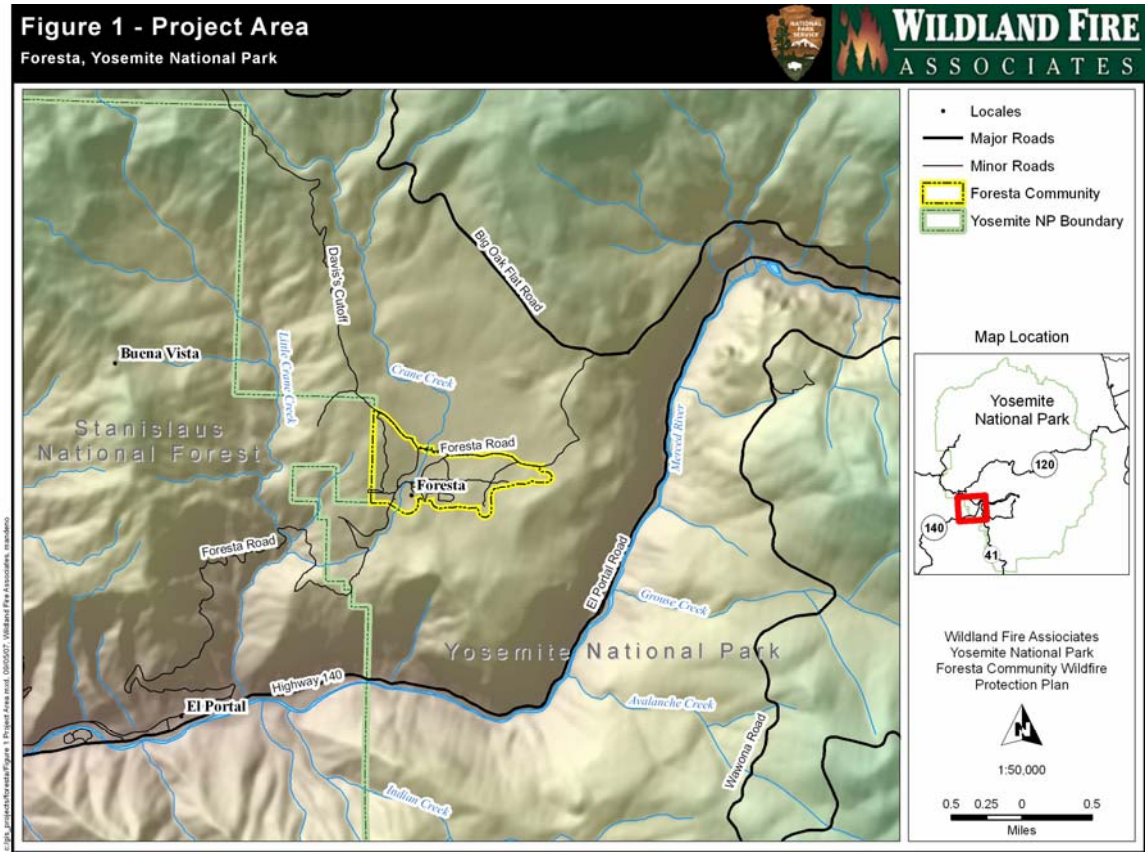
3.3 Post Fire

The community should meet with representatives of Mariposa County, the Park staff, and the Forest Service immediately after a wildland fire, to discuss the effectiveness of the fire prevention actions and suppression efforts that were taken. The meeting should be under the direction of a trained facilitator. In those cases where there has been loss of life or several homes have been damaged or destroyed, a Critical Stress Debriefing Team should be brought in to help victims cope with the situation.

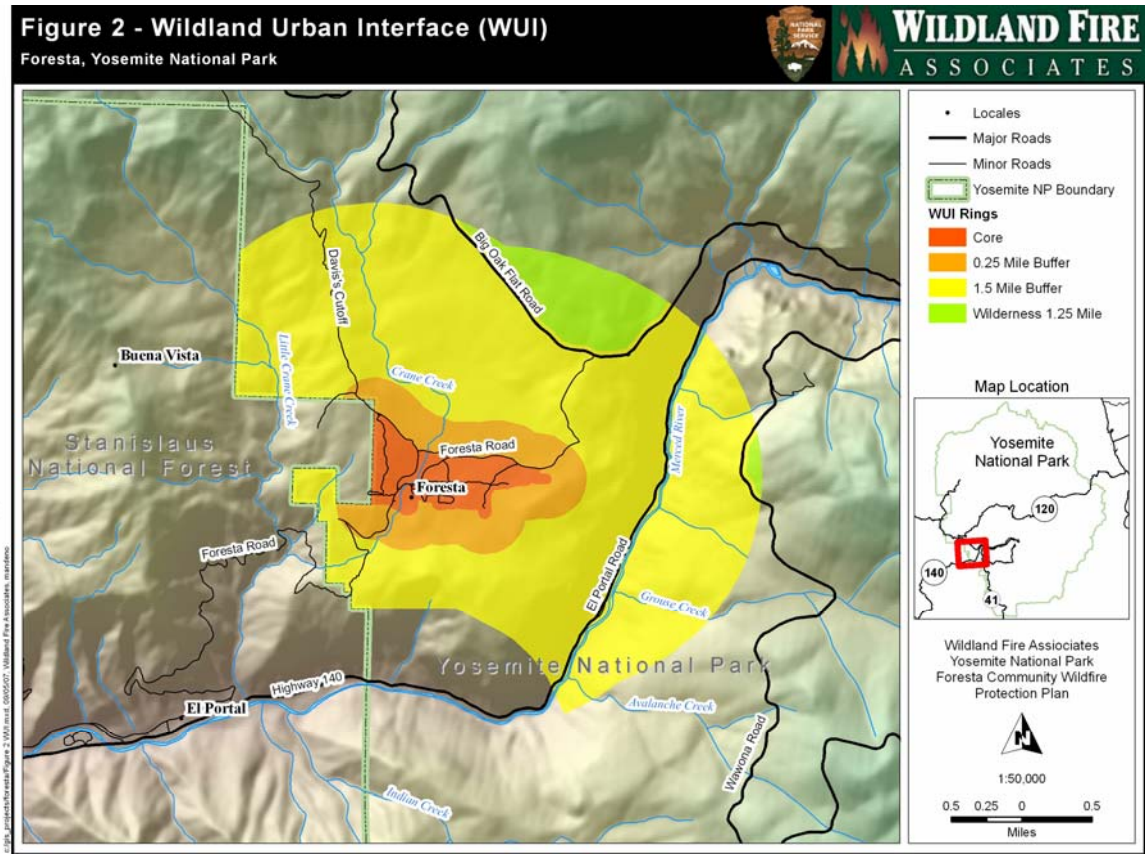
Post fire recovery from a low intensity wildland fire Photo: Wildland Fire Associates

4.0 Planning Process

4.1 Planning Area Boundaries



The Wildland Urban Interface (WUI) is defined as the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuel (USDI/USDA 1995). The 1.5-mile buffer standard was adopted by Yosemite National Park, regardless of land ownership, to define the WUI. The planning area was expanded to include the land beyond the ridge to the south and include McCauley Ranch and Big Meadow (Figure 1). Federal funds in the form of grants or fuels treatment funds, both subject to the appropriations process, are available to complete projects in a one-mile buffer around buildings, structures, or subdivisions located in WUI areas adjacent to federal lands.



4.2 Community Involvement

During February 2006, a fire mitigation specialist from Wildland Fire Associates and a Park representative met with the president of the Association to gain insight into the needs and concerns of the community. Three wildland fire mitigation specialists from Wildland Fire Associates spent a week in the area in May 2006, contacting officials and other stakeholders with a vested interest in the project. The specialists also conducted a series of site visits over the summer and early fall to gain an overview of the community and the surrounding lands, to determine the initial progress made by homeowners and others to implement the recommendations of the *Fire Safe* Program, and to conduct fuel-loading assessments.

Using the information gained during the field trips and contacts with stakeholders, the specialists drafting a conceptual paper outlining the elements of a proposed fuel treatment plan, which as presented at the July 2, 2006 meeting of the Foresta Preservation Association.

During the meeting those in attendance expressed support for the proposed plan and suggested ways it could be improved. Several attendees extended offers to help with the project. As a result, several follow up contacts were made over the next nine months to gather additional information, establish roles for future actions, and solidify support for the plan that was to be drafted by Wildland Fire Associates.

A liaison from the group was named to provide information and guidance to the contractor. The contractor periodically posted the draft on the company's website and encouraged input and comment.

Utilizing the concept paper as the nucleus, specialists drafted this plan and presented the final draft to the stakeholders at a closeout meeting on September 2, 2007.

Photo: Wildland Fire Associates

4.3 Stakeholders

Stakeholders include the Foresta Preservation Association, Yosemite National Park, Mariposa Fire Safe Council, Mariposa County, Stanislaus National Forest, California Department of Forestry and Fire Protection, Mariposa County Fire Department, and individual property owners within the community.

Prior to the start of the planning process, the contractor met with members of the Foresta Preservation Association (Association). Peter Padilla and Sara Nichols representing the Association met with Mike Beasley, Fire Use Manager, Yosemite National Park and three WFA planners met in May 2006. Those present at the July 2006, meeting included:

Name	Representing
Chris Falkenstein	Homeowner
Doe Falkenstein	Homeowner
Lucille Barcroft	Homeowner
Robyn Orsini	Homeowner
Heidi Massie	Homeowner

Name	Representing
Alan Henninger	Homeowner – Association Liaison
Joe Orsini	Homeowner
Ronald Schmidt	Homeowner
Don Denny	Homeowner
Linda Denny	Homeowner
Annie Barrett Cashner	Homeowner
Pete Padilla	Homeowner – Association President
Esther Mandeno	Wildland Fire Associates
Dan O'Brien	Wildland Fire Associates – Team Leader
Carl Douhan	Wildland Fire Associates
Taro Pusina	Yosemite National Park

Individuals contacted during the development of the plan include:

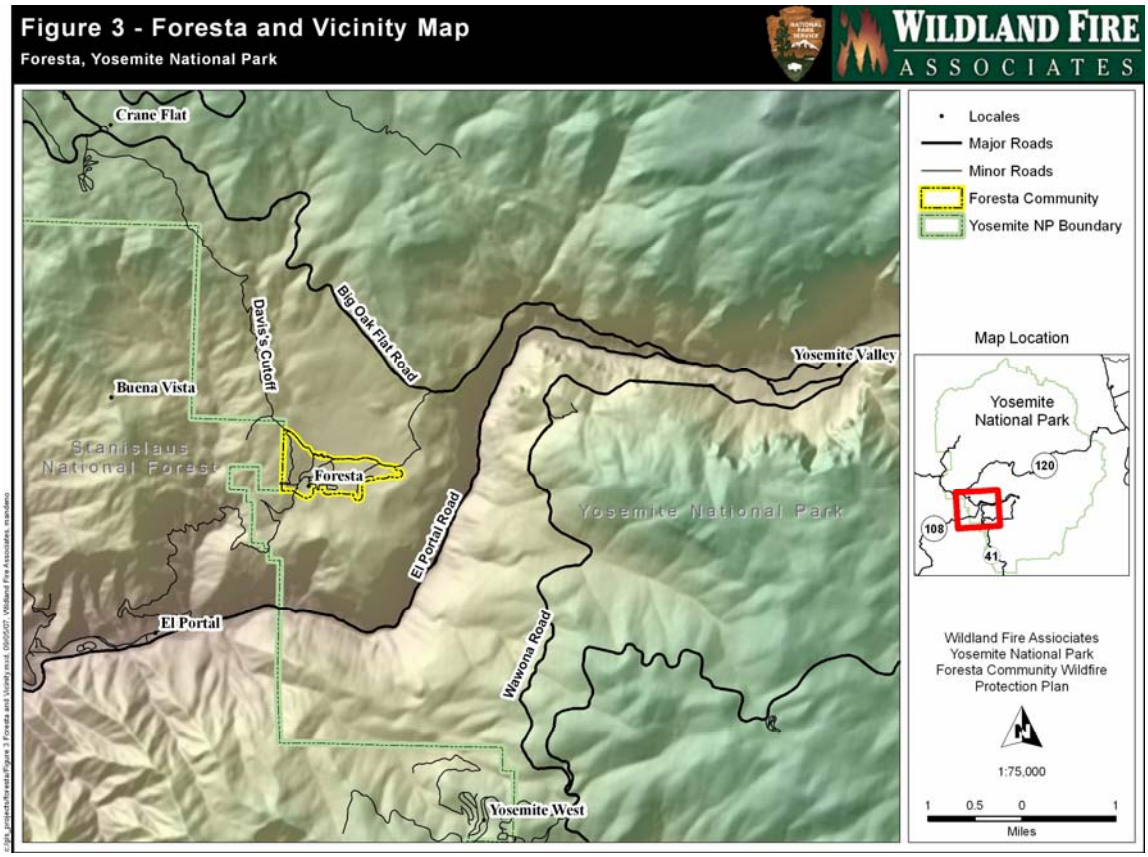
Name	Agency or Affiliation	Purpose
Matt Freeman	Mariposa County Highway Department	Determine status of Crane Creek bridge replacement project.
Alan Henninger	Foresta Preservation Association	Association Liaison – Background information and guidance.
Nancy Biffemeir	ECC Manager Yosemite National Park	Dispatch process and Reverse 911 capabilities.
Deron Mills	Assistant FMO Yosemite National Park	Evacuation and emergency response
Michael Beasley	Fire Use Manager Yosemite National Park	General guidance
Jim Middleton	Assistant Chief Mariposa County FD	Fire suppression and emergency response guidelines & procedures
Jen Hooke	Fire Ecologist Yosemite National Park	Fuel loading and related issues
Kimberly Bullock	Director Mariposa County Fire Safe Council	Guidance and accomplishments
Allan Johnson	District FMO Groveland District USDA Forest Service	Forest Service input

5.0 Community Description

5.1 General Environmental Conditions

5.1.1 Topography, Slope, Aspect, Elevation

Foresta is located to the west of Yosemite Valley and north of the Merced River Gorge at approximately 4,500 feet elevation (Figure 3). The community is situated in what can best be described as a shallow valley, with a low ridge to the south and a large meadow to the north. Aspect varies by location, but is predominately northern on the east of Crane Creek and eastern on the west side of Crane Creek. The terrain to the west of Crane Creek has some topographical relief, but the slope is not considered to be steep.



5.1.2 Meteorology, Climate, Precipitation

No meteorological records are specifically available for Foresta. Generally, the overall climate is temperate, with hot, dry summers and cold, wet winters. About 85% of the precipitation in the area falls between November and April. December, January, and February have the highest average precipitation, with a monthly average of 6 inches in Yosemite Valley at 4,000 feet. Average annual precipitation in Yosemite Valley is 36.5 inches. Annual precipitation decreases to 25 inches in El Portal at 2,000 feet and increases to 50 inches in the red fir forest at 6,000 to 8,000 feet. At elevations above 5,000 feet, 80% of the annual precipitation falls as snow (NPS 2000).

Mean daily range of temperatures at the South Entrance Station of Yosemite National Park (elevation 6,192 feet, which is 1,500 feet higher than the elevation at Foresta) ranges from 36 to 67 degrees Fahrenheit. At the lower elevations, below 5,000 feet, temperatures are hotter; mean daily high temperature at Yosemite Valley (elevation 3,966 feet), for example, varies from 46 to 90 degrees Fahrenheit. Frequent summer thunderstorms can persist into July (NPS 1990).

The temperature and precipitation values cited above are averages and reflect local differences in conditions resulting primarily from differences in elevation. In any given year, however, lengthy periods may occur during which precipitation and relative humidity are lower at specific locations. These periods result in low fuel moisture levels and provide ideal conditions for ignition and spread of wildland fires.

5.1.3 Hydrology

Crane Creek is the primary hydrological feature and feeds the main stem of the Merced River. Crane Creek in the vicinity of the community has overhanging stream banks and a sandy bottom. Shortly after the creek passes through Foresta, it cascades over Foresta Falls as it quickly descends to join the Merced River below.

In 1987, the U.S. Congress designated the main stem and the South Fork of the Merced River a "Wild and Scenic River" to protect the river's free-flowing condition and to protect and enhance its unique values for the benefit and enjoyment of present and future generations (16 United States Code [USC] 1271). This designation gives the Merced River and its tributaries, including Crane Creek, special protection under the Wild and Scenic Rivers Act.

5.1.4 Ecosystem Types

The primary vegetative community in the Foresta area spared from the full impact of the A-Rock Fire is a lower montane mixed-conifer ecosystem that is generally dominated by ponderosa pine. The two most important forest types in planning area are ponderosa pine/bear clover and ponderosa pine/mixed conifer (Yosemite National Park 2004). This vegetative community also contains incense cedar, sugar pine, and occasional California black oak. The most common understory shrubs are Mariposa manzanita, deer brush and bear-clover. Big Meadow is a dry montane meadow surrounded by lower montane forest. The area impacted by the A-Rock Fire is dominated by immature pine and Mariposa manzanita. Foothill pine/live oak/chaparral woodland and foothill chaparral are established on the slopes above the Merced River below the mixed conifer zone (generally below 3,000 to 4,000 feet).

5.1.5 Threatened and Endangered Habitat Types

No known surveys have been conducted in the area to determine the presence of species of special concern. Table 1 contains a list of species of special status for lower montane and foothills woodland areas of Yosemite National Park. These data are summarized from the Yosemite Fire Management Plan and include all species noted in lower montane forests and foothills woodlands.

Table 1: Threatened and Endangered Species – Yosemite NP Vicinity

Species	Federally Listed	State Listed
Yosemite onion		Rare
Thompkin's sedge		Rare
Congdon's woolly sunflower		Rare
Congdon's *lewisia*		Rare
Valley elderberry longhorn beetle	Threatened	
Limestone salamander	Species of Concern	Threatened
California red-legged frog	Threatened	Threatened
Mountain yellow-legged frog	Species of Concern	Species of Concern
Bald eagle	Threatened	Endangered
American Peregrine Falcon	De-listed	Endangered
California spotted owl	Species of Concern	Species of Concern
Great gray owl		Endangered
Willow flycatcher	Species of Concern	Endangered
Sierra Nevada red fox	Species of Concern	Threatened
Pacific fisher (Proposed)	Species of Concern	Species of Concern

Source: Yosemite Fire Management Plan, Chapter 3.

5.2 Cultural Resources

Prehistoric and historic archaeological sites, historic sites, and structures are present. Preliminary archaeological evidence indicates people may have been living in the area as long as 9,500 years ago. The Foresta – Big Meadow area was frequented by Miwok Indians, primarily in the summer. Numerous sites and areas that they used for a variety of purposes are known to exist throughout the area.

One of the earliest routes used by visitors to reach the Valley, Coulterville Road, passes through Foresta. The McCauley Ranch and other farming and ranching activities at Big Meadow existed prior to the area being included within the boundaries of the Park. A house, a historic barn and crib, other structural elements, and a cemetery still remain (Adapted from Green. 1987).

Many of the known physical resources and historic structures in the Park are either listed or considered eligible for listing in the National Register of Historic Places. However, few archaeological sites in the Park have been individually nominated for listing in the National Register.

5.3 Population and Demographics

Foresta is a small community. At the time of this writing (2007) there are 44 relatively small, single-family homes, three guest houses, and two barns scattered over an area approximately ½ mile wide and about a mile long (Approximately 300 acres in size). About a quarter of the homes are occupied on a year-around basis. The remaining homes are second homes that are used by their owners and/or rented to visitors. Other than a building that serves a variety of purposes ranging from a fire station to community center, there are no schools or other public facilities. Commercial activity is limited to home rentals or Bed-and-Breakfast type of lodging.

5.4 Legal Structure and Jurisdictional Boundaries

Foresta lies wholly within Mariposa County, and is an island surrounded by federal land – Yosemite National Park and the Sierra National Forest, which is administered by the Stanislaus National Forest. Yosemite National Park Fire Department has wildland and initial attack structural fire suppression response responsibilities for the community.

5.5 Land Use Development Trends

A number of the homes destroyed by the A-Rock Fire were rebuilt using building materials by the *Fire Safe* Program. The size of the community is expected to remain stable.

5.6 Infrastructure

The primary entrance road is paved, while side streets are gravel. There are no municipal water or sewer systems. Utility and telephone lines and LP storage tanks are primarily above ground.

5.7 Emergency Services

The community, located about 20 miles by road from the nearest assistance, is without ready access to emergency services. Yosemite National Park provides limited law enforcement coverage, primarily on an emergency response basis. Yosemite National Park provides structural and wildland fire coverage and ambulance service, with a moderate response time.

A study of past wildland fires shows that response by suppression forces has been effective. Most wildland fires have been held to less than 10 acres. Following periods of lightning, the Park flies aerial detection patrols to locate wildland fires. The lands west and south of the Big Oak Flat Road are classed as full suppression, and any wildland fire burning in the vicinity of Foresta would be suppressed using the appropriate management response. Resources available to suppress wildland fires include helicopters (helitac), airtankers, as well as a normal complement of hand crews and engines.

If a large wildland fire occurred on a hot, dry day with a Haines Index of 5-6, and during a period with a high number of visitors in the area, firefighters would have a difficult time defending the community. Narrow, two-lane roads with a large amount of visitor traffic, high winds, air turbulence, and other factors could make response difficult. However, due to the relatively close proximity of fire suppression resources, adequate suppression forces are generally available. In the event of multiple starts, the park is large enough that response priorities would be established and firefighting resources assigned accordingly.

5.8 Insurance Ratings

ISO risk ratings are developed by a company of the same name. ISO products and services help property and casualty insurance companies measure, manage, and reduce risk. Several factors are used to determine risk including distance to fire hydrants and fire stations. Non-urban areas such as Foresta can be rated from 1 to 10, where 1 is the highest or best rating and 10 is the lowest rating. Individual insurance companies use the information provided by ISO to establish their rates. An individual insurance company may assign a different ISO rating for a home in the same community based on where the home is located, when the structure was first insured, whether the home is a year-around residence, distance to fire hydrants and fire stations, etc.

The ISO ratings for Foresta range from 5 to 10.

5.9 Fire Safe Council and Other Organizations

Foresta is served by the Mariposa Fire Safe Council, which serves the entire County.

Foresta Preservation Association is a non-profit organization dedicated to promoting and protecting the best interests of property and homeowners in Foresta. The organization works to improve facilities and services in the community, to encourage community involvement in beneficial projects, to cooperate with federal, state, and local governmental agencies that service Foresta, and to promote friendship among homeowners.

6.0 Current Fire Environment

6.1 Wildland Fire Potential

Lightning-caused wildland fires are frequent in the Foresta area, generally resulting from the combination of dry vegetation, low relative humidity, and thunderstorms (NPS 1990). It is important to note, however, fire suppression and changing land use practices have dramatically affected natural fire regimes, altering ecological structures and functions in Sierra Nevada plant communities (NPS 2000). The active suppression of wildland fires and the altering of the stand structure through extensive logging 75 to 85 years ago have combined to create extensive accumulations of wildland fuels that are spatially continuous.

Under the right set of environmental and fuel conditions, the factors outlined in Section 6.4 can contribute to a catastrophic wildland fire. In 1990, the 22,000-acre A-Rock Fire burned up the steep south-facing slope in the Merced River Gorge and then northward into Foresta, destroying a number of structures in Foresta before it was controlled. At the same time, the Steamboat fire burned the north-facing slope across the gorge from the A-Rock Fire.

Looking into the future, heavy fuels, topography, adverse weather conditions, and the probability of lightning could once again result in a large, rapidly moving crown fire that would threaten the entire community and place life and property at great risk. There currently are a few suitable locations to establish holding lines to initiate a burnout operation that could possibly save the community from a wildland fire moving up the Crane Creek drainage, from the Merced River Gorge, or from a fire originating to the west or north. Due to long-range spotting and other phenomena associated with large, rapidly moving wildland fires, the ridge south of the community may not afford the community protection from a wildland fire originating in the Merced River Gorge. Under the current conditions, a wildland fire that started within Foresta could place nearby homes and possibly the entire community at risk, as well as spread in the Park or escape into the National Forest.

6.2 Local Fire Ecology

Countless scientific studies have focused on the importance of fire in shaping the forest, shrubland, and grassland vegetation in the Sierra Nevada, including areas in and around Yosemite National Park. The Yosemite Fire Management Plan (Chapter 3) summarizes the vegetation and fire characteristics reflecting these studies. Historically, the vegetation in and around the community of Foresta was naturally adapted to wildland fire. Vegetation communities developed with periodic fire as a natural component of the ecosystem. However, wildland fire is only one of several important processes and conditions that affect forest, shrubland, and grassland vegetation. Precipitation amounts and seasonal patterns, temperature, and biotic factors such as insects and disease also govern the spatial patterns of vegetation development, and these factors may change conditions over time. Elevation and terrain orientation and steepness of slope affect the physical environment, and seasonal shifts in weather and year-to-year differences in

climate result in variable patterns of fire behavior and other factors affecting forests and other plant communities. All of these factors contribute to considerable variation of vegetation characteristics and wildland fire patterns over space and time.

The Foresta area exhibits a significant range of forest, shrubland, and grassland characteristics. While the elevation range and steepness of slopes in the wide Crane Creek valley around Foresta are relatively moderate, the steep south- and east-facing slopes between Foresta and the Merced River support very different vegetation. The upper valley vegetation is predominately ponderosa pine/bear clover forest, though before the A-Rock fire it may have been predominantly ponderosa pine/mixed conifer forests. There is one permanent meadow on the northeast edge of the developed area. In contrast, the steep slopes down to the Merced River to the south and east have fewer trees and support mainly foothill pine/live oak/chaparral woodland and foothill chaparral.

Historically, fire played a significant role in maintaining vegetation types and patterns before Euro-American settlement. While Native American influences on fire behavior (especially human-caused ignitions) cannot be discounted, logging and fire suppression during the 20th century undoubtedly had major effects on current conditions and likely contributed to the severity of the 1990 A-Rock Fire. Disruption of historical patterns of fire behavior meant that the natural thinning effects of low-intensity wildland fire behavior were removed from the ecosystem. Consequently, fuels accumulated, and many young, small trees became established and created fuel ladders, a known cause of rapid crown fire development and spread. Continuation of fire suppression and lack of thinning and fuel management are likely to result in changes in forest types as shade-tolerant and fire-sensitive tree species increase, and periodic severe wildland fire resets the ecosystem back to treeless openings.

The A-Rock fire is an example of such an ecological reset. Much of this fire was stand-replacing, leaving behind few or no surviving trees over large areas. In contrast, historical fires were generally much less severe, leaving behind an open canopy of large trees with more grass and shrubs in the understory. New tree and shrub communities are becoming established in the openings created by the A-Rock Fire, and careful management may be needed to assure that the new forest that develops over the next several decades is placed on a proper ecological trajectory. This is an important consideration for burned over areas in and immediately surrounding Foresta.

6.3 Fire History

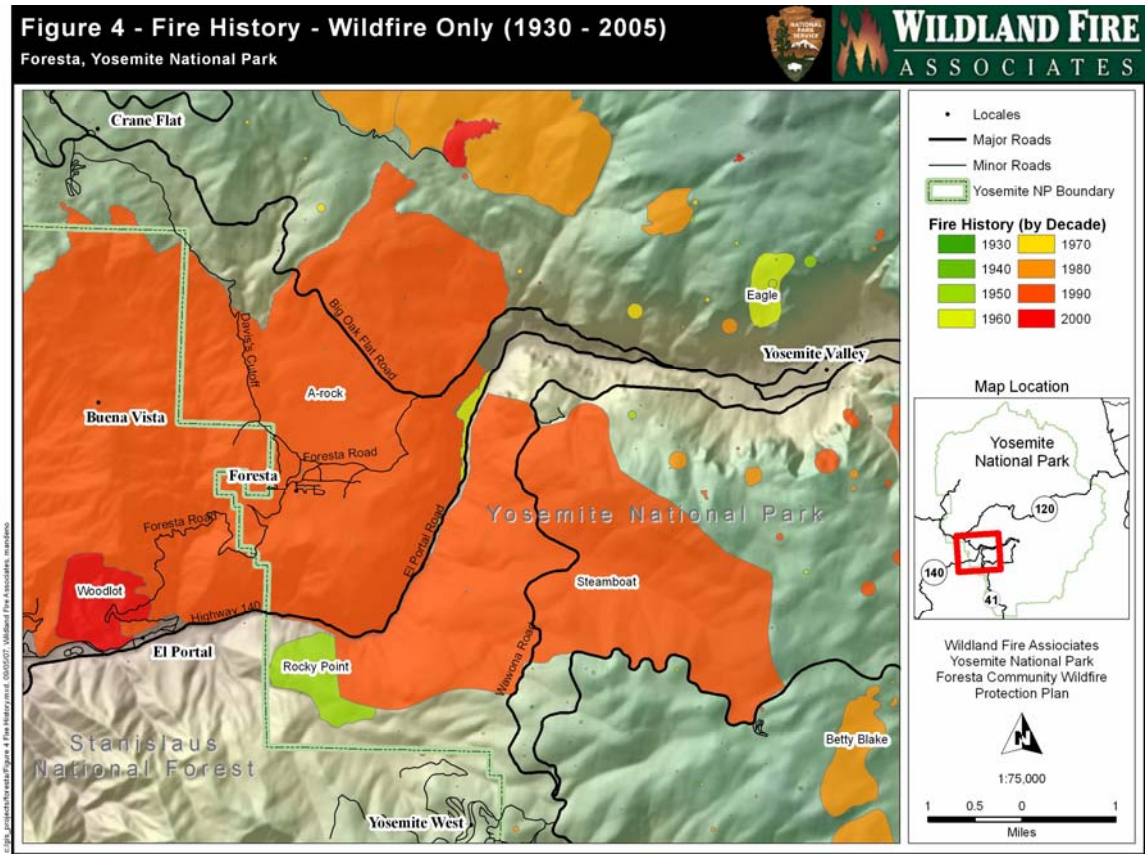
Historically, relatively frequent low-intensity fires occurred in all the vegetation types found in and around Foresta. These past fires burned with a fire return interval of 2 – 35 years (Yosemite National Park 2004), similar to other areas in the Sierra Nevada with equivalent vegetation. Historical forests having such a fire regime were generally open and tended to be relatively stable over time at the landscape scale (McKelvey et al. 1996). However, local variations in tree ages, sizes, and densities could result from patchy mortality caused by insects or local differences in fire severity. McKelvey et al. noted observations made by George Sudworth in 1899 indicating that fires burned regularly but crown fires were uncommon; rather, wildland fires burned mainly on the surface and

Fire scars in a stump south of Foresta record a series of wildland fires. Photo: Wildland Fire Associates

rarely killed large trees, and then on areas under one acre in size. It is likely that even the largest wildland fires today are not unusual for their size. Slow-moving, low-intensity surface fires historically probably often spread over tens of thousands of acres during years with favorable burning conditions. Rather, today's wildland fires are uncharacteristic in their severity, particularly when they burn and spread as active crown fires.

Current median fire return intervals are 10 times or more as long as pre-settlement median return intervals for the forest types typical of the Foresta area (McKelvey et al. 1996, Yosemite National Park 2004). Furthermore, the fire rotation (the length of time for the equivalent of all the area to burn once) is now well over 100 years, and it is estimated that the ponderosa pine/bear clover forest surrounding Foresta has missed 3 to 4 fire return intervals

These findings indicate that the forests are becoming more and more departed from natural fire regimes. The suppression and exclusion of fire as a natural and widespread process resulted in dramatic increases in live and dead fuel and changes in current fire intensities. Whereas pre-Euro American settlement forests remained well acclimated to periodic surface fires, present forests are highly vulnerable to uncharacteristically severe wildfire. Of additional concern, records maintained by the National Park Service indicate that human caused wildland fires tend to be larger than naturally ignited wildland fires.



6.4 Fire Weather

Frequent summer thunderstorms are common. Although lightning is more common in the higher elevations, many lightning caused wildland fires have been reported in the area Yosemite National Park 2004). Since 1930, 588 lightning fires have been recorded in ponderosa pine/mixed conifer and ponderosa pine/bear clover forest, just two of the many vegetation types in Yosemite National Park.

The forests in the Foresta area experience wet and dry periods each year. During dry seasons and especially during periods of

drought, live and dead fuel moistures may reach critically low levels. Low relative humidity, below average live and dead fuel moisture, low duff moisture, above average fuel loading, moderate to high winds, and periods of drought all favor development of large-scale wildland fires. Thus ignitions are likely to become spreading fires, and current dense forest structures (those with excessive fuels and fuel ladders) may result in elevated fire severities.

An observed phenomenon that may become more of a factor in the near future is the gradual warming of the environment. Whether or not "climate change" or "global warming" is a real phenomenon, warmer and drier climatic conditions during the last decade have come on the heels of wetter and cooler conditions that had favored increases in forest density and fuel accumulation. Whatever its cause, a warm climatic cycle can contribute in any year to earlier snowmelt, drought, and heavy, isolated rainstorms. The early loss of snow cover, patchy rainfall, and low soil water absorption during intense rainstorms, may contribute to lower live and dead fuel moisture during the summer months.

A tool developed by the National Wildfire Coordination Group (NWCG) indicates that during periods of high ignition probability and unstable air masses (Haines Index of 5-6), certain conditions result in a high probability of a high intensity, catastrophic wildland fire that is difficult to control. These conditions include: (a) RH <25%, (b) temperature >90 degrees, (c) 1-hour fuel moisture less than 5%, (d) woody fuel moisture <80%, (e) 20' wind speed >15 mph, and (f) an Energy Release Component (ERC) above 68 (90 percentile). These conditions are met more readily during warm, dry climatic cycles.

6.5 Hazardous Fuels

Most of the area around Foresta burned by the 1990 A-Rock Fire is now ponderosa pine/bear clover at an early stand development stage. Nominally the primary fuel model for this type is NFFL Fuel Model 2 – trees with grass understory. In stands of trees with grass understory, low-burning ground fires with low flame heights are typical, and effects on the relatively open overstory of large trees are minimal (Anderson 1982). Following the A-Rock fire, however, no large trees exist, excessive dead fuel lies on the ground, and live vegetation is primarily ponderosa pine saplings and Manzanita. NFFL Fuel Model 2 may be inappropriate; perhaps NFFL Fuel Model 4 or 5 would better predict expected fire behavior. But, in any case the large amount of fuel present must be noted as a major hazardous fuel issue.

Forested areas not burned by the A-Rock Fire nominally are NFFL Fuel Model 2 – ponderosa pine/bear clover – or NFFL Fuel Model 9 – ponderosa pine/mixed conifer. Here, the long history of fire suppression and also logging has contributed higher than average fuel loading, including both horizontal and vertical continuity that could lead to increased fire intensity and crown fires.

6.5.1 Fuel Hazard Ranking

The California Fire Plan fuel rank map for potential fire behavior rates the fuel rank for the Foresta area as high to very high (CDF 2006).

6.5.2 Fire Regime and Condition Class

6.5.2.1 Fire Regime

A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention, but including the influence of aboriginal burning (Agee 1993, Brown 1995). Coarse scale definitions for natural (historical) fire regimes have been developed by Hardy et al. (2001) and Schmidt et al. (2002) and interpreted for fire and fuels management by Hann and Bunnell (2001).

The five natural (historical) fire regimes are classified based on average number of years between fires (fire frequency) combined with the severity (amount of replacement) of the fire on the dominant overstory vegetation. These five regimes are described in Table 2.

Table 2: Fire Regime Definitions

Regime	Description
I	0-35 year frequency and low (surface fires most common) to mixed severity (less than 75% of the dominant overstory vegetation replaced).
II	0-35 year frequency and high (stand replacement) severity (greater than 75% of the dominant overstory vegetation replaced).
III	35-100+ year frequency and mixed severity (less than 75% of the dominant overstory vegetation replaced).
IV	35-100+ year frequency and high (stand replacement) severity (greater than 75% of the dominant overstory vegetation replaced).
V	200+ year frequency and high (stand replacement) severity.

Fire regimes may vary among vegetation types and different regions. Planners should consider this natural range of variability. For example, a natural fire regime can include very frequent, cool burning surface fires, but also include an occasional long return interval stand replacement fire when that stand replacement fire is within the natural range of variability; and will be considered when analyzing the health of the stand.

The desired result is that the landscape should take on an appearance of what is believed to have existed naturally and historically. It should display a mosaic of complex vegetation patterns and types that would have evolved naturally with ecological and geological processes. There generally should be less continuous, uninterrupted vegetation types, more openings, a variety of seral stages and different plant communities in a random patchwork.

6.5.2.2 Condition Class

A Condition Class is a classification of the relative degree of departure from the historical natural fire regime (FRCC 2006). Three Fire Regime Condition Classes (FRCCs) have been defined in Table 3, and they are appropriate for any of the fire regimes described in the Table. Condition class departure is based on five ecosystem attributes: vegetation characteristics (species composition, structural states, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity, and pattern; and other associated disturbances (e.g. insect and disease mortality, grazing, and drought). FRCCs are useful because they reflect the relative risk of losing one or more key component that defines an ecological system.

Table 3 – Fire Regime Condition Class (FRCC) Definitions

FRCC	Description	Potential Risks
Condition Class 1	Within the natural (historical) range of variability of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances.	Fire behavior, effects and other associated disturbances are similar to those that occurred prior to fire exclusion (suppression) and other types of management that do not mimic the natural fire regimes and associated vegetation and fuel characteristics. Composition and structure of vegetation and fuels are similar to natural (historical) regime. Risk of loss of key ecosystem components (e.g. native species, large trees, and soil) is low.
Condition Class 2	Moderate departure from the natural (historical) regime of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances.	Fire behavior, effects, and other associated disturbances are moderately departed (more or less severe). Composition and structure of vegetation and fuel are moderately altered. Uncharacteristic conditions range from low to moderate. Risk of loss of key ecosystem components is moderate.
Condition Class 3	High departure from the natural (historical) regime of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances.	Fire behavior, effects, and other associated disturbances are highly departed (more or less severe). Composition and structure of vegetation and fuel are highly altered. Uncharacteristic conditions range from moderate to high. Risk of loss of key ecosystem components is high.

Source: FRCC available on the Internet at http://www.frcc.gov/docs/FrccDefinitionsFinal.pdf

The fire regimes and condition classes for the project area in and around Foresta vary with vegetation type. Ponderosa pine/bear clover and ponderosa pine/mixed conifer forests historically experienced low severity surface fires (Fire Regime I). These forests missed a number of surface fires and reached a moderate to high degree of departure of a number of ecosystem attributes (Yosemite National Park 2004). Therefore, the condition before the 1990 A-Rock Fire was FRCC3, ample reason to explain why the A-Rock Fire was so severe. Currently, the areas that experienced crown fire during the A-Rock Fire are now about one median fire return interval past the last fire; which would indicate that a low intensity surface fire could be expected any time now based on the historical fire regime.

Historically, fires in Bid Meadow would have been frequent stand-replacing grass fires (Fire Regime II). Big Meadow, like other meadows in Yosemite National Park, most likely experienced few if any fires since fire suppression began in the 20th century and before the A-Rock Fire, and shrub and tree encroachment into the meadow were occurring (Yosemite National Park 2004). The FRCC prior to the A-Rock fire was most likely FRCC 3. Since the A-Rock fire tree and shrub encroachment still exist, and the FRCC is basically unchanged.

Although outside the potential treatment area, the steep slopes above the Merced River should be mentioned as they represent sites capable of extreme fire behavior. The shrub communities on these slopes probably burned historically as moderately frequent mixed severity or stand-replacing fires (Fire Regime III or IV). Having missed only one or two fires, these vegetative communities are judged to be moderately departed from the natural range of variability (Yosemite National Park 2004), and the vegetation has a rating of FRCC 2. Even though these slopes are not in critical condition, they pose a significant threat to the forests in and around Foresta.

6.5.3 Natural Firebreaks

Foresta lacks any significant geologic or hydrologic features that might serve as natural firebreaks to protect the community from an approaching wildland fire. There are no rocky ridges, rivers, or other bodies of water that provide significant protection, or provide opportunities for suppression forces to employ certain wildland fire suppression tactics. However, the ridge south and east of Foresta provides a major break in vegetation patterns that may prove useful for the creation of a firebreak.

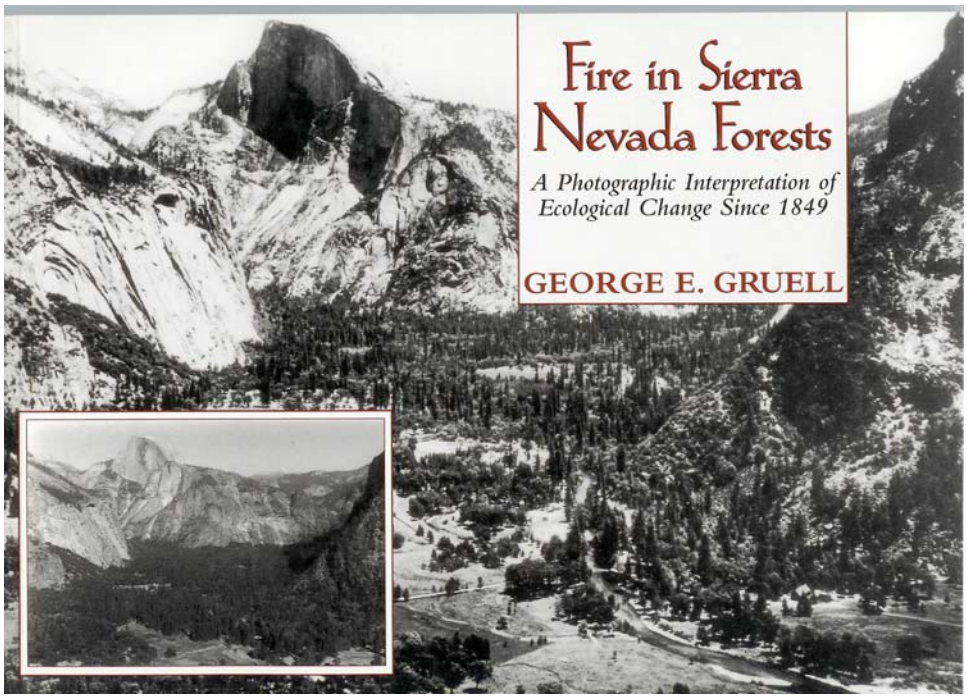
The recovering vegetation in the areas burned by crown fire during the A-Rock fire provides temporary protection as a firebreak in that suppression tactics are much more likely to be successful than in dense forests found in other nearby areas, particularly if residual surface fuels are reduced. As forest trees and shrubs grow and fill in the burned area, however, these advantages will be lost. Similarly, though relatively small, Big Meadow also provides suppression advantages, although wildland fires approaching Foresta from the northeast are less likely than from other directions. Big Meadow has great potential as a community and firefighter safety zone, particularly if tree and shrub encroachment on the perimeter is reduced.

6.6 Ignition History

Lightning and human activities have both contributed to ignition of wildland fires in the Foresta area for perhaps thousands of years. While lightning strikes vary seasonally and annually, lightning is a major source of potential ignitions. Yosemite National Park averages 55 wildland fire starts per year, most of which are from lightning (Yosemite Nation Park 2004). In 1990, lightning strike density in the Foresta area was 0-20 strikes per square mile (0-8 per square kilometer) per year (Yosemite National Park 2004 – Map 3-1). Regardless of the source of ignition, the actual ignition and spread of a wildland fire depends heavily on fuel moisture and fuel loading, depth, and arrangement (Anderson 1982).

Human-caused ignitions are also common. Native American burning is difficult to assess but is believed to have been significant. More recently, both accidental ignitions and prescribed fires have occurred in addition to lightning ignited wildland fires.

For ponderosa pine/bear clover forests Park-wide, the Park reports 247 lightning fires, 59 human-caused fires, and 121 prescribed fires between 1930 and 2000 (Yosemite National Park 2004). For the same period in ponderosa pine/mixed conifer forests, the Park reports 341 lightning fires, 19 human-caused fires, and 79 prescribed fires. This ignition history underscores the high probability that wildland fire ignitions will be a constant threat to the community.



7.0 Risk Assessment: Identifying and Evaluating Assets at Risk

7.1 Overview

Wildland fire is a dynamic event influenced by fuel, weather, and topography. Wildland fire risk modeling represents a "best knowledge and science" application, but does not provide any guarantees. However, it may be safe to assume that a maximum effort to mitigate hazardous fuels conditions around individual structures and the community provides the best chance of survival.

Guidelines for community wildfire protection plans established by the California Fire Plan Workgroup call attention to the need to identify what important assets might be lost in a wildland fire. Assets to be evaluated can range from esthetic values such as breathtaking views to natural processes or features to human improvements such as homes, businesses, and utilities. These assets are commonly referred to as "values at risk" and have been described in Section 5.0 Community Description. This section is designed to address how wildland fire can impact Foresta and those values that make it unique.

Although this section addresses values at risk from an economic and environmental perspective, it is important to note that a potential loss from wildland fire can include human life. There are no recorded incidents of loss of life or serious injuries from wildland fires in the Foresta area. However, rapidly spreading intense wildland fires are always dangerous, especially if evacuation routes are restricted. Furthermore, health hazards from smoke caused by wildland fires can exacerbate breathing difficulties, especially among children, the elderly, and those with chronic breathing or cardiovascular diseases. Wildland fires can also threaten the health and safety of firefighters suppressing the fire.

Another tool that firefighters use to assess a wildland fire suppression action is a listing of possible dangerous situations known as watch out lists. One such list is the *Wildland-urban Interface Watch Outs*, which lists the things firefighters should note as they take initial action to suppress a wildland fire in an urban setting. Those elements include:

- Bridge weight limits
- Poor access and narrow one-way roads
- Inadequate water supply
- Natural fuels located 30 feet or closer to structures on level ground
- Extreme fire behavior
- The need to evacuate public, livestock, pets, and/or animals
- Propane and above ground fuel tanks that are next to wooden structures or close to vegetation.
- Power lines and poles. Watch for both overhead and downed power lines.

Many of these elements are present in Foresta and will be addressed in this section.

7.2 Values at Risk

7.2.1 Structures/Density

The Wildland-Urban Interface (WUI) is the area where structures and other human development meet or intermingle with undeveloped wildland. The WUI may be composed of both interface and intermix communities. Intermix communities, such as Foresta, are places where housing and vegetation intermingle. In intermix, wildland vegetation is continuous, more than 50 percent vegetated, in areas with more than 1 house or structure per 40 acres (16 ha), and are within 1.5 miles of an area over 1,325 acres (500 ha) that is more than 75 percent vegetated.

The density of houses and structures in Foresta is 0.167 houses per acre, scattered over approximately 300 acres, which is over 50 percent vegetated. A great deal of work has been done to create defensible space around each structure in the community. The houses and structures that survived the A-Rock Fire are most vulnerable to wildland fire because they are generally sited in heavy stands of mixed-conifer forests. The majority of new houses that replaced existing homes following the A-Rock Fire are located in areas that are recovering. Most were constructed of fire resistant material and the owners have created adequate defensible space to protect them from the impacts of wildland fire.

Each home or structure was assessed and the data gathered was used to estimate the community's over-all risk to wildland fire, which is discussed in Section 7.3 Data Analysis.

7.2.2 Infrastructure

With the exception of a community building and a small water storage tank, infrastructure is primarily limited to improvements made by individual homeowners. There are no microwave, television, or cell phone towers. Power and telephone lines and LP storage tanks are primarily above ground, making them vulnerable to wildland fire. Under the right set of circumstances, an LP tank could actually contribute to fire intensity.

7.2.3 Access

A number of issues must be considered when assessing wildland fire safety and evacuation routes. The wildland fire fighting community uses an acronym to remind each wildland firefighter of the key elements to firefighter and public safety, "LCES". LCES stands for Lookouts, Communications, Escape Routes, and Safety Zones. One of the primary concerns expressed by the homeowners and Park fire management personnel is the limited number of feasible routes available to enter and leave Foresta, and the condition of the only bridge that crosses Crane Creek to reach the houses located on the west side of the creek and to access the unimproved segments of Foresta Road and Davis's Cutoff.

Foresta Bridge **Photo: Wildland Fire Associates**

Of primary concern at the start of this planning effort was the condition of the only bridge across Crane Creek. In the summer of 2006 it was posted with a 6-ton limit, and would not support heavy fire engines and other heavy vehicles. However, this is expected to change in the near future. Mariposa County is planning to replace the existing structure with a CONSPAN modular pre-cast bridge system as early as the fall of 2007, which will meet State legal load limits (Freeman, personal comm.). There are no immediate plans at this time to replace Meadow Bridge located on the north side of the community. However, the new bridge is much wider than the current bridge and meets State standards. It should be adequate for the needs of the community and fire suppression personnel. If at some later date it appears that a second bridge is needed, the Park should complete a feasibility study and meet NEPA requirements.

Access to the area may be problematic for fire suppression forces arriving by vehicle from Yosemite Valley, El Portal, and Hodgdon Meadow. The Big Oak Flat Road is the primary means of accessing the Park from the north and is a popular route for visitors from Northern California. This road is the only link between the northern portion of the park and the southern portion of the park, including Yosemite Valley and El Portal. The segment north of the Foresta turn-off to the Park boundary near Hodgdon Meadow is wide with shoulders, while the segment east of the Foresta turn-off to the junction in Yosemite Valley with the El Portal Road is narrow and often times congested at popular pullouts overlooking Yosemite Valley. During certain times of the year, such as major holidays, traffic on the road can be extremely heavy. However, other than during periods of heavy visitor use, response times are generally good.

The Park maintains the paved segment of Foresta Road that provides access to the community from the Big Oak Flat Road for the first three-quarters of a mile, and the remaining mile is maintained by Mariposa County. It varies in width and condition depending on jurisdiction. In most places it is adequate for two-way traffic. However, it lacks shoulders and is narrow enough in places that two vehicles may encounter difficulty passing. This could create problems if local residents are attempting to leave the area and encounter fire engines that are responding to a wildland fire. Vegetation along side the road is encroaching and should be treated, and the treated area periodically maintained to provide improved sight distances and to create defensible space. Such actions will provide for the safety of those evacuating the area and fire suppression personnel who may be entering the area. At some future date, as the vegetation grows and matures, an

additional project should be identified to create and maintain a shaded fuel break where necessary.

Two secondary routes serve the area: Foresta Road and Davis's Cutoff. Both routes are identified in the Yosemite Fire Management Plan as maintained fire roads. They are rough and narrow, and neither is maintained on a regular basis. There are times when they may be nearly impassible.

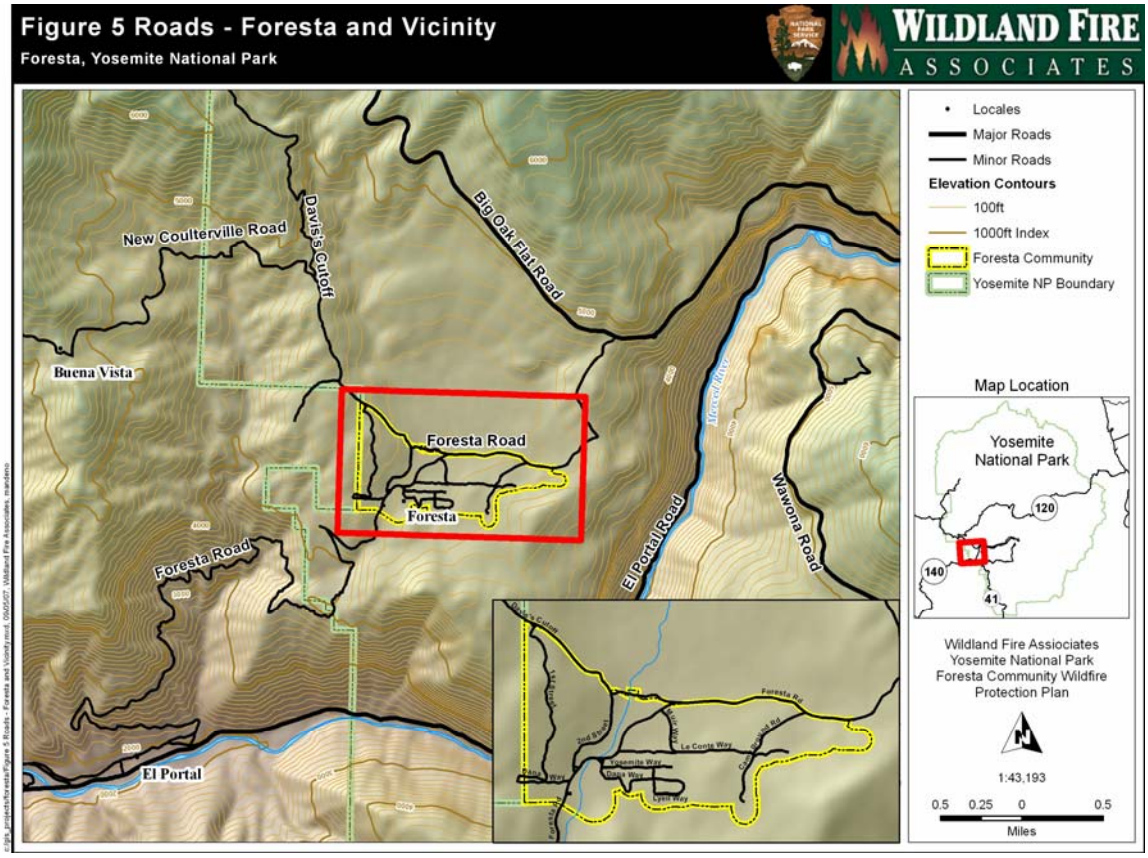
The unimproved segment of Foresta Road that provides access to El Portal from the community is often rough and may not be passable to vehicles without high clearance or 4-wheel drive. One of the three bridges on the route is rated at 6-tons. The road is located on the west flank of a steep, narrow drainage. The location of the road is of concern. Under the right combination of fuel loading and weather conditions, steep, narrow drainages can become death traps during a wildland fire.

The Davis's Cutoff, which parallels the Big Oak Flat Road, leads from Foresta to where it meets the Big Oak Flat Road in the vicinity of Crane Flat. For over half that distance, the two roads are separated by less than 1/2 mile. The Davis's Cutoff has been abandoned by the County past the turn-off to the last home site beyond Foresta, and has not been maintained beyond that point on a regular basis. There are locked gates on both ends of the road, which is used primarily for Park administrative purposes and wildland fire management activities. The Davis's Cutoff would require a great deal of work and regularly scheduled maintenance in order to be considered as viable escape route.

Streets in the community are primitive. In many places they are generally narrow and can be rough. Under certain conditions ground water and run-off can collect in spots and create soft, muddy areas that may difficult to drive through. During an emergency, most should be designated for one-way traffic. It may be necessary to close others.

Replacing the current bridge with one meeting state highway standards will eliminate the issue of load restrictions and will greatly improve access to the entire community and enhance evacuation operations, should that be necessary. The new bridge will be constructed of concrete and would not be vulnerable to fire or increased sedimentation following a wildland fire. A bridge on the lower end of the El Portal Road between Foresta and El Portal has a weight restriction of 6 tons, and the road's location in a narrow canyon may increase the risk to anyone using it during a wildland fire.

The Big Oak Flat Road, which is known to all, is a relatively short distance from Foresta and provides a paved escape route to the north and to the east. Using the Big Oak Flat Road to escape a wildland fire is much preferable than driving on a primitive road that is unfamiliar to most, especially at night or during the confusion and chaos of a rapidly spreading wildland fire.



7.2.4 Cultural Resources

Prehistoric and historic archaeological sites, historic sites, and structures are present. Prehistoric sites are not expected to be impacted by wildland fire because they are generally located below the surface or have been subjected to wildland fire in the past. However, suppression or management actions, such as fireline construction, could impact surface and subsurface artifacts. Historic structures located in the area are of wood construction with shake roofs. It is probable that they could be damaged or destroyed as a result of wildland fire activity, and must be protected from flames and embers.

7.2.5 Ecologically Sensitive Areas

Riparian areas are almost always the richest centers of species diversity. They are highly sensitive to disturbance by wildland fire and flooding and should be afforded a high level of protection. Heavy flooding of Crane Creek in the past as evidenced by serious damage to a historic bridge and downed trees along the stream is likely to occur again in the future and could negatively impact the aquatic and riparian areas within the community.

The forest, shrub, and grassland vegetation in the area are fire adapted and will recover over time from a wildland fire. However, following a high-intensity wildland fire it may take a century or more of active management following a high-intensity wildland fire to return the area to an appearance and condition of what is believed to have existed naturally and historically.

The stands of mature mixed conifer that was not severely impacted by the A-Rock Fire remain vulnerable to wildland fire unless treated. An open stand of timber on the north side of the community has been the location of past community gatherings and has great sentimental value.

Much of the area impacted by the A-Rock fire is recovering from the stand-replacing event and must be actively managed within the wildland-urban interface to reduce fuel loading and to provide for human safety and well-being.

Another area that is threatened is Big Meadow – not from fire but from encroaching forest. Fire exclusion has permitted primarily ponderosa pine to become well established along the fringe of what at one time was a much larger meadow. Expanding the meadow to its earlier size is ecologically appropriate and would provide a larger community safety zone.

7.2.6 Water and Watersheds

The Merced River and its tributaries, including Crane Creek, receive special protection under the Wild and Scenic Rivers Act. A heavy rain event occurring shortly after a catastrophic wildland fire could lead to flooding, heavy siltation, and damage to riparian areas, and structures and bridges.

7.2.7 Air Quality

Foresta lies within a Class I Airshed. Air quality can be impacted by a wildland fire as well as management actions taken to manage fuels.

Foresta is located at mid-elevation with the Sierra Nevada crest rising to the east and Yosemite Valley and El Portal and the Merced River drainage below. Past fires in the area have impacted visibility in Yosemite Valley, and have settled into the Merced River drainage under the right set of atmospheric conditions. Note, however, that smoke was common historically. George Sudworth reported that he routinely encountered fires in 1899, with travel at times difficult because of dense smoke.

A community with a school and hospital are located in Yosemite Valley. Members of the community, and certain visitors, may be susceptible to the impacts of a wildland fire or controlled burn.

The amount of smoke produced by a prescribed fire can be managed by burning smaller units or by timing the burn to take advantage of optimum fuel conditions and adequate atmospheric smoke dispersal. Procedures are in place to monitor and document smoke emission and fire behavior during a prescribed burn. Hourly PM 2.5 data are available from fixed site in Yosemite Valley. A second monitoring point may be set up in another location to ensure air quality standards are not exceeded in the community.

7.2.8 Recreation

Yosemite National Park and Yosemite Valley may be the world's best-known example of glacier-carved terrain. The dramatic scale of waterfalls, rounded domes, massive monoliths, and towering cliffs draws millions of visitors annually intent on hiking, camping, and experiencing all this unique park has to offer. Foresta exists to provide quiet and solitude for individuals who return to houses and cabins oftentimes-in family ownership for generations.

A wildland fire occurring in the Foresta area would temporarily impact visitors to the park but could have long-term impact in the Foresta area.

7.3 Data Analysis

7.3.1 Catastrophic Fire Potential

Two of the rating elements, fuel density and slope, were used to rate the potential of a catastrophic wildland fire impacting the area. The ratings could range from a low of 2 (Grass with scattered trees or Manzanita or oak brush and a slope less than 20%) to a high of 17 (Dense, continuous conifers and/or thick manzanita or oak brush, and a slope greater than 45%). Risk Ratings of Low, Moderate and High were selected in order to conform to national standards and to simplify the planning process.

Table 4: Catastrophic Fire Potential

Rating Range	Potential	Description
2 - 8	Low	Light fuels, moderate terrain
9 – 12	Moderate	Medium fuel loading that requires moderate winds (8mph at mid-flame height) to spread, intermediate terrain
13 – 17	High	Heavy fuel loading with dead fuel on forest floor, steep slopes

7.3.2 Vulnerability of Structures

The remaining 12 factors were used to assess how vulnerable the entire community was to wildland fire. The assessment looks at factors such as the design of the community, wildland fire response capabilities, and structure construction materials, defensible space, and location of utilities.

Table 5: Community Vulnerability Factors

Factor	Description
Subdivision Design	
Ingress/Egress	❑ Number and condition of roads in and out of the subdivision.
Primary Road Width	❑ Width of primary roads
Accessibility	❑ Road steepness, condition, adequate bridge(s)
Secondary Road Terminus	❑ Ability to turn around at the end of a road
Average Lot Size	❑ Self explanatory
Street Signs	❑ Street signs present at major intersections. House numbers present
Response Capabilities	
Response Time	❑ Response time to a wildland fire
Hydrants	❑ Type and profile of hydrants
Draft sources	❑ Alternate water sources
Structure Vulnerability	
Materials	❑ Combustibility of building materials
Defensible Space	❑ Amount of defensible space around a home
Utilities	❑ Placement of electrical and gas service

Table 6: Rating Factors to Determine Community Vulnerability

Rating Range	Level of Vulnerability	Description
6 – 18	Low	Well prepared – Low vulnerability
19 – 27	Moderate	Problem areas exist. Action is required
>28	High	Significant problem areas exist that place the entire subdivision at risk

7.4 Summary of Findings

Of the 50 structures that were assessed, 22 percent fell into the Low category, 26 percent were rated as Moderate, 36 percent were rated High, and 16 percent were ranked in the Very High category for being at risk from a catastrophic wildland fire (Figure 6). The over-all vulnerability of the community was rated Moderate.

Figure 6: Vulnerability of Structures to Catastrophic Wildland Fire

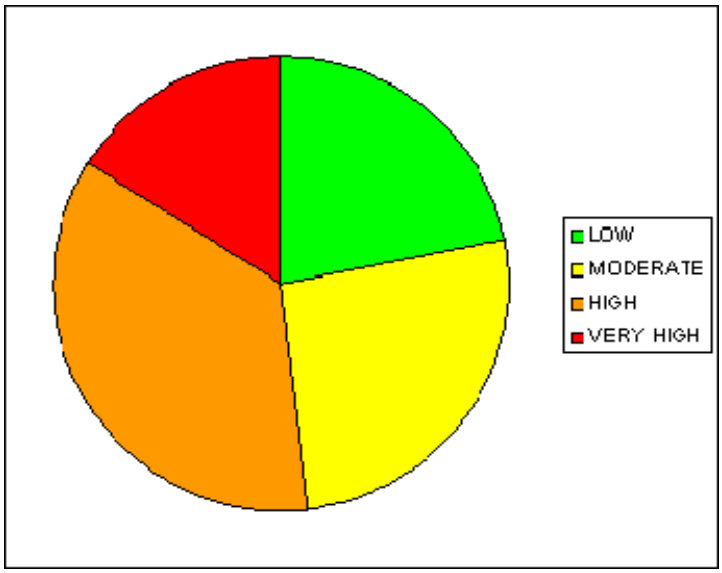


Photo: Wildland Fire Associates

8.0 Mitigation Strategy: The Action Plan

Lomakatsi's Ecological Principles for Fuel Load Reduction and Tree Planting

Lomakatsi is a Hopi word that means "Life in Balance" and is the concept behind Lomakatsi Restoration Project, a grass roots 501(3) c non-profit organization in southwestern Oregon. The principles of the organization are sound, and ones that should be considered as fuels treatment plans are identified and completed.

1. *Act conservatively. Don't change things too much at once.*

2. *Respect what is already on site.*
   - *Maintain shaded areas and 70-80% overstory canopy coverage in mixed conifer forests. (Can be adjusted).*
   - *Retain large trees.*
   - *Leave a diversity of tree and plant species, and maintain uneven-aged stands.*
   - *In restoration work, plant only native species on site.*
   - *Include indigenous traditional ecological knowledge as reference point in ecosystem restoration.*

3. *Remember the wildlife*
   - *Leave some places undisturbed for the birds and wildlife currently using the area.*
   - *Leave some small piles of cut material unburned, as habitat for wildlife.*
   - *Leave buffers of undisturbed vegetation in streamside riparian areas.*
   - *Retain snags for wildlife habitat. Chart their locations for monitoring and fire safety precautions.*

4. *Remember the soil: leave some of the cut materials on the ground, perpendicular to the slope, to catch upslope erosion and contribute to future soil.*

5. *Remember the people.*
   - *Listen to residents and neighbors. They know the ways in which each site is unique.*
   - *Match site diversity with worker diversity. Hispanic, Native American, and current youth cultures each have their own ways of understanding the complex diversity of nature.*
   - *Train workers about ecological principles and how to see the special characteristics of each place.*
   - *Pay workers according to their training, experience, and quality of work.*
   - *Pay workers well, and listen to them. Happy, respected people do the best work.*
   - *Look for usable material to carry from site to site for poles, furniture, fuels, etc.*

6. *Learn.*
   - *Keep complete records of prior conditions, work accomplished, and time, money, and people that it took.*
   - *Review information about similar sites before deciding how to treat new ones.*

8.1 Introduction

It is anticipated that it will be necessary to complete the recommended project in stages and that existing park treatment units will be used to the extent possible. It will also be necessary to ensure that follow-up treatments are performed on a regularly scheduled rotation.

Initial projects will concentrate on the community and the immediate vicinity, and will be designed to take advantage of the fuels treatment work completed to date by the National Park Service and others, enhance the safety of firefighters defending the community and residents, and create a series of shaded fuel breaks and openings that will enhance the ability of firefighters to defend the community. All projects will take advantage of terrain features, changes in fuel type, watercourses, and roads and other man-caused disturbances to the fullest extent possible.

Another element of the planning process was to assess each residence's vulnerability to wildland fire and to address the need for an evacuation plan for Foresta.

8.2 Desired Future Conditions

The primary goal of this analysis is protecting the community and homeowners from a catastrophic wildland fire. Many recognize that years of fire suppression and other factors have contributed to dense, unhealthy forests, which are prone to attack by insects and disease, and are vulnerable to catastrophic wildland fire. By default, efforts to protect the community may yield a secondary outcome as well – restoring healthy forest conditions as a byproduct of the very treatments that provide community protection. Such synergy has occurred frequently throughout the West where community protection and ecological restoration have been implemented.

What May Have Existed Naturally And Historically?

A mosaic of complex vegetation patterns and types that would have evolved naturally through ecological and geological processes. The landscape vegetation would generally have reduced continuity of fuels, more openings, a variety of seral stages, and different vegetative communities in a random patchwork.

The landscape should take on an appearance of what may have existed naturally and historically as work is completed. A mosaic of complex vegetation patterns and types that would have evolved naturally through ecological and geological processes will be present. The landscape vegetation should generally have reduced continuity of fuels, more openings, a variety of seral stages, and different vegetative communities in a random patchwork. Such a forest landscape is characteristically relatively open woodland with low amounts of surface fuels and fuel ladders. A forest landscape of this type provides considerable community protection, wildland fire suppression potential at the wildland/urban interface, and ecological sustainability for the long term.

An example of how a ponderosa pine/mixed conifer forest might look following treatment. Photo: WFA

8.3 Mitigation Goals and Objectives

8.3.1 Goals

Full support by the community and stakeholders of the analysis is imperative. Actions must be taken within the community and around individual homes to provide for the safety of firefighters and the public in the event of a wildland fire. One of the components of a successful program is to provide on-going educational opportunities to fully inform homeowners about the *Fire Safe* Program. Recognizing the importance of attempting to properly sequence treatments on the landscape by working first around individual homes and within the communities and then moving further out into the surrounding landscape is necessary.

The desire of the stakeholders is to reduce the amount of hazardous fuels within and adjacent to the community, reduce and regulate fuel loading, and modify the vegetation structure and composition as necessary to protect life, property, resources, and restore natural processes. When fully implemented, the altered vegetation in combination with a *Fire Safe* community will provide for firefighter and public safety and afford fire suppression personnel a greater than ninety percent success rate when defending a

community or isolated home against a wildland fire, while respecting the aesthetic and ecological values important to the local residents and visitors.

On a landscape scale, vegetative complexity is the key to mitigating wildland fire behavior. A broad range of vegetative types and native plant species must be maintained in a mosaic in order to slow fire spread to a manageable level.

The primary mitigation goals are to:

- Provide for firefighter and public safety;
- Reduce hazardous fuel accumulations on wildlands within and adjacent to the community;
- Reduce risk of wildland fire starting on federal lands impacting the community;
- Restore and maintain healthy ecosystems on a landscape-scale that are not as vulnerable to ecological events outside the historical range of variability;
- Coordinate efforts to secure adequate fuels treatment funding; and
- Continue to build on the existing *Fire Safe* education programs.

8.3.2 Objectives

- Provide defensible space around individual structures and for the community as a whole by reducing the wildland fuel load and altering vegetative patterns.
- Create different vegetative associations and vegetation patterns that are less continuous and consist of a variety of age classes, as appropriate, and include more random openings to aid in wildland fire suppression.
- Reduce the likelihood of the establishment and perpetuation of undesirable plant species.
- Enhance ecosystem health by reducing the fuel loading and stand composition to more natural levels.
- Coordinate fuel management activities to take full advantage of fuels mitigation work completed to date.
- Create shaded fuel breaks in appropriate locations.
- Establish lines of communication with stakeholders necessary to set project priorities, request and receive funding, carryout fuel management projects, and fully implement the key elements of the *Fire Safe* Program.
- Formalize a means of systematically monitoring and evaluating fuel loading to ensure that projects that are completed are properly maintained to provide the desired results.

8.4 On-Going Fuel Treatment Projects

Over the past 15 years, the National Park Service and others have treated most of the land in and adjacent to Foresta. Treatment methods have included prescribed fire, mechanical fuel reduction (primarily cut, pile, and burn), and the use of masticators to grind and spread dead woody surface fuels.

Table 7: Completed Fuel Management Projects by Method (1970-2006)

Method	Acres	Comments
Prescribed fire	16.3	
Cut, Pile, and Burn	45.9	
Prescribed fire	1,127.7	
Private homeowners	140.3	
Multiple Treatments	2.496	
Cut, Pile, and Burn	22.309	
Masticator – Demo	.5	Mounted on a Heavy Loader
Masticator – Demo	.5	Mounted on a skidloader (Bobcat ™)
Cut and Chip	1.5	Completed by MCFSC

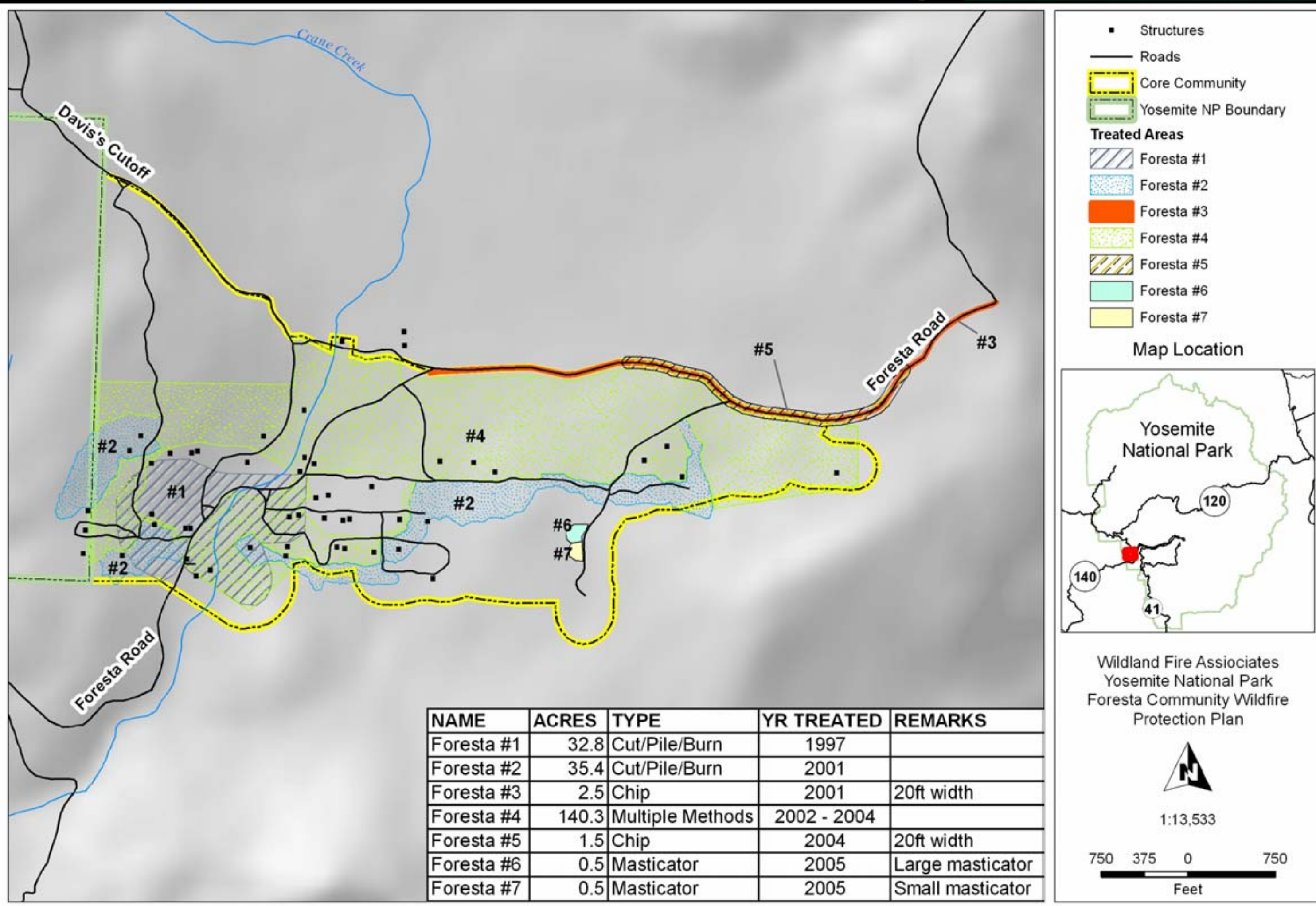
Source: Yosemite National Park/MCFSC

Local residents have performed a great deal of work around their homes, and the Mariposa County Fire Safe Council (MCFSC) cut and chipped vegetation along Foresta Road to increase defensible space.

Area treated with a masticator **Photo: Wildland Fire Associates**

Figure 7 - Treated Areas - Cut/Hand Pile/Burn - Other

Foresta, Yosemite National Park



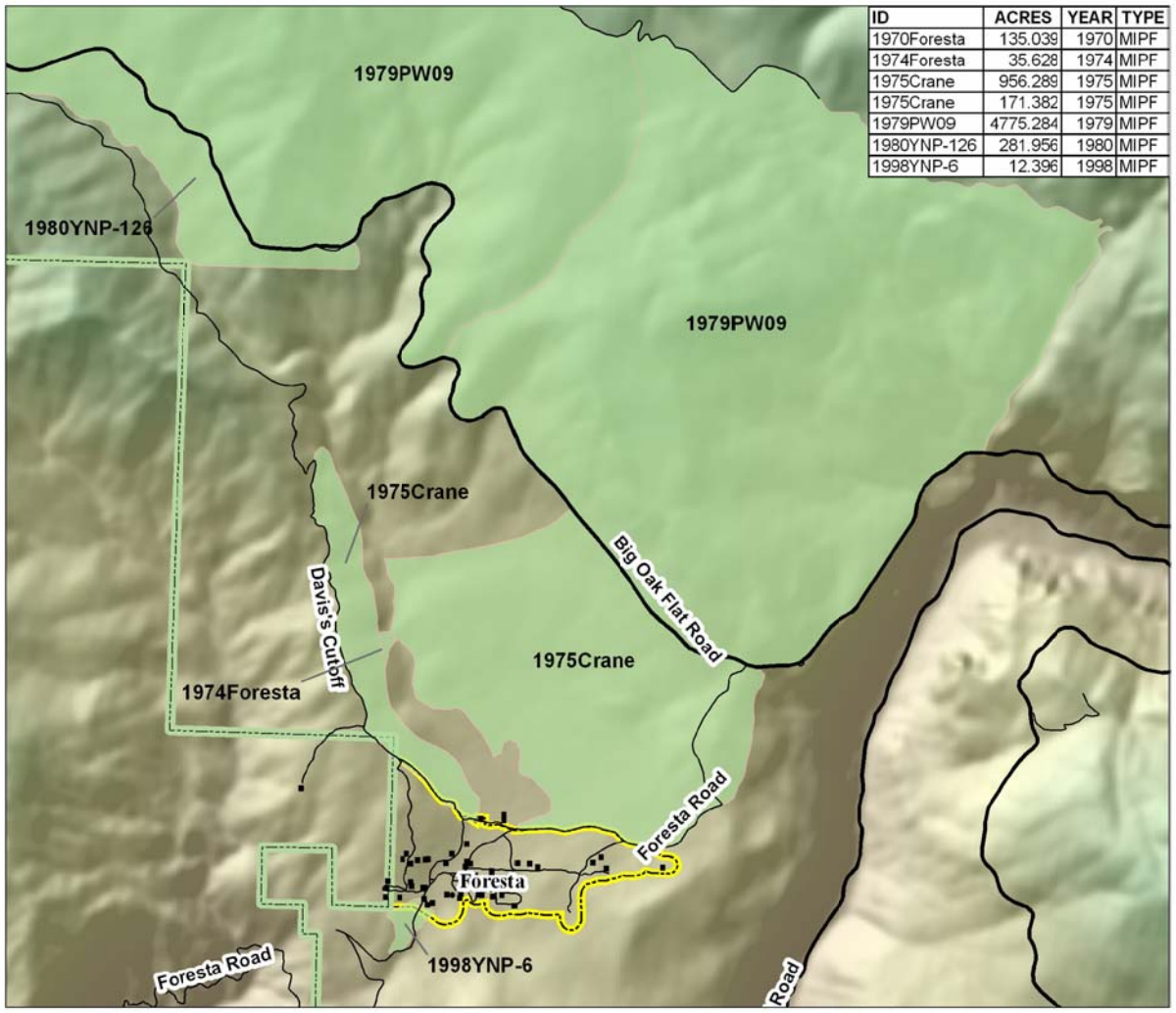
NAME	ACRES	TYPE	YR TREATED	REMARKS
Foresta #1	32.8	Cut/Pile/Burn	1997	
Foresta #2	35.4	Cut/Pile/Burn	2001	
Foresta #3	2.5	Chip	2001	20ft width
Foresta #4	140.3	Multiple Methods	2002 - 2004	
Foresta #5	1.5	Chip	2004	20ft width
Foresta #6	0.5	Masticator	2005	Large masticator
Foresta #7	0.5	Masticator	2005	Small masticator

Figure 8 - Treated Areas - Prescribed Fire (1970 to 1999)

Foresta, Yosemite National Park

WILDLAND FIRE ASSOCIATES

ID	ACRES	YEAR	TYPE
1970Foresta	135.039	1970	MIPF
1974Foresta	35.628	1974	MIPF
1975Crane	956.289	1975	MIPF
1975Crane	171.382	1975	MIPF
1979PW09	4775.284	1979	MIPF
1980YNP-126	281.956	1980	MIPF
1998YNP-6	12.396	1998	MIPF



- Locales
- Structures
- Roads
- Core Community
- Yosemite NP Boundary

Fire History

- Prescribed Fire
- Piles

Map Location

Wildland Fire Assiociates
Yosemite National Park
Foresta Community Wildfire
Protection Plan

1:41,299

2,000 1,000 0 2,000

Feet

c:/gis_projects/foresta/Figure 8 Treated Areas.mxd, 09/05/07, Wildland Fire Associates, mandeno

8.5 Prioritization Process

The publication, *Preparing a Community Wildfire Protection Plan* (SAF 2004), recommends a process to aid in the development of a community wildland fire risk assessment. The process allows a community to take the lead in setting priorities for its own protection and have a greater influence over the location and type of land management treatments that occur on federal lands surrounding their community.

To complete a meaningful community-wide fire risk assessment a broad range of factors must be considered. Environmental factors such as wildland fuel type and arrangement, terrain features, and risk of wildland fire occurrence; infrastructure and other community values at risk; and local preparedness and firefighting capabilities must be evaluated. It is also important to determine the direction from which a wildland fire is more likely to come that will pose the greatest threat to the community. The results of the survey and analysis process were used to identify fuels treatment priorities and methods to be used on federal and non-federal land and to describe ways that homeowners can reduce their own risks through *Fire Safe* building and landscaping practices.

In keeping with the primary goals identified by the stakeholders and outlined in Section 8.3.1 Goals**,** initial projects will focus on public and fire fighter safety and ecosystem restoration. Other factors, such as air and water quality, the numerous cultural resources in the area, and financial considerations were also taken into consideration.

The Best Use of Limited Funds

There has been a great deal of concern expressed on the part of all the stakeholders related to ingress and egress. The new bridge over Crane Creek being built by Mariposa County will go a long way towards addressing these concerns. What is the best way to mitigate the remaining road related issues? Federal, State, and local funds are limited. In light of the Healthy Forest Restoration Act and other federal and state fuels management programs, it is much more likely that funding could be requested and received for fuels treatment programs than for road improvement projects.

The goal of reducing the risk from wildland fire and creating a fire safe community requires long-term effort. Priority projects are generally focused on reducing and modifying fuels to slow down a wildland fire to aid in suppression and allow for safe evacuation, with a longer-term goal of expanding the treated area out a mile or more from the community. As a result, it will be necessary to complete the process on a project-by-project basis.

Treatment of the fuels in the community and vicinity will involve a variety of treatment methods. The projects identified in this plan are designed to reduce the fuel load in order to impede the spread of a wildland fire, provide firefighters with defensible space, and allow for safe evacuation of the area. Actions taken to protect the community and its inhabitants must be environmentally sound and consistent with park planning documents, including the Park's Fire Management Plan. .

A great deal of work has already been done to thin the new growth and provide protection for homes in the community. Projects that complement or enhance previous fuel treatments have been identified and included, as appropriate. Higher priority should be given to projects that improve on past treatments and create additional defensible space around the community. However, certain elements, such as a means of disposing of the biomass created should be completed early in the process.

Initially, the trees, brush, and slash that will be removed will have limited commercial value and are best disposed of on site. Air quality, burn windows, and labor costs limit disposal options. An environmental friendly means of disposing of the biomass that will be created by the various projects has been identified and included in this plan. A strategy to manage heavy fuels has been identified and methods developed to accomplish this task.

8.6 Readiness to Proceed

As indicated in the previous section, a great deal of work has already been done to provide for the safety of the residents and the protection for homes in the community. Fuels treatment projects have been identified and documented in the Park's Fire Management Plan. Prescriptions to implement projects have been developed and are included in this plan. The Park has agreed to take the lead for requesting funding and overseeing the projects, and has already secured funding to treat fuels in close proximity to the community. The National Park Service and the Stanislaus National Forest are considering other projects in the vicinity designed to provide additional protection to the community and improve forest health.

Contact has been made with the manufacturer of the Air Curtain Destructor and local and regional forest management contractors. Proposed treatments will complement the work completed and planned by the National Park Service. Plans are underway to develop a prescribed burn plan that will incorporate all the various projects into one document.

Specific project guidance has been developed to treat fuels and included in this plan. The use of an Air Curtain Destructor has been tested in several locations in California and has proven to be very efficient and environmental friendly. The other treatment methods identified in this plan have been used throughout the United States with great success.

Action will be required to redefine the WUI to include the ridgeline to the south. This may require additional NEPA compliance. However, this action is not expected to delay the implementation of this plan.

Expanding the Inner WUI would allow for comprehensive management of the area that poses the greatest threat to the community and increase the management options available. It would also make the project area compatible with existing prescribed fire (fuels management) units.

8.7 Possible Actions

The use of a broad range of treatment methods is recommended to fully implement the hazard fuel treatment component of the community protection plan. The purpose of the treatments will be to create more open stands of vegetation less susceptible to crown fire and create fuel breaks utilizing a variety of means where appropriate. Other actions may be necessary to improve the over-all safety of the population and mitigate non-fuel related situations such as disrupted ecological processes.

Projects must conform to standards and guidance found in the Park's Fire Management Plan (FMP). For example, the FMP permits the use of a broad range of methods, including mechanical means to treat fuels within the Core WUI[2]. Requirements are different for the remainder of the WUI buffer. The FMP indicates that management ignited prescribe fire should be used to manage that area, to the extent possible.

In consideration of the vegetation conversion and heavy fuel loading resulting from the A-Rock Fire and the abnormal fuel loading present in the forested areas that escaped the fire, it may be necessary to use mechanical pretreatment methods before prescribed fire can be used exclusively in the project area. The anticipated treatment sequence for much of the area will involve the use of mechanical means to thin the stands of trees and reduce ground fuels so that prescribed fire can be used under a variety of prescriptions to reduce the fuel loading and further thin the emerging vegetation. Once the fuel loading and stand composition have been reduced to a point where wildland fire will not adversely impact the remaining vegetation, the area will be treated and maintained using prescribed fire.

8.7.1 Vegetation Management/Fuel Management Projects

8.7.1.1 Mechanical and Manual Treatment

Mechanical and manual treatment of fuels onsite will be a key component of the fuels management process. These treatments will involve the use of tools such as chain saws or heavy equipment such as a hydro-axe or other similar type of mechanical treatment device to remove smaller diameter trees and shrubs. A hydro-axe, for example, is capable of reducing a 20-foot tall tree into small pieces of wood no larger than a baseball bat, and often times much smaller. The resulting wood chips could be left in place to hold the soil and reduce the possibility of erosion. Once the right set of conditions are determined, a light understory burn could be used as a follow up treatment to reduce the overall accumulation of dead and down fuel to levels more resembling the average fuel loading for a typical site.

Mechanical equipment may be utilized to physically remove heavy down fuels (fallen trees) from areas near structures or other sensitive areas within the Wildland Urban Interface (WUI). Another use of mechanical equipment, such as chainsaws would be to

[2] The Core WUI consists of the community and a ¼ mile buffer.

manage brush and other surface fuels. It may also be necessary to prune lower limbs on large diameter trees to reduce the likelihood of a crown fire.

Chipping and/or hauling residue to a bio-fuel plant or disposal site would have an application within the community or near roads where the chips could be handled efficiently or blown back onto the land.

8.7.1.2 Thinning and Brushing

Thinning using power saws and pile burning or lopping and scattering of lower limbs would be utilized in areas that are not favorable for the use of mechanical equipment, near buildings and other structures, and near riparian areas, as necessary. It is anticipated the pile burning would be only used on a limited basis.

8.7.1.3 Prescribed Burning

Broadcast burning (alone or as part of a mechanical fuel treatment project) would be used in certain areas to treat existing fuels and to maintain a large portion of the WUI buffer zone once the site is treated. Depending on species composition and other factors, a prescription could be developed that would permit under burning of the stand to reduce fuel loading and control understory growth, while limiting the amount of heavy fuels laying on the ground that would be consumed. Using prescribed fire to treat areas that have been previously treated with a masticator may require the development of a custom fuel model to predict fire behavior.

8.7.1.4 Slash/Biomass Disposal

Burning excess biomass using an air curtain burner located near Foresta is expected to be a key element of the fuels treatment program. It could treat fuels from the community, and debris from other treatment areas in the vicinity could be brought for disposal. An Air Curtain Destructor efficiently burns larger diameter materials and other debris with a minimum amount of residue and release of emissions. Because a unit of the size necessary for this project is difficult to move, the fuels will in all likelihood have to be hauled to a disposal site in the immediate area for treatment.

8.7.1.5 Forest Products Utilization

Whenever appropriate, homeowners would be encouraged to gather suitable materials for utilization as firewood. It may also be appropriate for the Park to sell wood suitable for firewood to a local vendor for use in campgrounds. Larger material suitable for commercial purposes could be removed and sold, if appropriate and permitted.

Table 8: Comparison of Treatment Methods

METHOD	SLOPE	COST/ACRE	PROS	CONS
Air Curtain Destructor (ACD)	All	$450-700 excluding cost of ACD	Reduced emissions Reduced residue Handle large volumes	Materials must be hauled to disposal site. Soil disturbance.
Masticator	<40%	$370 -430	Efficient Low slash	Not suitable for steep slopes. Needs place to turn around. Soil disturbance.
Chipping	All	$350-600	No slash Chips can be used to stabilize soils Utilizes Products	Requires access. Can be labor intensive. In order to utilize chips, they must be transported.
Thinning/Pile Burning	All	Cut $170-200 Pile $150-170 Burn $70-300	Low tech Broad rage of applications	Labor intensive. Residue could increase amount of surface fuel. Smoke concerns.
Broadcast burning	All	$500-1,500 Size of treatment area dependent	Can mimic nature Cost effective	Possibility of escape. Requires experienced personnel. Smoke concerns. Scheduling concerns
Cut, Remove by hand, Chip	Flat to Steep	$1,200 - 2,500	Low tech Broad rage of applications	Labor intensive. Steep slope increases cost
Logging	All	Dependent on commercial value	Utilizes product Removes biomass	Lack of available markets. Low number of logs. Soil disturbance.
Pruning	All	$500-1,000	Effective	Labor intensive Generates slash
Firewood	All	None	Utilizes product	Possible liability Issues.

Source: Michael Beasley, Yosemite National Park, July 2004; Living with Fire: Protecting Communities and Restoring Forest May 2006

8.7.2 Infrastructure Improvements

8.7.2.1 Water Supply

The Park should stage a portable pump and kit, such as a Mark III, at the fire house and train interested homeowners in its use so that the tank can be filled at optimum times.

8.7.2.2 Roads/Access

Vegetation along side the Foresta Road between the community and the Big Oak Flat Road should be treated, and the treated area periodically maintained to provide improved sight distances and to create defensible space. Such actions will provide for the safety of those evacuating the area and fire suppression personnel who may be entering the area. At some future date, as the vegetation grows and matures, an additional project should be identified to create and maintain a shaded fuel break where necessary.

The streets within the community should be improved to facilitate drainage and eliminate sections that are chronically soft and muddy. This action will improve access to individual homes and aid in the protection of the home and area evacuation.

The county portion of the access road should be widened to provide better access for fire suppression forces and to facilitate evacuation of the area during an emergency. The need for and the feasibility of constructing a second bridge on the north side of the community should be assessed at some future date.

8.7.2.3 Utilities

Above ground utilities should, at some point, be placed underground.

8.7.3 Emergency Response

Adequate equipment and other suppression resources are available and procedures are in place to respond to any wildland fire situation. Park and Mariposa County firefighters are well trained and equipped and an interagency agreement between the Park and the County is in place to guide response efforts. A structural protection plan should be developed by the Park.

8.7.4 Defensible Space

Local residents and the Park have created defensible space up to 300 feet from almost every structure in the community. Specific action plans which address the maintenance and improvement of defensible space are available as part of this document.

8.7.5 Evacuation Plan

A formal evacuation plan for Foresta was not included in the Mariposa County Emergency Operation Plan. At such time that the *Mariposa County Emergency Operations Plan* and the *Reciprocal Fire Protection Agreement between the United States Department of Interior National Park Service and the County of Mariposa* are updated, procedures and designated routes of travel and the staging area should be identified and included.

8.7.6 Education

The Foresta Preservation Association has a quarterly newsletter that is available on the Internet at www.foresta.org. Their newsletter periodically publishes information taken from the *Fire Safe* Program that encourages fire safety throughout the community. Based on the size and demographics of the community, this means of disseminating information is adequate for the present. The FPA should actively participate is a member of the Mariposa County Fire Safe Council.

8.7.7 *Fire Safe* Inspector Program

Currently, the Park position that performs *Fire Safe* inspections is vacant. Annual *Fire Safe* inspections are expected to continue once that position is filled.

8.8 Watershed Protection

There are no known adverse effects on soil and water quality for most of the projects. It is anticipated that machinery will be used to complete a portion of the contracts. Some equipment can cause soil compaction and soil disturbance. Care should be taken to reduce impacts by limiting use on wet or moist soils and in riparian areas. Smaller pieces of equipment such as skid loaders and equipment with wide tracks or large pneumatic tires often cause fewer disturbances and should be specified in a request for quotes. Water quality should be monitored, as necessary.

8.9 Permitting and Exemptions

Before the park service can implement fuels treatment projects, site-specific plan(s) will be developed and approved by the park superintendent. Several of these plans are already in place.

WUI areas are broken into two components: the core community (Foresta) plus a ¼ mile-wide belt around it (Inner WUI), and a belt extending from ¼ mile up to no more than 1 ½ miles from the community (Outer WUI). The current Fire Management Plan and Associated Environmental Impact Statement provide guidance for treatment of fuels within the core community and the Outer WUI. These guidelines have been incorporated into the identified project; no further action is required.

The current Fire Management Plan and Associated Environmental Impact Statement also address in general terms many of the recommended projects. However, it may be necessary to complete an additional planning document that is NEPA compliant in order to use mechanical equipment or mechanical means to treat fuels more than ¼ mile beyond the core community and to construct and maintain a permanent firebreak outside the core WUI area.

All projects involving the use of prescribed fire are contingent upon approval by Mariposa Air Pollution Control Officer (MAPCO); burning will occur only on permissive burn days. However, a variance request may be made to MAPCO if atmospheric conditions at the burn site are favorable for good smoke dispersal.

The Burn Boss or project manager, in consultation with the Park Fire Archeologist, will ensure that all required cultural resource surveys have been completed for each unit to be treated prior to implementation.

8.10 Prioritized Actions and Implementation Timeline

A variety of factors were taken into consideration during the planning process when establishing priorities for the projects and actions identified in this section. The first thing was to never loose sight of the primary goals of improving public and firefighter safety and restoring the ecosystem. Other key factors used to establish priorities included stakeholder input, available staffing, financial considerations, environmental factors, and

regulatory requirements. These projects also take into consideration reducing the risk from wildland fire and creating a fire safe community requires long-term effort.

Priority projects outlined in this plan generally focus on reducing and modifying fuels to slow down a wildland fire to aid in suppression and allow for safe evacuation, with a longer-term goal of restoring a balanced ecosystem that is historically relevant.

The first project, including a formal evacuation plan for Foresta in the Emergency Operations Plan for Mariposa County was determined to be the highest priority. This project is followed closely by the need to purchase an Air Current Destructor because many the fuels treatment projects are dependent on disposing of the slash and other by-products of thinning in an environmentally sensitive, cost-effective manner. Both of these projects can be completed simultaneously.

In the case of the fuels treatment projects, one project builds on another. However, certain fuels treatment projects (primarily management ignited prescribed burns) that reduce fuels outside the community boundaries but within the project area can in all likelihood be implemented in any order, so long as the projects are completed. This will allow the Park the flexibility of managing available funds and other resources in an efficient, cost-effective manner that conforms to the Yosemite National Park Fire Management Plan. It may be necessary to develop individual treatment plans for each project; however, creating a Fuels Treatment (Prescribed Burn) Plan similar to the prescribed burn plan developed for Lower Yosemite Valley is highly desirable.

The following is a listing of the proposed projects. Although some of the units have been modified slightly and two have been combined, the treatment units, in most cases, correspond to existing units that were identified by the Park and listed in the Park's Fire Management Plan for treatment. A map (Figure 9) delineates the proposed treatment units.

- Amend existing fire agreements to include a formal Evacuation Plan for Foresta.

- Acquire an Air Curtain Destructor to dispose of the slash and other activity fuels generated during thinning projects.

- Create 300' wide shaded fuel breaks on both sides of Foresta Road from the Big Oak Flat Road (Treatment Unit 9) to the road junction leading to Big Meadow.

- Use prescribed fire in Treatment Units 1 and 6 to reduce fuel loading. Unit 1 was scheduled for treatment in 2006 but the treatment could not be completed. Treating these two units will create a shaded fuel break that will provide improved protection for the community from a wildland fire that starts to the south and/or west of the community.

- Retreat Units 4, 5, and 7 using a combination of mechanical means and prescribed fire, if necessary to reduce fuel loading and achieve ecological restoration objectives.

- Treat the area south and east of the community (Treatment Unit 3), 600 feet out. (Now treated approximately 300' out) using primarily mechanical means such as a masticator to treat smaller fuels. Large diameter logs and standing dead trees would not be treated (However, standing dead trees that pose a safety hazard to the crews should be felled).

- Treat remaining stand of timber that escaped the A-Rock Fire south of the community (Treatment Unit 2), using mechanical means to pretreat the unit, as necessary, followed by prescribed fire. The use of mechanical means outside the core WUI area will require additional NEPA compliance because means other than prescribed fire will be used, which is currently not permitted in the Park's Fire Management Plan.

- Use prescribed fire in Big Meadow (Treatment Unit 8) to remove smaller encroaching pine and restore health and ecological balance to this key area. This unit was scheduled for treatment in 2006 but could not be completed. It may be desirable to use mechanical means to remove some of the larger pine trees that are encroaching, before implementing the prescribed burn.

- Establish and maintain a permanent firebreak on the ridge south of Foresta (Treatment Unit 10) and complete the associate NEPA compliance process.

- Treat the remainder of Treatment Unit 3 beyond the 600' initial treatment area to the ridge. This may involve mechanical pretreatment of the fuels followed by prescribed fire, if appropriate. However, much of this project could be completed using environmental and fuel condition factors to regulate fire intensities.

As indicated in Section 8.7 Possible Actions, projects must conform to standards and guidance found in the Park's Fire Management Plan (FMP). For example, the FMP permits the use of a broad range of methods, including mechanical means to treat fuels within the Core WUI[3]. Requirements are different for the remainder of the WUI buffer. The FMP indicates that management ignited prescribe fire should be used to manage that area, to the extent possible.

In consideration of the vegetation conversion and heavy fuel loading resulting from the A-Rock Fire and the abnormal fuel loading present in the forested areas that escaped the fire, it may be necessary to use mechanical pretreatment methods before prescribed fire can be used exclusively in the project area. The anticipated treatment sequence for much of the area will involve the use of mechanical means to thin the stands of trees and reduce ground fuels so that prescribed fire can be used under a variety of prescriptions to reduce the fuel loading and further thin the emerging vegetation. Once the fuel loading and stand composition have been reduced to a point where wildland fire will not adversely impact the remaining vegetation, the area will be treated and maintained using prescribed fire.

[3] The Core WUI consists of the community and a ¼ mile buffer.

Figure 9 - Proposed Treatment Units

Foresta, Yosemite National Park

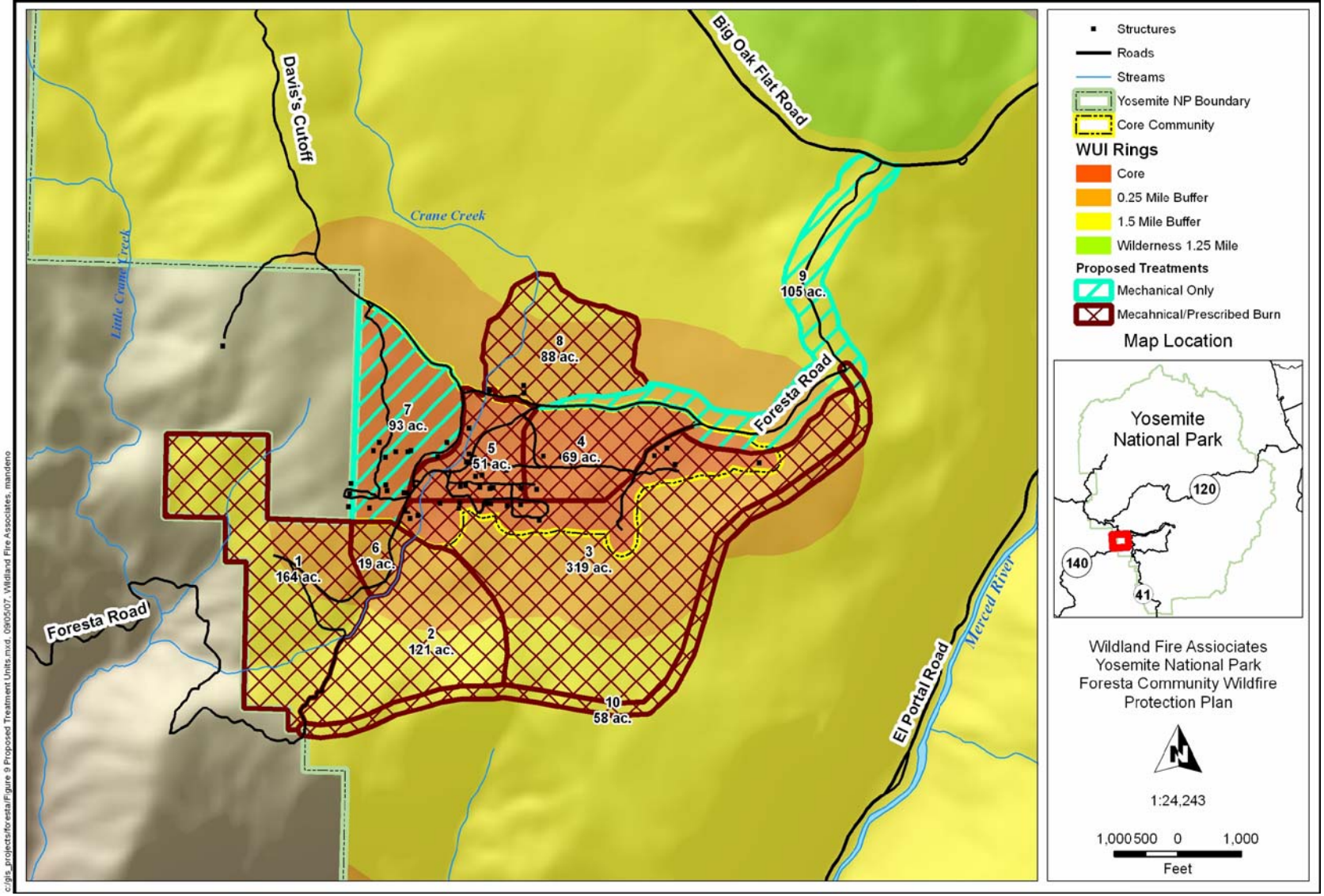


Table 9: Prioritized Actions and Implementation Timeline

Project	Short Term <1 year	Medium Term 1 – 10 Yrs.	Long Term 10+ Yrs.	Steps to Implement	Remarks
Include Foresta in Mariposa County Evacuation Plan	**X**			1. Park contacts Mariposa County Sheriff. 2. Sheriff completes addendum	• Recommended completion date: January 2008.
Secure Air Curtain Destructor (ACD)	**X**			1. Complete funding request. 2. Secure funding and purchase 3. Schedule and transport to site. 4. Assign loader & operator	• The ACD is a key component of the fuels management program and should be secured ASAP. • Could be purchased by a group of agencies and shared.
Improve Defensible Space within the Community	**X**			Owners treat areas as needed.	• Follow new 100' guidelines.
300' Shaded Fuel Break on both sides of Foresta Road between Big Oak Flat Road and Foresta.		**X**	Maintain	1. Finalize methods to be used and areas to be treated. 2. Complete planning process. 3. Secure funding. 4. Implement program.	• A project wide plan should be developed. • Projects should complement work completed or scheduled by the NPS or others. • Institute monitoring plan to insure objectives are being achieved. • Schedule follow-up treatments.
Treat Units 1 & 6		**X**	Maintain	1. Finalize methods to be used and areas to be treated. 2. Ensure NEPA compliance 3. Complete planning process. 4. Secure funding. 5. Implement program. 5. Monitor to determine if objectives are being met.	• A project wide plan should be developed. • Projects should complement work completed or scheduled by the NPS or others. • Institute monitoring plan to insure objectives are being achieved. • Schedule follow-up treatments.

Project	Short Term <1 year	Medium Term 1 – 10 Yrs.	Long Term 10+ Yrs.	Steps to Implement	Remarks
Retreat Units 4, 5, and 7 using a combination of mechanical means, including the use of a masticator and prescribed fire, if necessary.		**X**	Maintain	1. Finalize methods to be used and areas to be treated. 2. Complete planning process. 3. Secure funding. 4. Implement program. 5. Monitor to determine if objectives are being met.	• A project wide plan should be developed. • Projects should complement work completed or scheduled by the NPS and others. • Institute monitoring plan to insure objectives are being achieved. • Schedule follow-up treatments.
Treat the area south and east of the community (Treatment Unit 3), 600 feet out		**X**	Maintain	1. Finalize methods to be used and areas to be treated. 2. Complete planning process. 3. Secure funding. 4. Implement program. 5. Monitor to determine if objectives are being met.	• A project wide plan should be developed. • Projects should complement work completed or scheduled by the NPS and others. • Institute monitoring plan to insure objectives are being achieved. • Schedule follow-up treatments.
Treat Big Meadow (Treatment Unit 8) with Prescribed fire.		**X**		1. Finalize methods to be used and areas to be treated. 2. Complete planning process. 3. Secure funding. 4. Implement project 5. Monitor to determine if objectives are being met. 6. Schedule follow-up treatments.	• A project wide plan should be developed. • Prescriptions should create intensities sufficient to kill encroaching pine. • Institute monitoring plan to insure objectives are being achieved.

Project	Short Term <1 year	Medium Term 1 – 10 Yrs.	Long Term 10+ Yrs.	Steps to Implement	Remarks
Establish and maintain a permanent firebreak on ridge south of Foresta and complete the associate NEPA process.		**X**	Maintain	1. Complete NEPA compliance. 2. Complete planning process. 3. Secure funding 4. Implement project. 5. Institute monitoring plan to insure objectives are being achieved. 6. Schedule follow-up treatments	• The recommended width of the firebreak is based on outputs from Behave Plus. Its primary purpose is to provide fire suppression forces with additional options to manage a wildland fire threatening Foresta.
Treat fuels beyond 600' shaded fuel break			**X** Maintain	1. Complete NEPA compliance. 2. Finalize methods to be used and areas to be treated. 3. Complete planning process. 4. Secure funding. 5. Implement project 7. Monitor to determine if objectives are being met.	• Due to the size of the project, it may be necessary to complete it in stages. • Projects should complement work completed or scheduled by the NPS. • Institute monitoring plan to insure objectives are being achieved. • Maintain treated areas.

8.11 Additional Projects

Two additional projects that are not fuels related have also been identified. Due to the relative complexity of each project, the anticipated high cost, and the length of the planning process, each project should be addressed in more depth in a project specific planning document.

8.11.1 Improve Primary Foresta Access Road

As indicated in several sections in this document, the width of the road providing access from the Big Oaks Flat Road to the community was found in randomly selected places to be too narrow to meet State of California standards for road width as specified in the *Homeowners' Summary of Fire Prevention and Loss Reduction Laws* (Title 14, Code of California Regulations, Division 1.5, Chapter 7, Subchapter 2, Article 5.2). Mariposa County and the Park should collaborate to widen the road and make other improvements necessary to provide for the safe evacuation of the community and improve access for fire suppression personnel. This is a high priority project.

8.11.2 Replace Upper Bridge

A second bridge on the northern edge of the community provided an alternative means of ingress and egress to the community west of Crane Creek. That bridge was badly damaged during a flash flood and has not been repaired or replaced. Because there is only one suitable escape route, replacing the bridge would provide an extra level of protection for those living west of Crane Creek. If the replacement of the bridge is determined to be necessary and feasible, the project should be prioritized and included in the Park's list of road and bridge improvement projects.

Meadows Bridge **Photo: Wildland Fire Associates**

8.12 Monitoring and Evaluation

When validating a treatment there are three important questions that must be answered:

- What is the need?
- What tools did I use?
- Were these tools effective?

These questions will help the project manager verify that the tool or suite of tools used was appropriate and the treatment objectives were achieved.

The determination to treat an area was made based on the existing fuel conditions, desired future conditions, available funding, and the ability to support the program, both at inception and down the line. Progress must be assessed at various points during the project to determine if the project is on schedule and if the desired results are being achieved. This should be accomplished using an interdisciplinary approach, as well as an interagency approach, whenever possible.

A monitoring program will be included as part of the fuels treatment program. The program will ascertain if the quantifiable objectives identified in the individual fuel reduction plans are being achieved and if the desired long-term biological changes are occurring. Monitoring results will be used to validate the program, adjust prescriptions, and identify new units suitable for similar treatment.

9.0 Summary and Conclusions

9.1 Analysis and Findings

Experienced wildland fire specialists analyzed the situation through a series of site visits, meetings, telephonic interviews, and literature searches. The specialists used the results to recommend certain courses of action that are outlined in this plan. They determined that the community is at moderate risk from wildland fire and recommended mitigation measures to improve the overall defensibility of the community.

Incidents like the one occurring during the 2000 fire season at Los Alamos, New Mexico, point out the value of maintaining a fire safe community. The education and involvement of the property holders and homeowners are key to the success of the *Fire Safe* Program. The inability of the community to gain full buy-in and large-scale participation by all homeowners places the entire community at risk. Therefore, it is important that the community launch a full-scale effort to gain the support of all the homeowners for any fuel treatment project that is being proposed or implemented.

There is a need for an evacuation plan to provide for public safety. This can be accomplished by amending existing plans and agreements. Public safety could also be enhanced by improving the Foresta Road between the community and Big Oak Flat Road and by creating and maintaining a shaded fuel break from the community to the Big Oak Flat Road.

The amount of debris generated by creating and maintaining defensible space around homes, creating a 300+ foot wide shaded fuel break on both sides of Foresta Road, and expanding defensible space along the boundary of the community will be significant. These materials must be disposed of in an efficient, cost-effective manner. Burning is a good way to accomplish fuel reduction. Unfortunately, there are many limitations to the use of prescribed fire to treat fuels, including cost, air quality concerns, limited burn windows, limited resources, proximity to homes and the Park, etc. Many agencies in California have successfully used an Air Curtain Destructor to reduce debris from thinning operations. It is critical that this piece of equipment be acquired as early as possible in the process to insure it is available to burn the debris that will be generated. Because the period to apply for a grant to purchase this key piece of equipment is rapidly approaching, it is a high priority item.

To successfully compete for limited Wildland Urban Interface funding, it is important to demonstrate that other mitigation measures have been initiated or are in place. By completing and maintaining defensible space within the community, the stakeholders will demonstrate a willingness to take the actions necessary to protect their community. It is also important to work closely with the USDA Forest Service when treating fuels in close proximity to the park boundary. In many cases it may be safer and more cost effective to work together to treat fuels on both sides of the boundary.

9.2 Plan Update Process

This plan is a living document. It will be necessary to update the plan as conditions change, new projects are added, or as projects identified in the plan are completed. Copies of the plan should be placed in 3-ring binders so that it can be easily updated in the future. The programs will be monitored and adjusted when necessary. Annual meetings involving all stakeholders will be held as required to gather additional input on future projects and garner additional support for the program.

9.3 Next Steps

It is important to continue to build consensus within the planning group and the community. Regular meetings between the homeowners, other stakeholders, and the Park must be held to solicit input and generate support the process. The plan must be updated to reflect the changes to the community as new houses are added and initial projects, such as the shaded fuel break along Foresta Road and the fuels treatment projects southwest of the community, are completed.

Project and community leaders must be proactive when seeking additional funds to complete future projects. Hazard Fuel Funds for some agencies have already been exhausted, and there will be ever-increasing pressure to cutback funding for Wildland Urban Interface projects in light of increasing federal deficits. Creative financing, such as grants and cost sharing, may be the required to complete projects. For example, it may be appropriate for the Association to request grant monies to purchase an Air Curtain Destructor and enter into an agreement with the Park to operate it.

It is important that areas that have been treated receive follow up treatment. The open nature of shaded fuel breaks lend themselves well to the regeneration of certain tree species, brush, and other fuels that could impact the ability of firefighters to manage a wildland fire. If ignored, defensible space created around dwellings can soon be lost to new vegetation filling the void.

Future changes in ambient air quality standards may also impact the ability of the community to use prescribed fire to manage fuels and must be considered when planning treatment projects.

9.4 Responsible Parties

The following table lists some of the actions that are required to implement the program and to keep it moving forward in a positive, cost-effective manner. It, like the rest of the plan, is subject to revision and modification. It is desirable that the responsible party name a specific person to carry out each task.

Table 10: Responsible Parties

Task	Responsible Party	Initiate Action
Route CWPP for signature	NPS	NPS
Include Foresta in Mariposa County Evacuation Plan	County Sheriff	FPA/NPS
Develop Structural Protection Plan	NPS	NPS
Improve entrance road to conform to State standards	NPS - MC	FPA
Acquire Air Curtain Destructor via appropriation process	NPS	NPS
Acquire Air Curtain Destructor via grant process	FPA	FPA
Initiate a feasibility study to replace Meadows Bridge[4]	NPS	FPA
Carryout fuel treatment adjacent to structures	Owner	NPS
Enforce Fire Safe Guidelines	NPS	NPS
Carryout fuel treatment projects within the WUI	NPS	NPS
Complete NEPA requirements for actions not addressed in the Park's Fire Management Plan	NPS	NPS
Distribute Fire Safe materials	MCFSC	FPA
Keep Foresta Property Owners informed of CWPP issues and progress on various projects and initiatives	FPA	FPA/NPS
Maintain and update the CWPP	FPA	FPA/NPS
Request grant to maintain the CWPP	FPA	FPA
Call and schedule annual meeting to review CWPP	FPA	FPA
Monitor fuels situation in the Foresta area	NPS	NPS
Initiate follow up fuels treatment projects	NPS	NPS
Represent FPA at MCFSC and other similar meetings	FPA	FPA

FPA: Foresta Preservation Association NPS: Yosemite National Park MC: Mariposa County
MCFSC: Mariposa County Fire Safe Council

[4] In 2001 an engineering report was completed that assessed the structural integrity of the bridge and provided a cost for replacement. The park must comply with NEPA before the bridge can be replaced.

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Appendix A

Wildland Fire Terms

WILDLAND FIRE TERMS

As Defined in the National Fire Plan

A

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.

Aerial Ignition: Ignition of fuels by dropping incendiary devices or materials from aircraft.

Air Tanker: A fixed-wing aircraft equipped to drop fire retardants or suppressants.

Agency: Any federal, state, or county government organization participating with jurisdictional responsibilities.

Anchor Point: An advantageous location, usually a barrier to fire spread, from which to start building a fire line. An anchor point is used to reduce the chance of firefighters being flanked by fire.

Aramid: The generic name for a high-strength, flame-resistant synthetic fabric used in the shirts and jeans of firefighters. Nomex, a brand name for aramid fabric, is the term commonly used by firefighters.

Aspect: Direction toward which a slope faces.

B

Backfire: A fire set along the inner edge of a fireline to consume the fuel in the path of a wildfire and/or change the direction of force of the fire's convection column.

Backpack Pump: A portable sprayer with hand-pump, fed from a liquid-filled container fitted with straps, used mainly in fire and pest control. (See also Bladder Bag.)

Bambi Bucket: A collapsible bucket slung below a helicopter. Used to dip water from a variety of sources for fire suppression.

Behave: A system of interactive computer programs for modeling fuel and fire behavior that consists of two systems: BURN and FUEL.

Bladder Bag: A collapsible backpack portable sprayer made of neoprene or high-strength nylon fabric fitted with a pump. (See also Backpack Pump.)

Blow-up: A sudden increase in fire intensity or rate of spread strong enough to prevent direct control or to upset control plans. Blow-ups are often accompanied by violent convection and may have other characteristics of a firestorm. (See Flare-up.)

Brush: A collective term that refers to stands of vegetation dominated by shrubby, woody plants, or low growing trees, usually of a type undesirable for livestock or timber management.

Brush Fire: A fire burning in vegetation that is predominantly shrubs, brush, and scrub growth.

Bucket Drops: The dropping of fire retardants or suppressants from specially designed buckets slung below a helicopter.

Buffer Zones: An area of reduced vegetation that separates wildlands from vulnerable residential or business developments. This barrier is similar to a greenbelt in that it is usually used for another purpose such as agriculture, recreation areas, parks, or golf courses.

Bump-up Method: A progressive method of building a fire line on a wildfire without changing relative positions in the line. Work is begun with a suitable space between workers. Whenever one worker overtakes another, all workers ahead move one space forward and resume work on the uncompleted part of the line. The last worker does not move ahead until completing his or her space.

Burn Out: Setting fire inside a control line to widen it or consume fuel between the edge of the fire and the control line.

Burning Ban: A declared ban on open air burning within a specified area, usually due to sustained high fire danger.

Burning Conditions: The state of the combined factors of the environment that affect fire behavior in a specified fuel type.

Burning Index: An estimate of the potential difficulty of fire containment as it relates to the flame length at the most rapidly spreading portion of a fire's perimeter.

Burning Period: That part of each 24-hour period when fires spread most rapidly, typically from 10:00 a.m. to sundown.

C

Campfire: As used to classify the cause of a wildland fire, a fire that was started for cooking or warming that spreads sufficiently from its source to require action by a fire control agency.

Candle or Candling: A single tree or a very small clump of trees that is burning from the bottom up.

Chain: A unit of linear measurement equal to 66 feet.

Closure: Legal restriction, but not necessarily elimination of specified activities such as smoking, camping, or entry that might cause fires in a given area.

Cold Front: The leading edge of a relatively cold air mass that displaces warmer air. The heavier cold air may cause some of the warm air to be lifted. If the lifted air contains enough moisture, the result may be cloudiness, precipitation, and thunderstorms. If both air masses are dry, no clouds may form. Following the passage of a cold front in the Northern Hemisphere, westerly or northwesterly winds of 15 to 30 or more miles per hour often continue for 12 to 24 hours.

Cold Trailing: A method of controlling a partly dead fire edge by carefully inspecting and feeling with the hand for heat to detect any fire, digging out every live spot, and trenching any live edge.

Command Staff: The command staff consists of the information officer, safety officer, and liaison officer. They report directly to the incident commander and may have assistants.

Complex: Two or more individual incidents located in the same general area, which are assigned to a single incident commander or unified command.

Contain a fire: A fuel break around the fire has been completed. This break may include natural barriers or manually and/or mechanically constructed line.

Control a fire: The complete extinguishment of a fire, including spot fires. Fireline has been strengthened so that flare-ups from within the perimeter of the fire will not break through this line.

Control Line: All built or natural fire barriers and treated fire edge used to control a fire.

Cooperating Agency: An agency supplying assistance other than direct suppression, rescue, support, or service functions to the incident control effort; e.g., Red Cross, law enforcement agency, telephone company, etc.

Coyote Tactics: A progressive line construction duty involving self-sufficient crews that build fire line until the end of the operational period, remain at or near the point while off duty, and begin building fire line again the next operational period where they left off.

Creeping Fire: Fire burning with a low flame and spreading slowly.

Crew Boss: A person in supervisory charge of usually 16 to 21 firefighters and responsible for their performance, safety, and welfare.

Crown Fire (Crowning): The movement of fire through the crowns of trees or shrubs more or less independently of the surface fire.

Curing: Drying and browning of herbaceous vegetation or slash.

D

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.

Debris Burning: A fire spreading from any fire originally set for the purpose of clearing land or for rubbish, garbage, range, stubble, or meadow burning.

Defensible Space: An area either natural or manmade where material capable of causing a fire to spread has been treated, cleared, reduced, or changed to act as a barrier between an advancing wildland fire and the loss to life, property, or resources. In practice, "defensible space" is defined as an area a minimum of 30 feet around a structure that is cleared of flammable brush or vegetation.

Deployment: See Fire Shelter Deployment.

Detection: The act or system of discovering and locating fires.

Direct Attack: Any treatment of burning fuel, such as by wetting, smothering, or chemically quenching the fire or by physically separating burning from unburned fuel.

Dispatch (Communications Center): The implementation of a command decision to move a resource or resources from one place to another.

Dispatcher (Communications Officer): A person employed who receives reports of discovery and status of fires, confirms their locations, takes action promptly to provide people and equipment likely to be needed for control in first attack, and sends them to the proper place.

Dispatch Center: A facility from which resources are directly assigned to an incident.

Division: Divisions are used to divide an incident into geographical areas of operation. Divisions are established when the number of resources exceeds the span-of-control of the operations chief. A division is located with the incident command system organization between the branch and the task force/strike team.

Dozer: Any tracked vehicle with a front-mounted blade used for exposing mineral soil.

Dozer Line: Fire line constructed by the front blade of a dozer.

Drip Torch: Hand-held device for igniting fires by dripping flaming liquid fuel on the materials to be burned; consists of a fuel fount, burner arm, and igniter. Fuel used is generally a mixture of diesel and gasoline.

Drop Zone: Target area for air tankers, helitankers, and cargo dropping.

Drought Index: A number representing net effect of evaporation, transpiration, and precipitation in producing cumulative moisture depletion in deep duff or upper soil layers.

Dry Lightning Storm: Thunderstorm in which negligible precipitation reaches the ground. Also called a dry storm.

Duff: The layer of decomposing organic materials lying below the litter layer of freshly fallen twigs, needles, leaves, and immediately above the mineral soil.

E

Energy Release Component (ERC): The computed total heat released per unit area (British thermal units per square foot) within the fire front at the head of a moving fire.

Engine: Any ground vehicle providing specified levels of pumping, water, and hose capacity.

Engine Crew: Firefighters assigned to an engine. The Fireline Handbook defines the minimum crew makeup by engine type.

Entrapment: A situation where personnel are unexpectedly caught in a fire behavior-related, life-threatening position where planned escape routes or safety zones are absent, inadequate, or compromised. An entrapment may or may not include deployment of a fire shelter for its intended purpose. These situations may or may not result in injury. They include "near misses."

Environmental Assessment (EA): EAs were authorized by the National Environmental Policy Act (NEPA) of 1969. They are concise, analytical documents prepared with public participation that determine if an environmental impact statement (EIS) is needed for a particular project or action. If an EA determines an EIS is not needed, the EA becomes the document allowing agency compliance with NEPA requirements.

Environmental Impact Statement (EIS): EISs were authorized by the National Environmental Policy Act (NEPA) of 1969. Prepared with public participation, they assist decision makers by providing information, analysis, and an array of action alternatives allowing managers to see the probable effects of decisions on the environment. Generally, EISs are written for large-scale actions or geographical areas.

Equilibrium Moisture Content: Moisture content that a fuel particle will attain if exposed for an infinite period in an environment of specified constant temperature and humidity. When a fuel particle reaches equilibrium moisture content, net exchange of moisture between it and the environment is zero.

Escape Route: A preplanned and understood route firefighters take to move to a safety zone or other low-risk area, such as an already burned area, previously constructed safety area, a meadow that won't burn, or natural rocky area that is large enough to take refuge without being burned. When escape routes deviate from a defined physical path, they should be clearly marked (flagged).

Escaped Fire: A fire that has exceeded or is expected to exceed initial attack capabilities or prescription.

Extended Attack Incident: A wildland fire that has not been contained or controlled by initial attack forces, and for which more firefighting resources are arriving, en route, or being ordered by the initial attack incident commander.

Extreme Fire Behavior: "Extreme" implies a level of fire behavior characteristics that ordinarily precludes methods of direct control action. One of more of the following is usually involved: high rate of spread, prolific crowning and/or spotting, presence of fire whirls, and strong convection column. Predictability is difficult because such fires often exercise some degree of influence on their environment and behave erratically, sometimes dangerously.

F

Faller: A person who fells trees. Also called a sawyer or cutter.

Field Observer: Person responsible to the situation unit leader for collecting and reporting information about an incident obtained from personal observations and interviews.

Fine (Light) Fuels: Fast-drying fuels, generally with comparatively high surface area-to-volume ratios, which are less than 1/4-inch in diameter and have a timelag of one hour or less. These fuels readily ignite and are rapidly consumed by fire when dry.

Fingers of a Fire: The long narrow extensions of a fire projecting from the main body.

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

Fire Behavior Forecast: Prediction of probable fire behavior, usually prepared by a fire behavior officer, in support of fire suppression or prescribed burning operations.

Fire Behavior Specialist: A person responsible to the planning section chief for establishing a weather data collection system and for developing fire behavior predictions based on fire history, fuel, weather, and topography.

Fire Break: A natural or constructed barrier used to stop or check fires that may occur, or to provide a control line from which to work.

Fire Cache: A supply of fire tools and equipment assembled in planned quantities or standard units at a strategic point for exclusive use in fire suppression.

Fire Crew: An organized group of firefighters under the leadership of a crew leader or other designated official.

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 Line: A linear fire barrier that is scraped or dug to mineral soil.

Fire Load: The number and size of fires historically experienced on a specified unit over a specified period (usually one day) at a specified index of fire danger.

Fire Management Plan (FMP): A strategic plan that defines a program to manage wildland and prescribed fires, and documents the fire management program in the

approved land use plan. The plan is supplemented by operational plans such as preparedness plans, preplanned dispatch plans, prescribed fire plans, and prevention plans.

Fire Perimeter: The entire outer edge or boundary of a fire.

Fire Season: 1) Period(s) of the year during which wildland fires are likely to occur, spread, and affect resource values sufficient to warrant organized fire management activities. 2) A legally enacted time during which burning activities is regulated by state or local authority.

Fire Shelter: An aluminized tent offering protection by means of reflecting radiant heat and providing a volume of breathable air in a fire entrapment situation. Fire shelters should only be used in life-threatening situations, as a last resort.

Fire Shelter Deployment: The removing of a fire shelter from its case and using it as protection against fire.

Fire Storm: Violent convection caused by a large continuous area of intense fire. Often characterized by destructively violent surface indrafts, near and beyond the perimeter, and sometimes by tornado-like whirls.

Fire Triangle: Instructional aid in which the sides of a triangle are used to represent the three factors (oxygen, heat, fuel) necessary for combustion and flame production; removal of any of the three factors causes flame production to cease.

Fire Use Module (Prescribed Fire Module): A team of skilled and mobile personnel dedicated primarily to prescribed fire management. These are national and interagency resources, available throughout the prescribed fire season, that can ignite, hold, and monitor prescribed fires.

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

Fire Weather Watch: A term used by fire weather forecasters to notify using agencies, usually 24 to 72 hours ahead of the event, that current and developing meteorological conditions may evolve into dangerous fire weather.

Fire Whirl: Spinning vortex column of ascending hot air and gases rising from a fire and carrying aloft smoke, debris, and flame. Fire whirls range in size from less than one foot to more than 500 feet in diameter. Large fire whirls have the intensity of a small tornado.

Firefighting Resources: All people and major items of equipment that can or potentially could be assigned to fires.

Flame Height: The average maximum vertical extension of flames at the leading edge of the fire front. Occasional flashes that rise above the general level of flames are not considered. This distance is less than the flame length if flames are tilted due to wind or slope.

Flame Length: The distance between the flame tip and the midpoint of the flame depth at the base of the flame (generally the ground surface); an indicator of fire intensity.

Flaming Front: The zone of a moving fire where the 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. Also called fire front.

Flanks of a Fire: The parts of a fire's perimeter that are roughly parallel to the main direction of spread.

Flare-up: Any sudden acceleration of fire spread or intensification of a fire. Unlike a blow-up, a flare-up lasts a relatively short time and does not radically change control plans.

Flash Fuels: Fuels such as grass, leaves, draped pine needles, fern, tree moss and some kinds of slash that ignite readily and are consumed rapidly when dry. Also called fine fuels.

Forb: A plant with a soft, rather than permanent woody stem, that is not a grass or grass-like plant.

Fuel: Combustible material. Includes vegetation, such as grass, leaves, ground litter, plants, shrubs and trees that feed a fire. (See Surface Fuels.)

Fuel Bed: An array of fuels usually constructed with specific loading, depth and particle size to meet experimental requirements; also, commonly used to describe the fuel composition in natural settings.

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

Fuel Model: Simulated fuel complex (or combination of vegetation types) for which all fuel descriptors required for the solution of a mathematical rate of spread model have been specified.

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

Fuel Reduction: Manipulation, including combustion, or removal of fuels to reduce the likelihood of ignition and/or to lessen potential damage and resistance to control.

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.

Fusee: A colored flare designed as a railway-warning device and widely used to ignite suppression and prescription fires.

G

General Staff: The group of incident management personnel reporting to the incident commander. They may each have a deputy, as needed. Staff consists of operations section chief, planning section chief, logistics section chief, and finance/administration section chief.

Geographic Area: A political boundary designated by the wildland fire protection agencies, where these agencies work together in coordination and effective utilization

Ground Fuel: All combustible materials below the surface litter, including duff, tree or shrub roots, punchy wood, peat, and sawdust that normally support a glowing combustion without flame.

H

Haines Index: An atmospheric index used to indicate the potential for wildfire growth by measuring the stability and dryness of the air over a fire.

Hand Line: A fireline built with hand tools.

Hazard Reduction: Any treatment of a hazard that reduces the threat of ignition and fire intensity or rate of spread.

Head of a Fire: The side of the fire having the fastest rate of spread.

Heavy Fuels: Fuels of large diameter such as snags, logs, and large limb wood that ignite and are consumed more slowly than flash fuels.

Helibase: The main location within the general incident area for parking, fueling, maintaining, and loading helicopters. The helibase is usually located at or near the incident base.

Helispot: A temporary landing spot for helicopters.

Helitack: The use of helicopters to transport crews, equipment, and fire retardants or suppressants to the fire line during the initial stages of a fire.

Helitack Crew: A group of firefighters trained in the technical and logistical use of helicopters for fire suppression.

Holding Actions: Planned actions required to achieve wildland prescribed fire management objectives. These actions have specific implementation timeframes for fire use actions but can have less sensitive implementation demands for suppression actions.

Holding Resources: Firefighting personnel and equipment assigned to do all required fire suppression work following fireline construction but generally not including extensive mop-up.

Hose Lay: Arrangement of connected lengths of fire hose and accessories on the ground, beginning at the first pumping unit and ending at the point of water delivery.

Hotshot Crew: A highly trained fire crew used mainly to build fireline by hand.

Hotspot: A particular active part of a fire.

Hotspotting: Reducing or stopping the spread of fire at points of particularly rapid rate of spread or special threat, generally the first step in prompt control, with emphasis on first priorities.

I

Incident: A human-caused or natural occurrence, such as wildland fire, that requires emergency service action to prevent or reduce the loss of life or damage to property or natural resources.

Incident Action Plan (IAP): Contains objectives reflecting the overall incident strategy and specific tactical actions and supporting information for the next operational period. The plan may be oral or written. When written, the plan may have a number of attachments, including: incident objectives, organization assignment list, division assignment, incident radio communication plan, medical plan, traffic plan, safety plan, and incident map.

Incident Command Post (ICP): Location at which primary command functions are executed. The ICP may be co-located with the incident base or other incident facilities.

Incident Command System (ICS): The combination of facilities, equipment, personnel, procedure and communications operating within a common organizational structure, with responsibility for the management of assigned resources to effectively accomplish stated objectives pertaining to an incident.

Incident Commander: Individual responsible for the management of all incident operations at the incident site.

Incident Management Team: The incident commander and appropriate general or command staff personnel assigned to manage an incident.

Incident Objectives: Statements of guidance and direction necessary for selection of appropriate strategy (ies), and the tactical direction of resources. Incident objectives are based on realistic expectations of what can be accomplished when all allocated resources have been effectively deployed.

Infrared Detection: The use of heat sensing equipment, known as infrared scanners, for detection of heat sources that are not visually detectable by the normal surveillance methods of either ground or air patrols.

Initial Attack: The actions taken by the first resources to arrive at a wildfire to protect lives and property, and prevent further extension of the fire.

J

Job Hazard Analysis: This analysis of a project is completed by staff to identify hazards to employees and the public. It identifies hazards, corrective actions, and the required safety equipment to ensure public and employee safety.

Jump Spot: Selected landing area for smokejumpers.

Jump Suit: Approved protection suit worn by smokejumpers.

K

Keech Byram Drought Index (KBDI): Commonly used drought index adapted for fire management applications, with a numerical range from 0 (no moisture deficiency) to 800 (maximum drought).

Knock Down: To reduce the flame or heat on the more vigorously burning parts of a fire edge.

L

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. They help initiate and assure the continuation of crowning.

Large Fire: 1) For statistical purposes, a fire burning more than a specified area of land e.g., 300 acres. 2) A fire burning with a size and intensity such that its behavior is determined by interaction between its own convection column and weather conditions above the surface.

Lead Plane: Aircraft with pilot used to make dry runs over the target area to check wind and smoke conditions, topography, and to lead air tankers to targets and supervise their drops.

Light (Fine) Fuels: Fast-drying fuels, generally with comparatively high surface area-to-volume ratios, which are less than 1/4-inch in diameter and have a timelag of one hour or less. These fuels readily ignite and are rapidly consumed by fire when dry.

Lightning Activity Level (LAL): A number, on a scale of 1 to 6, which reflects frequency and character of cloud-to-ground lightning. The scale is exponential, based on powers of 2 (i.e., LAL 3 indicates twice the lightning of LAL 2).

Line Scout: A firefighter who determines the location of a fire line.

Litter: Top layer of the forest, scrubland, or grassland floor, directly above the fermentation layer, composed of loose debris of dead sticks, branches, twigs, and recently fallen leaves or needles, little altered in structure by decomposition.

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.

M

Micro-Remote Environmental Monitoring System (Micro-REMS): Mobile weather monitoring station. A Micro-REMS usually accompanies an incident meteorologist and ATMU to an incident.

Mineral Soil: Soil layers below the predominantly organic horizons; soil with little combustible material.

Mobilization: The process and procedures used by all organizations, federal, state and local for activating, assembling, and transporting all resources that have been requested to respond to or support an incident.

Modular Airborne Firefighting System (MAFFS): A manufactured unit consisting of five interconnecting tanks, a control pallet, and a nozzle pallet, with a capacity of 3,000 gallons, designed to be rapidly mounted inside an unmodified C-130 (Hercules) cargo aircraft for use in dropping retardant on wildland fires.

Mop-up: To make a fire safe or reduce residual smoke after the fire has been controlled by extinguishing or removing burning material along or near the control line, felling snags, or moving logs so they won't roll downhill.

Multi-Agency Coordination (MAC): A generalized term which describes the functions and activities of representatives of involved agencies and/or jurisdictions who come together to make decisions regarding the prioritizing of incidents, and the sharing and use of critical resources. The MAC organization is not a part of the on-scene ICS and is not involved in developing incident strategy or tactics.

Mutual Aid Agreement: Written agreement between agencies and/or jurisdictions in which they agree to assist one another upon request, by furnishing personnel and equipment.

N

National Environmental Policy Act (NEPA): NEPA is the basic national law for protection of the environment, passed by Congress in 1969. It sets policy and procedures for environmental protection, and authorizes environmental impact statements and environmental assessments to be used as analytical tools to help federal managers make decisions.

National Fire Danger Rating System (NFDRS): A uniform fire danger rating system that focuses on the environmental factors that control the moisture content of fuels.

National Wildfire Coordinating Group: A group formed under the direction of the Secretaries of Agriculture and the Interior and comprised of representatives of the U.S. Forest Service, Bureau of Land Management, Bureau of Indian Affairs, National Park Service, U.S. Fish and Wildlife Service, and Association of State Foresters. The group's purpose is to facilitate coordination and effectiveness of wildland fire activities and provide a forum to discuss, recommend action, or resolve issues and problems of substantive nature. NWCG is the certifying body for all courses in the National Fire Curriculum.

Nomex ®: Trade name for a fire resistant synthetic material used in the manufacturing of flight suits, pants, and shirts used by firefighters (see Aramid).

Normal Fire Season: 1) A season when weather, fire danger, and number and distribution of fires are about average. 2) Period of the year that normally comprises the fire season.

O

Operations Branch Director: Person under the direction of the operations section chief who is responsible for implementing that portion of the incident action plan appropriate to the branch.

Operational Period: The period of time scheduled for execution of a given set of tactical actions as specified in the incident action plan. Operational periods can be of various lengths, although usually not more than 24 hours.

Overhead: People assigned to supervisory positions, including incident commanders, command staff, general staff, directors, supervisors, and unit leaders.

P

Pack Test: Used to determine the aerobic capacity of fire suppression and support personnel, and assign physical fitness scores. The test consists of walking a specified distance, with or without a weighted pack, in a predetermined period of time, with altitude corrections.

Paracargo: Anything dropped, or intended for dropping, from an aircraft by parachute, by other retarding devices, or by free fall.

Peak Fire Season: That period of the fire season during which fires are expected to ignite most readily, to burn with greater than average intensity, and to create damages at an unacceptable level.

Personnel Protective Equipment (PPE): All firefighting personnel must be equipped with proper equipment and clothing in order to mitigate the risk of injury from, or exposure to, hazardous conditions encountered while working. PPE includes, but is not limited to: 8-inch high-laced leather boots with lug soles, fire shelter, hard hat with chin strap, goggles, ear plugs, aramid shirts and trousers, leather gloves, and individual first aid kits.

Preparedness: Condition or degree of being ready to cope with a potential fire situation

Prescribed Fire: Any fire ignited by management actions under certain, predetermined conditions to meet specific objectives related to hazardous fuels or habitat improvement. A written, approved prescribed fire plan must exist, and NEPA requirements must be met, prior to ignition.

Prescribed Fire Plan (Burn Plan): This document provides the prescribed burn boss information needed to implement an individual prescribed fire project.

Prescription: Measurable criteria that define conditions under which a prescribed fire may be ignited, guide selection of appropriate management responses, and indicate other required actions. Prescription criteria may include safety, economic, public health, and environmental, geographic, administrative, social, or legal considerations.

Prevention: Activities directed at reducing the incidence of fires, including public education, law enforcement, personal contact, and reduction of fuel hazards.

Project Fire: A fire of such size or complexity that a large organization and prolonged activity is required to suppress it.

Pulaski: A combination chopping and trenching tool, which combines a single-bitted axe-blade with a narrow adze-like trenching blade fitted to a straight handle. Useful for grubbing or trenching in duff and matted roots. Well-balanced for chopping.

R

Radiant Burn: A burn received from a radiant heat source.

Radiant Heat Flux: The amount of heat flowing through a given area in a given time, usually expressed as calories/square centimeter/second.

Rappelling: Technique of landing specifically trained firefighters from hovering helicopters; involves sliding down ropes with the aid of friction-producing devices.

Rate of Spread: The relative activity of a fire in extending its horizontal dimensions. It is expressed as a rate of increase of the total perimeter of the fire, as rate of forward spread of the fire front, or as rate of increase in area, depending on the intended use of the information. Usually it is expressed in chains or acres per hour for a specific period in the fire's history.

Reburn: The burning of an area that has been previously burned but that contains flammable fuel that ignites when burning conditions are more favorable; an area that has reburned.

Red Card: Fire qualification card issued to fire rated persons showing their training needs and their qualifications to fill specified fire suppression and support positions in a large fire suppression or incident organization.

Red Flag Warning: Term used by fire weather forecasters to alert forecast users to an ongoing or imminent critical fire weather pattern.

Rehabilitation: The activities necessary to repair damage or disturbance caused by wildland fires or the fire suppression activity.

Relative Humidity (RH): The ratio of the amount of moisture in the air, to the maximum amount of moisture that air would contain if it were saturated. The ratio of the actual vapor pressure to the saturated vapor pressure.

Remote Automatic Weather Station (RAWS): An apparatus that automatically acquires, processes, and stores local weather data for later transmission to the GOES Satellite, from which the data is re-transmitted to an earth-receiving station for use in the National Fire Danger Rating System.

Resources: 1) Personnel, equipment, services, and supplies available, or potentially available, for assignment to incidents. 2) The natural resources of an area, such as timber, crass, watershed values, recreation values, and wildlife habitat.

Resource Management Plan (RMP): A document prepared by field office staff with public participation, and approved by field office managers that provides general guidance and direction for land management activities at a field office. The RMP identifies the need for fire in a particular area and for a specific benefit.

Resource Order: An order placed for firefighting or support resources.

Retardant: A substance or chemical agent that reduces the flammability of combustibles.

Run (of a fire): The rapid advance of the head of a fire with a marked change in fire line intensity and rate of spread from that noted before and after the advance.

Running: A rapidly spreading surface fire with a well-defined head.

S

Safety Zone: An area cleared of flammable materials used for escape in the event the line is outflanked, or in case a spot fire causes fuels outside the control line to render the line unsafe. In firing operations, crews progress so as to maintain a safety zone close at hand allowing the fuels inside the control line to be consumed before going ahead. Safety zones may also be constructed as integral parts of fuel breaks; they are greatly enlarged areas, which can be used with relative safety by firefighters and their equipment in the event of a blowup in the vicinity.

Scratch Line: An unfinished preliminary fire line hastily established or built as an emergency measure to check the spread of fire.

Severity Funding: Funds provided to increase wildland fire suppression response capability necessitated by abnormal weather patterns, extended drought, or other events causing abnormal increase in the fire potential and/or danger.

Single Resource: An individual, a piece of equipment and its personnel complement, or a crew or team of individuals with an identified work supervisor that can be used on an incident.

Size-up: To evaluate a fire to determine a course of action for fire suppression.

Slash: Debris left after logging, pruning, thinning or brush cutting; includes logs, chips, bark, branches, stumps, and broken understory trees or brush.

Sling Load: Any cargo carried beneath a helicopter and attached by a lead line and swivel.

Slop-over: A fire edge that crosses a control line or natural barrier intended to contain the fire.

Smokejumper: A firefighter who travels to fires by aircraft and parachute.

Smoke Management: Application of fire intensities and meteorological processes to minimize degradation of air quality during prescribed fires.

Smoldering Fire: A fire burning without flame and barely spreading.

Snag: A standing dead tree or part of a dead tree from which at least the smaller branches have fallen.

Spark Arrester: A device installed in a chimney, flue, or exhaust pipe to stop the emission of sarks and burning fragments.

Spot Fire: A fire ignited outside the perimeter of the main fire by flying sparks or embers.

Spot Weather Forecast: A special forecast issued to fit the time, topography, and weather of each specific fire. These forecasts are issued upon request of the user agency and are more detailed, timely, and specific than zone forecasts.

Spotter: In smokejumping, the person responsible for selecting drop targets and supervising all aspects of dropping smokejumpers.

Spotting: 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.

Staging Area: Locations set up at an incident where resources can be placed while awaiting a tactical assignment on a three-minute available basis. Staging areas are managed by the operations section.

Strategy: The science and art of command as applied to the overall planning and conduct of an incident.

Strike Team: Specified combinations of the same kind and type of resources, with common communications, and a leader.

Strike Team Leader: Person responsible to a division/group supervisor for performing tactical assignments given to the strike team.

Structure Fire: Fire originating in and burning any part or all of any building, shelter, or other structure.

Suppressant: An agent, such as water or foam, used to extinguish the flaming and glowing phases of combustion when direction applied to burning fuels.

Suppression: All the work of extinguishing or containing a fire, beginning with its discovery.

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 branchwood, downed logs, and stumps interspersed with or partially replacing the litter.

Swamper: (1) A worker who assists fallers and/or sawyers by clearing away brush, limbs and small trees. Carries fuel, oil, and tools, and watches for dangerous situations. (2) A worker on a dozer crew who pulls winch line, helps maintain equipment, etc., to speed suppression work on a fire.

T

Tactics: Deploying and directing resources on an incident to accomplish the objectives designated by strategy.

Temporary Flight Restrictions (TFR): A restriction requested by an agency and put into effect by the Federal Aviation Administration in the vicinity of an incident, which restricts the operation of nonessential aircraft in the airspace around that incident.

Terra Torch ®: Device for throwing a stream of flaming liquid, used to facilitate rapid ignition during burn out operations on a wildland fire or during a prescribed fire operation.

Test Fire: A small fire ignited within the planned burn unit to determine the characteristic of the prescribed fire, such as fire behavior, detection performance, and control measures.

Timelag: Time needed under specified conditions for a fuel particle to lose about 63 percent of the difference between its initial moisture content and its equilibrium moisture

content. If conditions remain unchanged, a fuel will reach 95 percent of its equilibrium moisture content after four timelag periods.

Torching: The ignition and flare-up of a tree or small group of trees, usually from bottom to top.

Two-way Radio: Radio equipment with transmitters in mobile units on the same frequency as the base station, permitting conversation in two directions using the same frequency in turn.

Type: The capability of a firefighting resource in comparison to another type. Type 1 usually means a greater capability due to power, size, or capacity.

U

Uncontrolled Fire: Any fire that threatens to destroy life, property, or natural resources,

Underburn: A fire that consumes surface fuels but not trees or shrubs. (See Surface Fuels.)

V

Vectors: Directions of fire spread as related to rate of spread calculations (in degrees from upslope).

Volunteer Fire Department (VFD): A fire department of which some or all members are unpaid.

W

Water Tender: A ground vehicle capable of transporting specified quantities of water.

Weather Information and Management System (WIMS): An interactive computer system designed to accommodate the weather information needs of all federal and state natural resource management agencies. Provides timely access to weather forecasts,

current and historical weather data, the National Fire Danger Rating System (NFDRS), and the National Interagency Fire Management Integrated Database (NIFMID).

Wet Line: A line of water, or water and chemical retardant, sprayed along the ground, that serves as a temporary control line from which to ignite or stop a low-intensity fire.

Wildland Fire: Any nonstructure fire, other than prescribed fire, that occurs in the wildland.

Wildland Fire Implementation Plan (WFIP): A progressively developed assessment and operational management plan that documents the analysis and selection of strategies and describes the appropriate management response for a wildland fire being managed for resource benefits.

Wildland Fire Situation Analysis (WFSA): A decision-making process that evaluates alternative suppression strategies against selected environmental, social, political, and economic criteria. Provides a record of decisions.

Wildland Fire Use: The management of naturally ignited wildland fires to accomplish specific prestated resource management objectives in predefined geographic areas outlined in fire management plans.

Wildland Urban Interface: The line, area or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

Wind Vectors: Wind directions used to calculate fire behavior.

Appendix B

Fire Safe Program Guidelines

OUTSIDE

1 Design/Construction

- ❑ Use fire resistant materials
- ❑ Build your home at least 30-100 feet from your property line
- ❑ Build your home away from ridge tops, canyons and areas between high points on a ridge
- ❑ Consider installing residential sprinklers
- ❑ Enclose the underside of eaves, balconies and above ground decks with fire resistant materials
- ❑ Try to limit the size and number of windows in your home that face large areas of vegetation
- ❑ Install only dual-paned or triple-paned windows
- ❑ Make sure that electric service lines, fuse boxes and circuit breaker panels are installed and main tained as prescribed by code
- ❑ Contact qualified individuals to perform electrical maintenance and repairs

2 Access

- ❑ Make sure that your street name sign is visibly posted at each street intersection
- ❑ Post your house address so it is easily visible from the street, especially at night
- ❑ Address numbers should be at least 3 inches tall and on a contrasting background
- ❑ Identify at least two exit routes from your neighborhood
- ❑ Clear flammable vegetation at least 10 feet from roads and five feet from driveways
- ❑ Cut back overhanging tree branches above access roads
- ❑ Construct roads that allow two-way traffic
- ❑ Make sure dead-end roads, and long drive ways have turn-around areas wide enough for emergency vehicles
- ❑ Design bridges to carry heavy emergency vehicles
- ❑ Post clear road signs to show traffic restrictions such as dead-end roads, and weight and height limitations

3 Roof

- ❑ Install a fire resistant roof. Contact your local fire department for current roofing requirements
- ❑ Remove dead leaves and needles from your roof and gutters
- ❑ Remove dead branches overhanging your roof and keep branches 10 feet from your chimney
- ❑ Cover your chimney outlet and stovepipe with a nonflammable screen of 1/2 inch or smaller mesh

4 Landscape

- ❑ Create a **Defensible Space** of 100 feet around your home. It is required by law.
- ❑ Create a **"LEAN, CLEAN and GREEN ZONE"** by removing all flammable vegetation within 30 feet immediately surrounding your home
- ❑ Then create a **"REDUCED FUEL ZONE"** in the remaining 70 feet or to your property line.

  You have two options in this area:

  A. Create horizontal and vertical spacing between plants. The amount of space will depend on how steep your property is and the size of your plants.

  B. Large trees do not have to be removed as long as all of the plants beneath them are removed.
- ❑ Remove lower tree branches at least six feet from the ground
- ❑ Landscape with fire resistant plants
- ❑ Maintain all plants with regular water, and keep dead braches, leaves and needles removed.
- ❑ When clearing vegetation, use care when operating equipment such as lawnmowers. One small spark may start a fire; a string trimmer is much safer.

5 Yard

- ❑ Stack woodpiles at least 30 feet from all structures and remove vegetation within 10 feet of woodpiles
- ❑ Locate LPG tanks (butane and propane) at least 30 feet from any structure and maintain 10 feet of clearance
- ❑ Remove all stacks of construction materials, pine needles, leaves and other debris from your yard
- ❑ Contact your local fire department to see if debris burning is allowed in your area; if so, obtain a burning permit and follow all local air quality restrictions

6 Emergency Water Supply

- ❑ Maintain an emergency water supply that meets fire department standards through one of the following:
  - a community water/hydrant system
  - a cooperative emergency storage tank with neighbors
  - a minimum storage supply of 2,500 gallons on your property (like a pond or pool)
- ❑ Clearly mark all emergency water sources
- ❑ Create easy firefighter access to your closest emergency water source
- ❑ If your water comes from a well, consider an emergency generator to operate the pump during a power failure

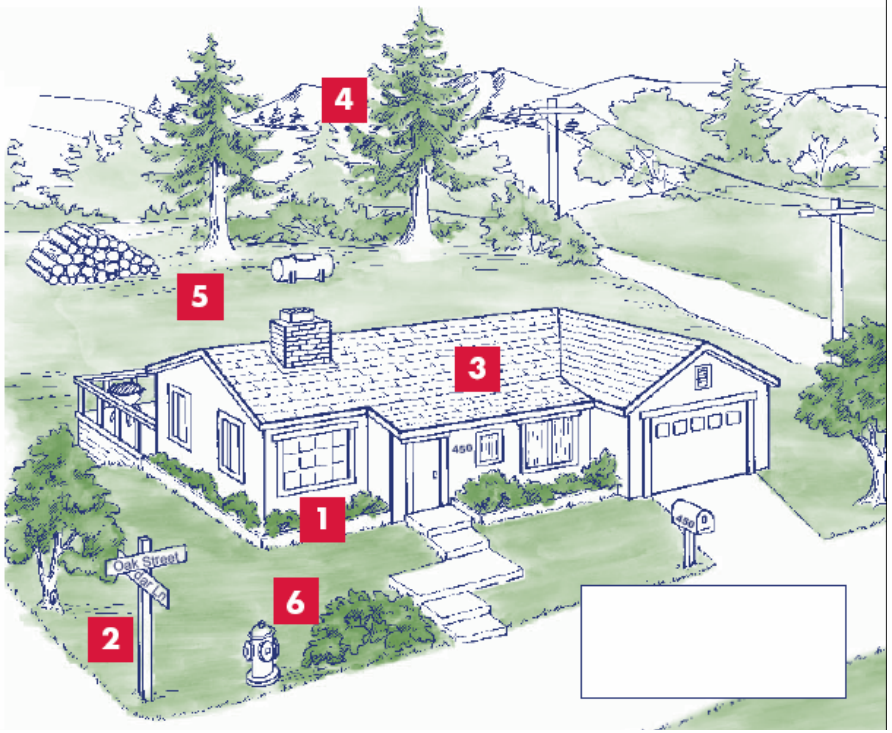
May 2006

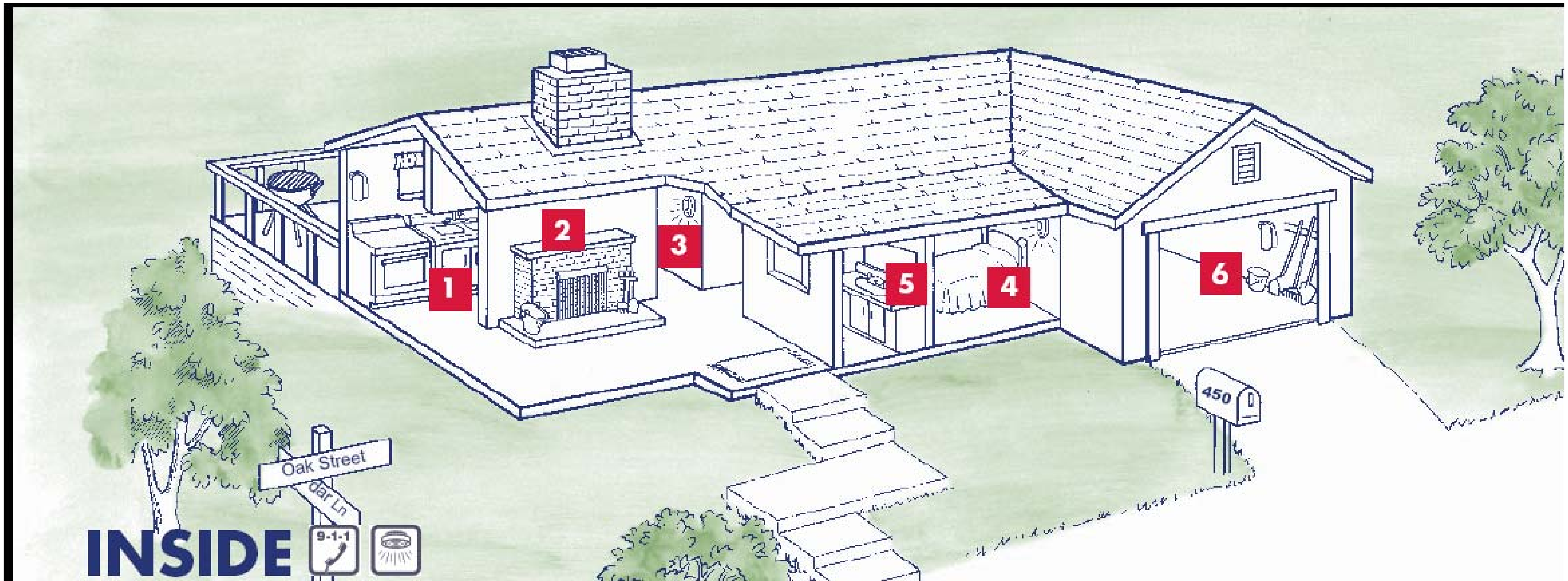
California Department of Forestry and Fire Protection

Homeowners Checklist

www.fire.ca.gov

How To Make Your Home Fire Safe





INSIDE

1 Kitchen

- ☐ Keep a working fire extinguisher in the kitchen
- ☐ Maintain electric and gas stoves in good operating condition
- ☐ Keep baking soda on hand to extinguish stove-top grease fires
- ☐ Turn the handles of pots and pans away from the front of the stove
- ☐ Install curtains and towel holders away from stoveburners
- ☐ Store matches and lighters out of reach of children
- ☐ Make sure that electrical outlets are designed to handle appliance loads

2 Living Room

- ☐ Install a screen in front of fireplace or wood stove
- ☐ Store the ashes from your fireplace (and barbe-cue) in a metal container and dispose of only when cold
- ☐ Clean fireplace chimneys and flues at least once a year

3 Hallway

- ☐ Install smoke detectors between living and sleep ing areas
- ☐ Test smoke detectors monthly and replace batteries twice a year, when clocks are changed in the spring and fall
- ☐ Replace electrical cords that do not work prop-erly, have loose connections, or are frayed

4 Bedroom

- ☐ If you sleep with the door closed, install a smoke detector in the bedroom
- ☐ Turn off electric blankets and other electrical appliances when not in use
- ☐ Do not smoke in bed
- ☐ If you have security bars on your windows or doors, be sure they have an approved quick re lease mechanism so you and your family can get out in the event of a fire

5 Bathroom

- ☐ Disconnect appliances such as curling irons and hair dryers when done; store in a safe location until cool
- ☐ Keep items such as towels away from wall and floor heaters

6 Garage

- ☐ Mount a working fire extinguisher in the garage
- ☐ Have tools such as a shovel, hoe, rake and bucket available for use in a wildfire emergency
- ☐ Install a solid door with self-closing hinges be-tween living areas and the garage
- ☐ Dispose of oily rags in (UL) Underwriters Laborato-ries approved metal containers
- ☐ Store all combustibles away from ignition sources such as water heaters
- ☐ Disconnect electrical tools and appliances when not in use
- ☐ Allow hot tools such as glue guns and soldering irons to cool before storing
- ☐ Properly store flammable liquids in approved containers and away from ignition sources such as pilot lights

* Disaster Preparedness

- ☐ Maintain at least a three-day supply of drinking water, and food that does not require refrigera-tion and generally does not need cooking
- ☐ Maintain a portable radio, flashlight, emergency cooking equipment, lanterns and batteries
- ☐ Outdoor cooking appliances such as barbecues should never be taken indoors for use as heaters
- ☐ Maintain first aid supplies to treat the injured until help arrives
- ☐ Keep a list of valuables to take with you in an emergency; if possible, store these valuables together
- ☐ For safety, securely attach all water heaters and furniture such as cabinets and bookshelves to walls
- ☐ Have a contingency plan to enable family mem-bers to contact each other. Establish a family/friend phone tree
- ☐ Designate an emergency meeting place outside your home
- ☐ Practice *emergency exit drills in the house* (EDITH) regularly
- ☐ Make sure that all family members understand how to STOP, DROP AND ROLL if their clothes should catch fire.

Defensible Space: Compliance with New 100-foot Requirements

Resource Code (PRC) 4291 (a) and (b) and California regulation 14, California Code of Regulations (CCR) 1299, Defensible Space.

The intent of the new defensible space regulations is to improve existing fuel breaks to reduce fire intensity, inhibit fire in crowns (tree tops), reduce the rate of fire spread, and provide a safer environment for firefighters to suppress a wildland fire.

Everyone who owns property in a wildland area in California needs to know about changes in the laws regarding defensible space. These new regulations:

- expand the defensible space clearance requirement around structures from 30 feet to a distance of 100 feet;
- provide for state law, or local ordinance, rule or regulation to specify requirements of greater than 100 feet;
- allow insurance companies to require homeowners to maintain firebreaks greater than 100 feet; and
- give the California Department of Forestry and Fire Protection (CDF) the authority to clear a property and then bill the property owner or lien the property.

Overview of Guidelines

- Property owners' legal responsibility to clear their property has been extended from 30 feet to 100 feet. Owners must now treat all property up to 100 feet away from their structure or to the property line, whichever is less and limited to their land (Land ownership in Foresta is somewhat unique in that most lots are small in size. The Park has granted permission to all homeowners to create defensible space adequate to meet the new State regulations, regardless of land ownership). This new zone between 30 feet and 100 feet is called the **Reduced Fuel Zone**.

- Property owners are not required to clear beyond 100 feet from their structure, but are encouraged to do so to create community-wide defensible space.
- Vegetation removal can cause soil disturbance, soil erosion, the regrowth of new vegetation and introduction of nonnative, invasive plants. Always keep soil disturbance to a minimum, especially on steep slopes.
- Use safe methods. Chain saws and other small engines must have spark arresters. Be careful of sparks from metal blades striking rocks. Complete any work with this equipment prior to high fire danger season.
- Although the PRC 4291 regulations do not address woodpiles, they should be moved to 30 feet from structures and protected from wind-driven embers by secure tarps or other means.

Hazard Clearance Zone (0-30ft) Guidelines

- Remove and clear all flammable vegetation and combustible material within 30 feet of each structure.
- You are not required to remove single specimens of trees, ornamental shrubbery, or similar plants used as ground cover, as long as they do not form a means of transmitting fire to any structure.
- Remove all dead and dying woody surface fuels and aerial fuels (branches). You don't want to have any vegetation that can form a "ladder" for fire to climb into taller vegetation. This guideline requires eliminating trees, bushes, shrubs and surface debris that are completely dead or with substantial amounts of dry or dead branches or leaves/needles that would readily burn.
- Remove loose surface litter, such as fallen leaves or needles, twigs, bark, cones, and small branches.
- Cut grass to a height of 3 inches within 30 feet adjacent to structures. Keep grass and other vegetation green by watering. If watering is not feasible, maintain a vegetation-free space between dry grass and any structure.
- Remove any portion of a tree that is within 10 feet of the outlet of any chimney or stovepipe.
- Maintain any tree adjacent to or overhanging any building free of dead or dying wood.
- Maintain the roof and gutters of any structure free of leaves, needles, or other dead vegetative growth.

- Provide and maintain at all times a screen (constructed of nonflammable material with openings of not more than half an inch in size) over the outlet of every chimney or stovepipe that is attached to any fireplace, stove, or other device that burns any solid or liquid fuel.

Reduced Fuel Zone (30-100ft) Guidelines - New for 2006

The California Board of Forestry and Fire Protection Guidelines are described below.

- Remove dead and dying woody surfaces and aerial fuels. Loose surface litter, normally consisting of fallen leaves or needles, twigs, bark, cones, and small branches are 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.
- Downed logs or stumps, when embedded in the soil, may be retained when isolated from other vegetation.
- **Implement one of the following two fuel treatments (options A or B) required by CCR 1299 and PRC 4291.** Properties with greater fire hazards will require greater clearing treatments. Combinations of the methods may be acceptable as long as the intent of these guidelines is met.

Fuel Treatment Option A – Defensible Space with Fuel Separation (30ft-100ft)

Option A is for more open areas with few trees.

- Grass should not exceed 4 inches in height. Where grass and other forbs are necessary to stabilize the soil and prevent erosion, they can be kept less than 18 inches in height above the ground when they are isolated from other fuels.

- Horizontal Clearance Requirements

Percent Slope	Distance from Structure	Factor	Example
0 - 20	10 Feet	2 times the height of the shrub	3' shrub = 6' space
20 - 40	20 Feet	4 times the height of the shrub	3' shrub = 12' space
> 40	30 Feet	6 times the height of the shrub	3' shrub = 18' space

- Vertical Clearance Requirements: The minimum vertical space between the top of a shrub and the bottom of the lowest tree branches is 3x the height of the shrub eg, 3ft shrub = 9 ft vertical space between the top of the shrub and the lowest tree limbs).

Fuel Treatment Option B – Defensible Space with Continuous Tree Canopy (30ft-100ft)

A vegetation removal option is available for those wanting to retain a continuous stand of larger trees with no space between tree canopies while creating defensible space. Spacing between aerial fuels is not required in a stand of larger trees. In this situation:

- Remove all surface fuels greater than 4 inches in height.
- Remove lower limbs of trees (prune) to at least 6 feet up to 15 feet (or the lower half of branches of smaller trees).

Any questions concerning the new regulations may have about the new regulations to the CDF, Madera-Mariposa-Merced Unit 5366 Hwy 49 North, Mariposa, CA 95338. (209-966-3622),

Adapted from *In the West* April 2006

Appendix C

Project Specifications

Project Name: Air Curtain Destructor	**Priority:** ___ Low ___ Med _x_ High
Number of Acres: N/A	**Estimated Cost:** ACD: $70,000 Adm: $17,500
Project Type: _____ Mechanical _____ RX Fire __x__ Other: Equipment Purchase	

Project Description

Purchase an Air Curtain Destructor (ACD)

Desired Results

Purchase an ACD and have it in place prior to the start of the first fuel reduction project. Preferably, the unit could be purchased by a group of agencies and shared.

Method

Yosemite National Park would assume the lead and complete a funding request or identify other ways to secure funding and purchase an ACD. Once the unit is purchased, the Park would schedule and transport the unit to a suitable site at Foresta or other convenient location and coordinate the fuel treatment projects.

Prescription

It is recommended that the Park acquire a Model S-217, which can burn between 2-5 tons per hour. The unit is large enough to handle the quantity of materials produced but small enough to transport on a lowboy. A Model S-220 model is of similar size and treats 3-6 tons per hour would be more efficient, but may be more difficult to transport on mountainous roads.

The target date to have the ACD in place and secure an air quality exemption from the Mariposa County Air Pollution Control District and other permits is June 1, 2008.

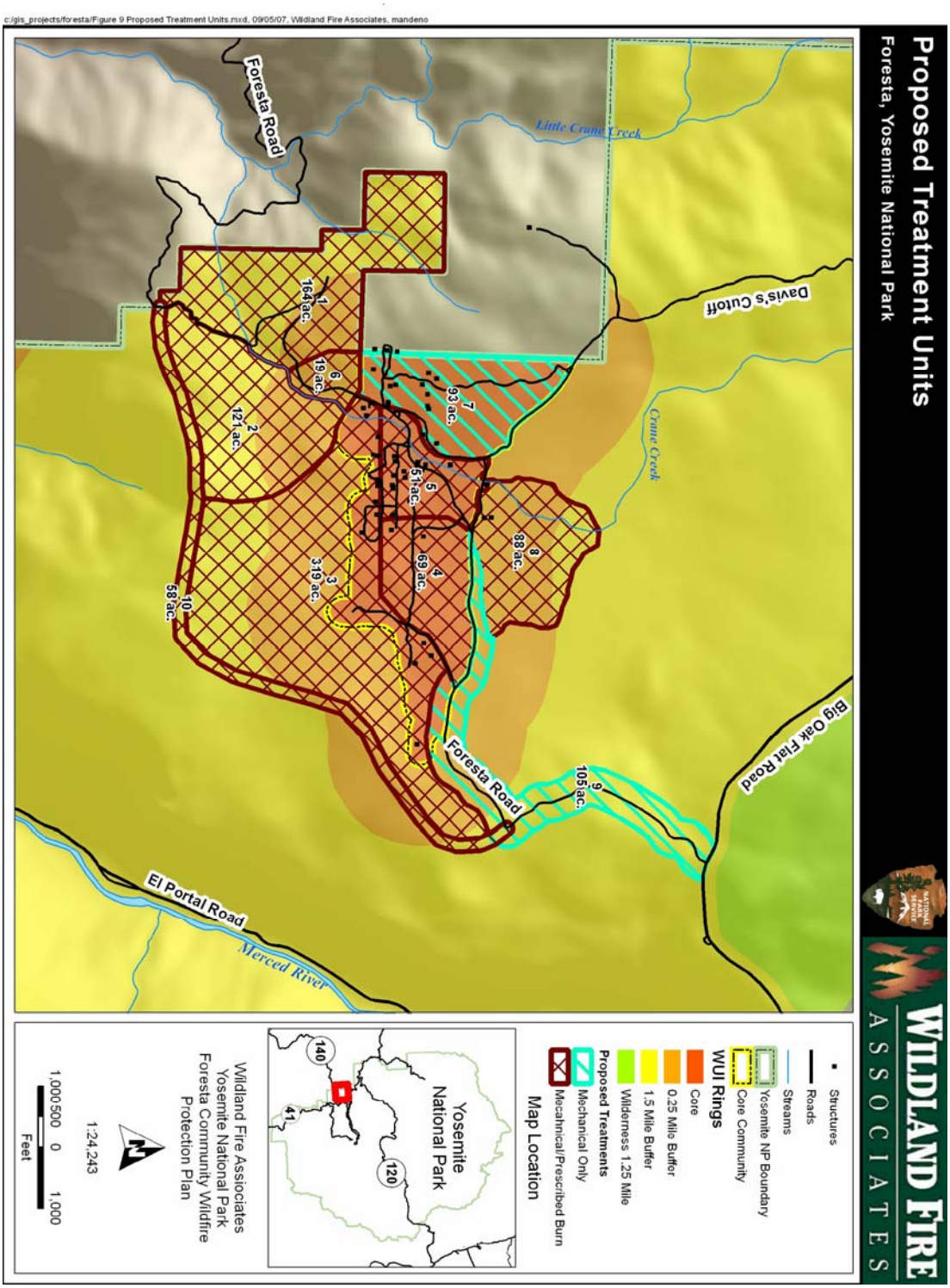
Remarks

Information concerning ACDs can be obtained from: Air Burners, LLC; 4390 Cargo Way; Palm City, Florida 34990. Phone number is 772.220.7303. E-mail: info@airburners.com - www.airburners.com The regional distributor is: Lance Armstrong, DDI Equipment, Grand Junction, Colorado. Phone: 970.243.3422.

Emissions data for the various sized units are available from Air Burners, LLC.

Model S-220 Air Curtain Destructor Photo: Air Burners, LLC

An overview of a disposal site located at Keystone, Colorado. The run off in the foreground resulted when the operation was halted at the end of each day and the fire in the box was extinguished. The residue in the background to the right of the ACD was the result of a month's operation. The amount of run-off and residue produced is dependent on the operation schedule and operating procedures. Photo: Wildland Fire Associates.


c:/gis_projects/foresta/Figure 9 Proposed Treatment Units.mxd, 09/05/07, Wildland Fire Associates, mandeno
Proposed Treatment Units
Foresta, Yosemite National Park
WILDLAND FIRE
ASSOCIATES
Foresta Road
Little Crane Creek
Davis's Cutoff
Crane Creek
Big Oak Flat Road
Foresta Road
El Portal Road
Merced River
1
164 ac.
6
19 ac.
7
93 ac.
2
121 ac.
5
5 ac.
8
88 ac.
4
69 ac.
3
319 ac.
10
58 ac.
9
105 ac.
Structures
Roads
Streams
Yosemite NP Boundary
Core Community
WUI Rings
Core
0.25 Mile Buffer
1.5 Mile Buffer
Wilderness 1.25 Mile
Proposed Treatments
Mechanical Only
Mechanical/Prescribed Burn
Map Location
Yosemite National Park
140
120
41
Wildland Fire Associates
Yosemite National Park
Foresta Community Wildfire Protection Plan
1:24,243
1,000 500 0 1,000
Feet

Project Name: Create Fuel Breaks	**Priority:** ___ Low ___ Med _x_ High
Number of Acres: 1056	**Estimated Cost:** Dependent on Method
Project Type: __x__ Mechanical __x__ RX Fire __x__ Other: ACD	

Project Description

Create a shaded fuel break up to one and one-half mile wide in some locations to protect Foresta from a high intensity wildland fire. (Units 1 -9).

Desired Results

It is the desire of the stakeholders to reduce the amount of hazardous fuels within and adjacent to the community, reduce and regulate fuel loading and modify the vegetation structure and stand composition as necessary to protect life, property and resources.

When fully implemented, the shaded fuel breaks in combination with increased defensible space around structures is expected to afford fire suppression personnel a ninety percent success rate when defending the community against a high-intensity wildland fire. The project will provide for safe and effective fire suppression actions while also considering natural processes and the esthetic values important to the community.

The landscape should take on an appearance of what may have existed naturally and historically. It should display a mosaic of complex vegetation patterns and types that would have evolved naturally with ecological and geological processes. There generally should be less continuous, uninterrupted vegetation types, more openings, a variety of seral stages and different plant communities in a random patchwork.

The work completed by the community will enhance the fuels mitigation work completed by the National Park Service and others.

Method

Discussion: This project is based on the assumption that due to the location of the community and the condition of the surrounding fuels, there is a good likelihood that Foresta is vulnerable to a wildland fire ignited on the surrounding lands. Intense wildland fires usually loft firebrands that can be carried by air currents for some distance (Commonly called *spotting distance*). Modeling using Behave Plus (Andrews 1986, Andrews et al. 2003) indicates that the spotting distance in the common fuel types in the area is between .5 and .8 miles. Depending on environmental conditions and other factors, the lofted embers can land on receptive fuels and ignite new fires (*spot fires*) in advance of the main fire.

The ridge to the south of Foresta can be used to hold a fire threatening the community from the south. It is important to treat the lands between the ridge and the community to remove receptive fuels that could be ignited by windborne embers and contribute to a crown fire that would be difficult to control.

Goal: Mitigate the treat to Foresta from a wildland fire igniting on surrounding lands to the extent that fire suppression resources have a 90% probability of successfully defending the community.

Objective: On the lands surrounding the community, the new projects will enhance the fuels mitigation work completed by the Park and others.

Objective: The north facing slope south of the community to the limit of the project should be treated so that any spot fires caused by windborne embers or lightning ignited or human caused wildland fires will burn as low intensity ground fires that can be more easily controlled by suppression forces.

Objective: The lands to the south of Foresta should be treated to the extent that a crown fire moving up the Crane Creek drainage cannot be sustained and fire suppression forces will be able to safely suppress the resulting surface fire or defend the community through the use of indirect suppression tactics.

Objective: Create an awareness in the community of the importance of creating defensible space around structures and reducing receptive fuels within and adjacent to the community. There is a need to attain all these objectives, as failure to meet any one – including the treatment of fuels within the community – may compromise the effectiveness of the other actions and place the residents and structures in jeopardy.

Method: The methods to be used to treat the vegetation will depend on the terrain and vegetation type. On slopes 40% or less, mechanical equipment such as a masticator should be used to reduce small trees and brush to surface fuels that can later be treated with prescribed fire, as needed. The smallest sized masticator suitable for the job should be used.

It may be necessary to use chainsaws and other similar devices to cut small trees and brush on slopes greater than 40%, and to limb trees to reduce ladder fuels. The materials not utilized for other purposes would be hauled to a central area and burned in an Air Curtain Destructor or brought to a road and chipped. The chipped materials would be blown back into the forest wherever possible to provide for soil protection and to return nutrients to the soil. The residue from the ACD would be removed to an appropriate location.

The project areas may receive follow up treatment in the form of a low-intensity broadcast burn, or it may be necessary to burn piles of residue if it is determined that the fuel loading is too great. The use of prescribed fire should only be considered if an ACD is not available or if the residue constitutes an unusually heavy fuel load that would contribute to high fire intensities that may kill the remaining trees. Care should be taken to reduce residence time around trees to protect root systems from excessive heat.

Prescription

The desired results are a forest composed of less continuous vegetation with more openings, a variety of seral stages and different plant communities in a random

patchwork that will not support a crown fire. To achieve those results several things must be considered:

Species Composition: When selecting species to remove, preference should be given to the pine species, oak, and Douglas fir. In riparian areas, brush should be given preference. The historic stand composition was one composed of large pine, with Douglas fir and some oak. A few white fir and incense cedar would have been present. Oak brush and manzanita would have been present in dryer, more open sites.

Age Classes: The desire is to create a forest that is composed of uneven aged trees and brush. Older trees should be scattered through the stand to replicate what would have been present following a fairly intense wildland fire. These larger trees would have survived subsequent light under burns that would have killed groups of small trees. The result would have been an uneven aged stand with pockets of the same cohort scattered through the site.

Tree size: Trees, regardless of species, greater than 20" dbh (diameter of the tree 4' from the ground) should be favored. **However**, in order to create an uneven-aged stand, trees of different cohorts should be left.

Stand Composition: Forested stand should be composed primarily of pine, Douglas fir, and oak with a limited number of incense cedar and white fir. Trees should be clumped and unevenly spaced through the stand in a random pattern with scattered small open areas. The result should be an uneven aged stand with pockets of the same cohort scattered through the site. Small patches (10 square meters or less) of dog-hair pine can be left, provided the patches are over 150' from the nearest structure. The clumping of white fir is not recommended unless the boles are limbed to eliminate fuel ladders.

Areas of brush that are currently occupying open areas should be allowed to remain unless the stand is highly decadent. However, there must be a transition area between brush fields and timbered areas to prevent the creation of fuel ladders.

Tree Spacing: Three elements generally must be present for the development of a surface supported (active) crown fire: 1) High wind speeds, 2) High crown bulk density and cover, and 3) low crown base height. There is little that can be done about the wind, but the other two elements can be manipulated to reduce the likelihood of an active crown fire. The key to preventing a wildland fire from reaching the tree canopies is removing smaller, understory trees and raising the height of lower branches of the larger trees. These two form ladder fuels that allow the fire to reach the crowns. The second element is determining tree spacing to further reduce crown bulk density. As a long-term goal: for slopes less than 40%, computer models suggest the spacing to be 22 feet between singe tree crowns or groups of trees. For slopes greater than 40% the spacing should be 24 feet. Trees should be limbed 6 – 8 feet from the ground in undeveloped areas and 10 feet next to roads.

Trees should be spaced randomly. Groups of two to four larger trees (20" dbh) can be

left but must be limbed to a height of 10 feet and living surface fuels, such as young trees and brush, removed. The creation of openings of one acre (.405 hectare) to two acres (.810 hectare) is encouraged.

It is not necessary to mark the trees to be left in the unit following thinning. It has been demonstrated that experienced operators, once given the standards, can thin the forest and remove the brush and undergrowth without further direction.

Limitations

Several archeological sites and three historic structures must be protected from damage due to their historical significance. They should not be disturbed, if possible.

Adequate protection must be afforded water quality. Riparian areas and drainages should not be disturbed and vegetation should not be treated within 25' of a watercourse.

A small amount of fugitive smoke is produced when the ACD is first ignited. Due care should be taken when locating a site for the unit so that the smoke from the start up and the emissions, dust and noise from the operation will not impact visitors and residents.

Remarks

- It is important to note that this project is not a "cure-all". History has shown that little can be done to halt or modify the rate and direction of spread of an independent crown fire. This type of crown fire is burning independently of the surface fire and burns with such a high intensity that it often creates its own environmental conditions.

- Fire investigators and others looked closely at what led to the loss of homes and outbuildings in Los Alamos, New Mexico as a result of the Cerro Grande Fire. Forest Service investigator Jack Cohen examined the area following the fire, and concluded that much of the fire burned "within several hundred yards or more of the Los Alamos residential area…as a surface fire - an underburn…the tree canopy was scorched but not consumed. [His] examination suggests that the high ignitability of Los Alamos was principally due to vegetation, flammable shrubs, wood piles, etc. adjacent to, touching and/or covering the homes…the high ignitability of most of the residential area allowed numerous simultaneous house fires that quickly overwhelmed the suppression forces" (Carle 2002). **Therefore, it is highly important that this project be completed in its entirety and in conjunction with the creation of defensible space around structures in the community.** When both projects are completed, the safety of firefighters and the public greatly improved.

- Depending on slope and aspect, surface fires may spread more quickly in open stands of timber than in closed stands of timber.

The stand at the left is composed of at least three cohorts. The stand would be treated to remove the majority of the small fir trees that crowd the site. The two trees in the foreground would remain, as would some of the mid-range trees – depending on spacing. The dead tree in the right center of the stand may be left for wildlife.

The result would be a more open stand, similar to the stand below. Note that the stand below is an uneven aged stand with openings. There is adequate ground cover to protect the site from erosion and elements necessary for a healthy ecosystem, such as fallen trees, standing snags, forbs, and brush remain. The trees have been limbed and ladder fuels have been removed. Very little surface fuel remains to carry a fire.

Project Name: Create a Fire Break	**Priority:** ___ Low _X_ Med ___ High
Number of Acres: 58	**Estimated Cost:** Dependent on Method Used
Project Type: __x__ Mechanical _____ RX Fire _____ Other:	

Project Description

Create a fuel break 100 feet wide along the ridge south of the community (Unit10).

Desired Results

Discussion: Several years ago a fire break was constructed along the ridge south of Foresta to provide a level of protection for the community from wildfires burning starting in the canyon. This fire break was allowed to return to nature. It is believed that a fire break in that location of sufficient width could be used by fire suppression personnel to halt the spread of a wildland fire by burning out fuels in advance of a wildland fire or using direct suppression tactics to suppressing a fire. It would also serve as a fireline when treating the unit to the north.

Goal: The primary goal is to provide suppression forces with another tool that could be used to halt the spread of a wildland fire treating the community from the south.

Objective: Halt the advance of a wildland fire threatening the community from the south.

Method

After developing a NEPA compliant plan, complete the project using a variety of tools. The preferred method is to use a masticator mounted on a Bobcat to remove small trees and brush, while avoiding soil disturbance. The completed project would result in a change of fuel type from brush and trees to grasses and low shrubs. In the event the use of a masticator is not a viable option, crews would cut, handpile, and burn the residue. In certain places, regardless of the method used to treat the fuels, the use of approved herbicides may be required to control brush and similar woody species.

Prescription

All trees and brush would be removed. Grasses and forbs would be encouraged. Based on outputs from Behave Plus such as flame length (22.5 feet) and fireline intensity (5020 Btu/ft/s), a fuel break 100 feet wide is expected to provide a change in fuel type wide enough to slow the rate of spread so that suppressions forces could use direct or indirect attack methods to suppress the fire.

Remarks

It will be necessary to maintain the fuel break on a regularly scheduled basis to prevent the reestablishment of brush and trees.

Appendix D

Tools

Fire Management Tech Tips

United States Department of Agriculture
Forest Service

Technology & Development Program

September 2002

5100 *0251 1317—SDTDC*

The Use of Air Curtain Destructors for Fuel Reduction

Alan R. Schapiro, Mechanical Engineer

Summary

The San Dimas Technology and Development Center (SDTDC) investigated the use of air curtain destructors (ACDs) as an efficient, environmentally friendly, and technically viable means of disposing of slash, wood, and other burnable waste materials. ACDs should be considered an additional alternative to current fuel reduction methods and disposal of road clearing debris such as pile burning, chipping, landfill disposal, and prescribed fire. SDTDC's research of the industry indicates that one company, Air Burners LLC, manufactures both self-contained and trench ACDs. Their self-contained ACDs are basically skid-mounted air curtain incineration systems including a refractory lined firebox that does not require any setup or teardown. Their trench burners are trailer-mounted air curtain incineration systems requiring a pit or earthen trench that functions as a firebox. Both types of burners can efficiently dispose of large quantities of forest waste products at very high temperatures with very little air emission. This safe and clean method of burning allows its operation nearly any time of year except when fire danger is too high. In addition to burning safely and cleanly, volume reductions of approximately 95 to 98 percent are achieved. The ash may be used as a soil amendment that can be spread on the forest floor.

Background

Use of ACDs for wildfire mitigation and fuel management is growing rapidly as an alternative to current fuel reduction methods. The use of prescribed fire as a means of slash removal is subject to weather conditions, and in some cases, prohibited in wildland urban interface areas. Leaving the slash on the forest floor to decompose is another traditional alternative. However, the slash may take many years to decompose, particularly in semiarid and cold environments. While decomposing, the material remains a considerable fire risk. This method can also increase the risk of unwanted insect outbreaks. Pile burning, another traditional alternative used to remove slash, is also subject to weather/burn conditions. Chipping, grinding, and mulching are other alternatives that still require a means of disposal and may prove to be very costly.

ACDs can be operated safely and practically year round for disposal of slash with only a few operating limitations such as fire conditions, required clearance from trees (or other fuel hazards), and maximum allowable wind conditions (figure 1). Volume reduction of slash is approximately 95 to 98 percent and the byproduct (ash) may be used as a soil amendment by spreading it on the forest floor.

Figure 1—Skid mounted ACD in full operation (no visible smoke).

For additional information, contact: Fire Management Program Leader, San Dimas Technology & Development Center, 444 East Bonita Avenue, San Dimas, CA 91773-3198; Phone 909-599-1267; TDD; 909-599-2357; FAX: 909-592-2309
LotusNotes: MailroomWOSDTDC@FSNOTES - Intranet(website):http://fsweb.sdtdc.wo.fs.fed.us - Internet e-mail: mail room-wo-sdtdc@fs.fed. us

The ACDs manufactured by Air Burners LLC have been used worldwide for several types of applications. They are used in forest fuel management and wildfire mitigation efforts, in the construction industry to reduce debris from land clearing and demolition operations, and at landfill sites to maximize costly space by reducing wood waste and similar burnable waste streams. They are also used in disaster recovery for clearing the aftermath from storms or floods.

Description

The main operating principle of the ACD is the high velocity air (curtain) blown across and into the upper portion of the combustion chamber (figure 2). This powerful curtain of air has two effects. First, the high volume of air causes overoxygenation of the fire, and secondly the high velocity airflow over the combustion chamber entraps particulates (smoke), which then completes combustion in the combustion chamber, thus limiting emissions and smoke. The high turbulence along with increased combustion time and temperatures in excess of 1,800 °F results in complete combustion and significantly reduced air emissions. Reduced air emissions lower impact on nearby residents, smoke sensitive individuals, and decrease smoke-related inversions during fall and winter. In addition, the high temperatures and oxygen-rich environment burn everything from green fuels to red slash.

Equipment

Air Burners LLC manufactures two types of ACDs: self-contained skid-mounted firebox systems that do not require any setup or teardown; and trench burners that require setup and an earthen pit or trench which functions as the firebox.

Skid-Mounted Systems

The skid-mounted ACD as shown in figure 3, is a self-contained system that includes a refractory walled firebox, diesel engine power plant, mechanical drive system, blower fan, and fuel tank. These ACDs are engineered to be transportable by a lowboy or similar drop-deck trailer. The transportability increases the flexibility of bringing the ACD to the wood waste source, rather than hauling the waste to a fixed location for processing. These ACDs are ready for use as soon as they are offloaded at the jobsite. The refractory lined firebox allows for controlled burning without the need for an earthen pit or trench. The forward equipment deck shown in figure 3 supports the diesel engine, the fuel tank, the direct drive system to operate the fan, and the fan. An air nozzle manifold is mounted on one side of the firebox. The wood waste is loaded over the top of the ACD on the side opposite the manifold (figure 4).

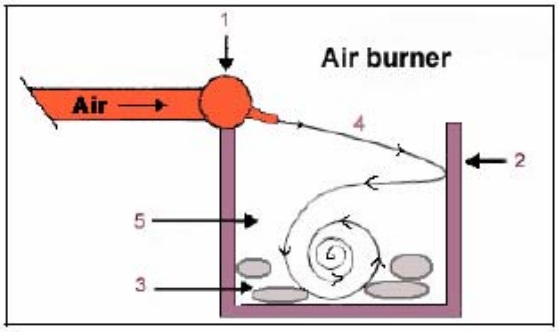


Figure 2—Air burner.

1. Air curtain burner manifold and nozzles directing high velocity air flow in refractory lined box or earthen trench.
2. Refractory lined wall for self contained ACD or earthen wall for trench ACD.
3. Waste material to be burned.
4. Air Flow forms a high velocity "curtain" over fire.
5. Continuous airflow over-oxygenates the fire, creating higher temperatures and thereby a more clean and complete burn.

Figure 3—Skid mounted ACD in full operation (no visible smoke).

Skid-mounted systems are designed and constructed to optimize the air curtain concept. High velocity air is blown across and down at an optimum angle into the pit creating the air curtain on top and a rotational turbulence within the firebox. The high velocity air creating the rotational turbulence provides an oxygen-enriched environment in the combustion zone that accelerates the combustion process (similar to the effect of fanning a fire). The temperature within the firebox is usually above 2,000 °F. The high velocity air

Figure 4—Loading fuel into ACD (full operation).

over the firebox creates an air curtain that traps unburned particulate until it is completely consumed. Nearly complete combustion is achieved with minimal amounts of escaped particulates, virtually eliminating smoke.

Vertical refractory walls aid in the combustion process by retaining and reflecting the high temperatures generated within the firebox. The combustion process reduces the wood waste by approximately 98 percent, leaving about 2 percent in volume as residual ash. Twin refractory lined panel doors at the rear of the firebox allow for ash removal. The unit has no bottom and can be dragged on its skids with the rear door panels open for dumping ash.

The skids and durability of the unit allow it to be dragged around the site for repositioning or from site to site depending upon the terrain and distance to be moved. The ash may be left in place, disposed of, or used as a soil amendment by mixing it with the soil at the site or other locations.

Air Burners LLC manufactures several skid-mounted systems with burn rates ranging from 1 to 15 tons per hour. The larger units are more difficult to transport or move around the site. Due to their size, special permits are required for transporting over roads. Systems can be customized to meet specific needs. The standard units can also be leased.

Trench Burner Systems

The trench burner systems are trailer-mounted self-contained air curtain incineration systems consisting of a power plant, mechanical drive system, blower fan, and fuel tank (figure 5). All of the components are either mounted to or stored on the trailer. An earthen trench must be constructed since the trench burners do not contain a firebox. The manifold sections are assembled and placed along the trench edge. Carrier pipe sections are assembled to carry the air from the power plant to the manifold, thereby keeping the trailer-mounted components clear of damaging heat generated from the burning operations (figure 6). Burning operations can usually run until the ash in the trench needs to be removed or a new trench is needed. Air Burners LLC manufactures several trailer-mounted trench systems with burn rates ranging from 5 to 14 tons per hour. These units can also be leased.

Firebox vs Trench Burner

The self-contained firebox burners eliminate guesswork regarding the size of the fire area. These above-ground units avoid problems with the water table, rocks, and roots and allow for easier ash removal. The real minus for these units is their size. The smallest ACDs weigh over 20,000 pounds. So dragging it around in soft soil can be difficult. While the smaller units will fit on a

Figure 5—Trailer mounted trench burner system.

Figure 6—Trench burner.

standard equipment trailer, the larger units are oversized loads for most roads. So the logistics are more complicated than towing a trench burner.

The trench burner can be easily towed behind a truck to the jobsite. These units will handle more uneven terrain than the fireboxes and can be mobilized quickly. The trench allows the operator to easily see the fire and load the pit without the need to raise the fuel up over the wall. The real minus for the trench burner is in the construction of the trench. The trench must be dug correctly or the efficiency of the ACD goes down, increasing emissions and decreasing thru-put (burn rate). If the trench is omitted or too shallow, the principle of the air curtain is lost. Ground and soil conditions become a big factor. A high water table can create flooding in the trench and cause trench walls to lose integrity if the soil is too soft. Additional safety factors also must be considered. Precautions must be taken to alert personnel to the pit's location to avoid inadvertently failing in or perching heavy loading equipment too near the edge of the pit causing the walls to collapse.

Operation

Skid-mounted or trench burner ACDs are simple, easy, and almost identical to operate. ACD operations follow three stages: startup, full operation, and burndown. For startup, the trench or firebox is partially loaded with layers of fine and easily burnable forest slash. An accelerant (typically diesel fuel) is applied over the layers and covered with heavier logs to just under the manifold. Fusees could be used for ignition. The fan is started once the heavier materials burn, and the fan speed is gradually increased to full capacity. Smoke will be produced during startup, but will decrease as the fan speed increases and the process approaches full operation. Startup burning takes about 1 hour and is complete when a base of hot coals and burning material is established. During full operation, slash is fed to the fire at a steady rate using a front-end loader or an excavator with a bucket and thumb. The last stage, burndown, typically takes about 1 to 2 hours. The air is slowly decreased as the last load burns down. After burndown, hot coals may remain for several days under an insulating blanket of ash. The ash may be left in place, disposed of, or used as a soil amendment by mixing it with the soil onsite or at other locations.

Skid-mounted ACDs are designed to run for approximately 24 hours before the ash needs to be removed. Long burns are generally more efficient (having lower emissions) than shorter burns. The efficiency starts to drop once the ash pile reaches approximately 1/4 to 1/3 the depth of the firebox or pit.

For safe operation, the manufacturer recommends a 100-foot clearance around the AM Barring extremely high winds there is little chance of large embers escaping the trench or firebox and burning beyond the clear area. Very small embers can escape, but generally burn completely before they hit the ground. Having an engine and crew onsite further reduces the risk of fire. A patrol of the area may reduce the clear area requirements and burn condition limitations. ACDs should not be operated if the fire danger is too high or if people or animals are likely to fall into the pit or climb up on the box. Should conditions require shutdown, the fire could be extinguished in 10 to 20 minutes. Safety should always be the number one operational consideration.

U.S. Environmental Protection Agency regulations for New Source Performance Standards (NSPS) requires that ACDs operate below opacity limits of 35 percent during the initial 30-minute startup and 10 percent during operation (6-minute average), provided the material burned is restricted to 100 percent wood waste, clean lumber, and/or yard waste. Air Burner ACDs operate well below these limits in contrast to open burning which averages between 60 to 80 percent opacity.

SDTDC Evaluation

SDTDC is currently planning to operate a skid-mounted unit for evaluation purposes in Fall 2002 at a site within national forest lands. Data will be collected on aspects such as mobility, durability, and operability to develop Forest Service recommendations and standards for operation. This information will be published during FY 2003.

Conclusions

ACDs should be considered when evaluating alternatives to current fuel reduction methods in urban interface areas. ACDs may not be as cost competitive in areas where broadcast and pile burning are acceptable. Potential advantages to ACDs include:

- Produces lower smoke emissions compared to pile or broadcast burning.
- Burns a greater variety of materials from green fuel to red slash.
- Reduces fire risk and outbreak of insect problems.
- Operates with fewer restrictions on weather and burn conditions.

- Residents in urban interface areas are more willing to accept ACD use and remove wood waste and slash fuel hazards around their homes if offered free disposal
- The fire is contained and easily and quickly extinguished, if necessary.

Information
For further information regarding ACDs manufactured by Air Burners LLC, contact:
Brian O'Connor or Norbert Fuhrmann

Air Burners LLC
4390 Cargo Way
Palm City, FL 34990
888-566-3900 or 772-220-7303
www.airburners.com

Approximate English to Metric System Conversion Factors

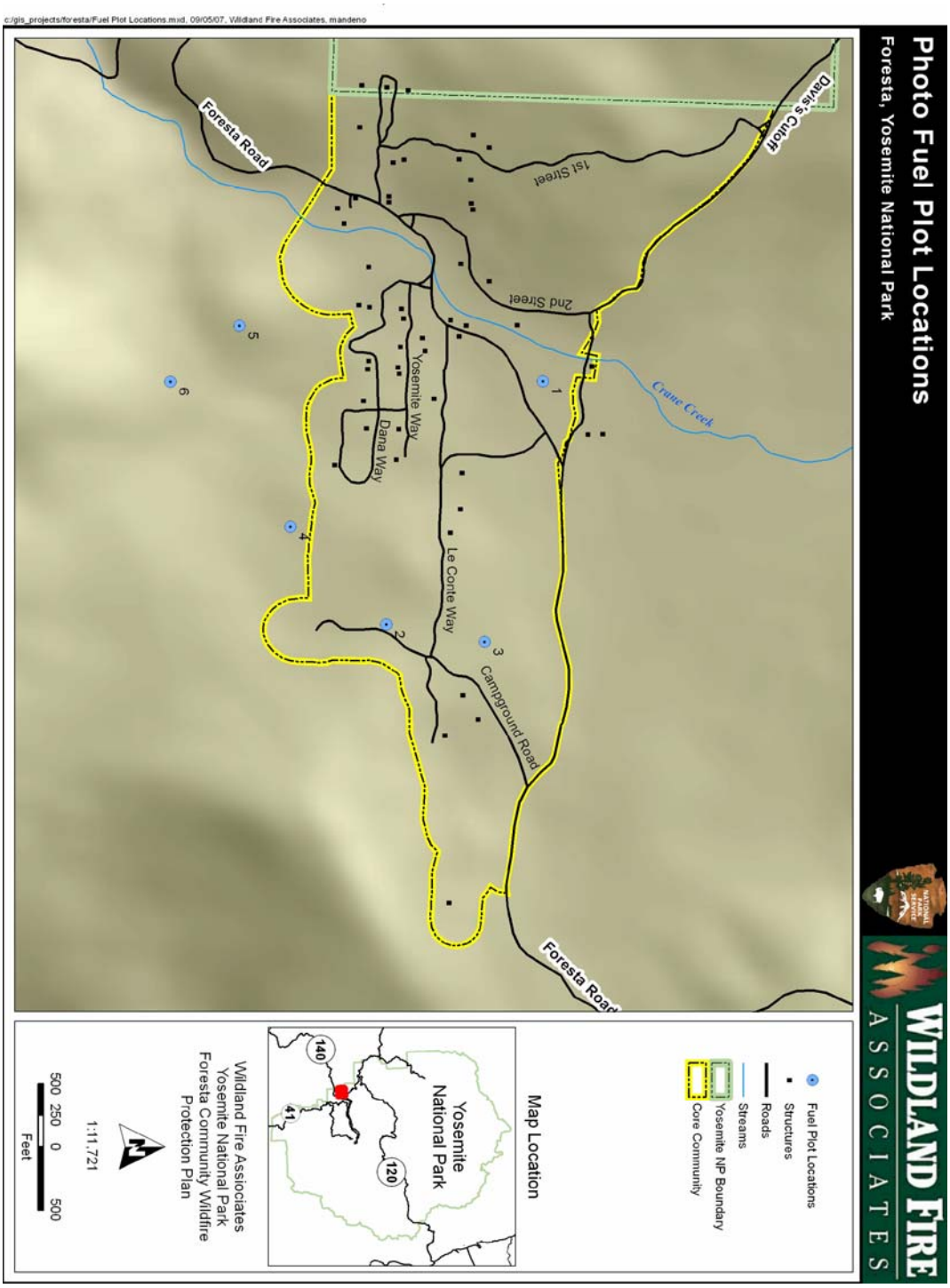
To Change	To	Multiply by
pounds	kilograms	0.454
tons	kilograms	907.2

Temperature Conversion of Units
°C = (°F - 32) /1.8

About the Author
Alan Schapiro, a licensed professional engineer in the State of California, obtained both a bachelor's degree in mechanical engineering and a master's degree in engineering from Cornell University. He has 20-plus years of engineering and project management experience in the development, design, startup, and operation of oil/gas, coal, nuclear, and alternate/renewable electric generation power plants. Alan is a project leader in the Fire and Aviation program responsible for air curtain destructor applications, fire engine development and testing, and foam proportioner testing. He also has responsibilities in other program areas such as engineering roads technology, forest management, and recreation.

Appendix E

Photo Points


c:/gis_projects/foresta/Fuel Plot Locations.mxd, 09/05/07, Wildland Fire Associates, mandeno
Photo Fuel Plot Locations
Foresta, Yosemite National Park
WILDLAND FIRE
ASSOCIATES
Davis's Cutoff
1st Street
2nd Street
Foresta Road
Crane Creek
Yosemite Way
Dana Way
Le Conte Way
Campground Road
Foresta Road
1
2
3
4
5
6
Fuel Plot Locations
Structures
Roads
Streams
Yosemite NP Boundary
Core Community
Map Location
Yosemite National Park
140
120
41
Wildland Fire Associates
Yosemite National Park
Foresta Community Wildfire Protection Plan
1:11,721
500 250 0 500
Feet

DATA SHEET

Location **Foresta Photo Point 1** Elevation **4308 ft**

Northing: **4176329** Easting: **257345** (UTM, Zone 11, NAD83)

Woody Fuel Loadings

SIZE CLASS (inches)	Loading (tons/acre)
0 - 0.25	0.191
0.26 - 1	1.216
1.1 - 3	1.452
3+ sound	0.000
3+ rotten	0.000
Total	2.859

Other Measurements

Avg. litter depth (in.)	1.00
Avg. duff depth (in.)	0.38
Avg. sound diameter (in.)	0
Avg. rotten diameter (in.)	0
Tree canopy cover (percent)	60%

Stand Information

Characteristic	Incense cedar	Sugar pine	Ponderosa pine	White fir	Black oak	ALL	Snags > 15cm d.b.h.
> 15cm d.b.h.							
Trees per hectare	348	0	0	0	0	398	50
Basal area (m^2/ha)	64	0	0	0	0	67	2
Avg. d.b.h. (cm)	44	0	0	0	0	44	24
Avg. height (m)	18	0	0	0	0	18	5
Avg. crown base hght (m)	8	0	0	0	0	8	0
2.5 to 15cm							
Trees per hectare	0	0	0	0	0	0	0
Avg. height (m)	0	0	0	0	0	0	0

Fuel Model and Descriptive Narrative

Immediate area most represented by NFFL fuel model 9 with little to no understory growth.
Though all trees in plot were Incense cedar, many large Ponderosa pines in stand.

Expected Fire Behavior

Fires run through the surface litter relatively quickly and have flame lengths up to 2 to 3 feet.
Concentrations of dead-down woody material will contribute to possible torching out of trees, spotting, and crowning.

Remarks

Relatively tall open stand of ponderosa pine and incense cedar. Near intersection of Foresta Road and Old Coulterville Road. Area recently burned. Char on barks of all trees at least 20 to 25 ft high.

DATA SHEET

Location **Foresta Photo Point 2** Elevation **4479 ft**

Northing: **4175951** Easting: **257932** (UTM, Zone 11, NAD83)

Woody Fuel Loadings

SIZE CLASS (inches)	Loading (tons/acre)
0 - 0.25	0.128
0.26 - 1	3.067
1.1 - 3	7.322
3+ sound	3.850
3+ rotten	0.863
Total	15.229

Other Measurements

Avg. litter depth (in.)	3.00
Avg. duff depth (in.)	0.38
Avg. sound diameter (in.)	4.5
Avg. rotten diameter (in.)	3.5
Tree canopy cover (percent)	20%

Stand Information

Characteristic	Incense cedar	Sugar pine	Ponderosa pine	White fir	Black oak	ALL	Snags > 15cm d.b.h.
> 15cm d.b.h.							
Trees per hectare	0	0	0	0	0	99	99
Basal area (m^2/ha)	0	0	0	0	0	5	5
Avg. d.b.h. (cm)	0	0	0	0	0	26	26
Avg. height (m)	0	0	0	0	0	3	3
Avg. crown base hght (m)	0	0	0	0	0	0	0
2.5 to 15cm							
Trees per hectare	0	0	647	0	0	647	0
Avg. height (m)	0	0	4	0	0	4	0

Fuel Model and Descriptive Narrative

Immediate area most represented by NFFL fuel model 5 with little to no overstory.
Emerging ponderosa pine stand.

Expected Fire Behavior

Fire is generally carried in the surface fuels that are made up of litter cast by the undergrowth and trees, though in this case, woody material from a prior mastication project would also contribute to fire duration and severity.
Understory comprised mostly of bear clover, bracken fern and other herbaceous species.

Remarks

Many young (polesized and smaller) ponderosa pines, bracken fern covers a dense litter bed. Overstory was burned in prior fire and woody remains were masticated.

DATA SHEET

Location **Foresta Photo Point 3** Elevation **4423 ft**

Northing: **4176189** Easting: **257975** (UTM, Zone 11, NAD83)

Woody Fuel Loadings

SIZE CLASS (inches)	Loading (tons/acre)
0 - 0.25	0.016
0.26 - 1	0.306
1.1 - 3	4.378
3+ sound	0.958
3+ rotten	77.558
Total	83.216

Other Measurements

Avg. litter depth (in.)	1.88
Avg. duff depth (in.)	0.25
Avg. sound diameter (in.)	3.2
Avg. rotten diameter (in.)	23.5
Tree canopy cover (percent)	40%

Stand Information

Characteristic	Incense cedar	Sugar pine	Ponderosa pine	Knobcone pine	Black oak	ALL	Snags > 15cm d.b.h.
> 15cm d.b.h.							
Trees per hectare	0	0	199	0	0	348	99
Basal area (m^2/ha)	0	0	4	0	0	70	64
Avg. d.b.h. (cm)	0	0	17	0	0	34	75
Avg. height (m)	0	0	23	0	0	9	11
Avg. crown base hght (m)	0	0	4	0	0	1	0
2.5 to 15cm							
Trees per hectare	0	0	99	0	0	99	0
Avg. height (m)	0	0	6	0	0	6	0

Fuel Model and Descriptive Narrative

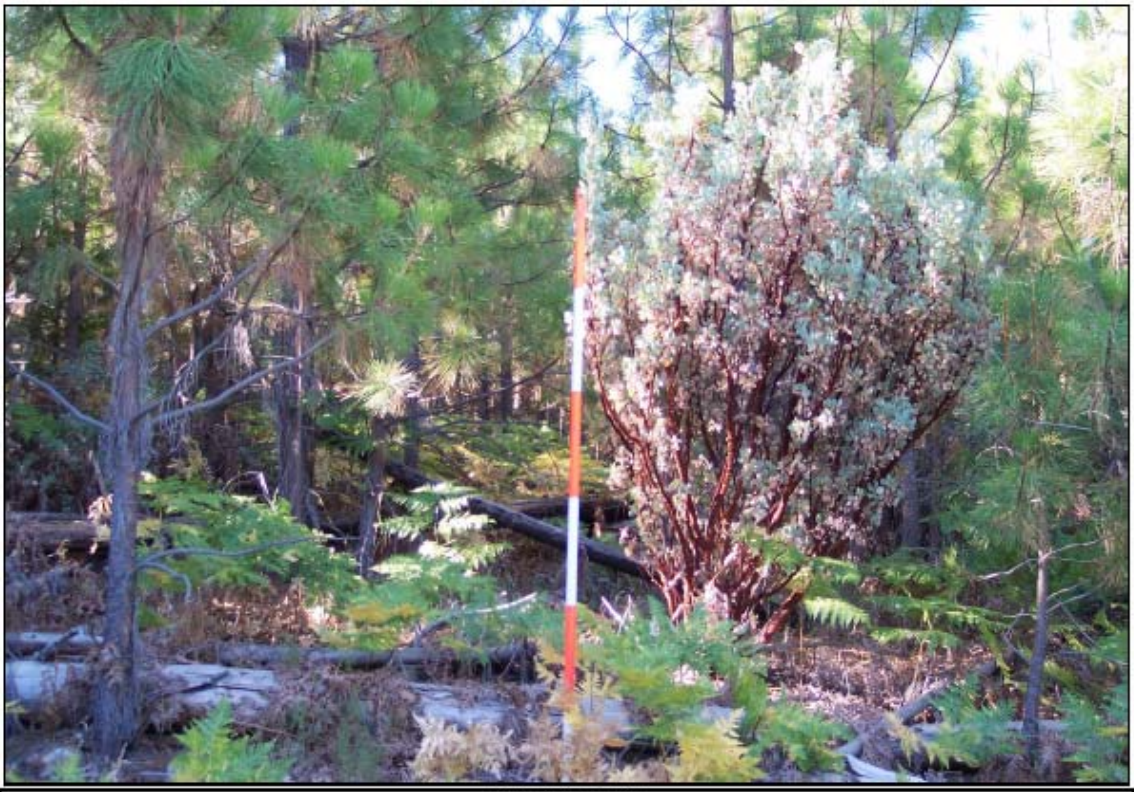
Immediate area most represented by NFFL fuel model 2 with an emerging mixed pine stand.

Expected Fire Behavior

Fire spread is primarily through the fine herbaceous fuels, either curing or dead. These are surface fires where the herbaceous material, in addition to litter and dead-down stemwood from the timber overstory, contribute to the fire intensity. Understory comprised mostly of grasses.

Remarks

It appears that understory thinning and pile burning has been conducted in this stand about 5 to 10 years ago. Fairly clear understory with occasional bucked up 1000hr logs and large snags.



DATA SHEET

Location **Foresta Photo Point 4** Elevation **4456 ft**

Northing: **4175720** Easting: **257695** (UTM, Zone 11, NAD83)

Woody Fuel Loadings

SIZE CLASS (inches)	Loading (tons/acre)
0 - 0.25	0.048
0.26 - 1	0.611
1.1 - 3	5.837
3+ sound	12.400
3+ rotten	19.372
Total	38.268

Other Measurements

Avg. litter depth (in.)	4.25
Avg. duff depth (in.)	0.25
Avg. sound diameter (in.)	5.50
Avg. rotten diameter (in.)	8.67
Tree canopy cover (percent)	90%

Stand Information

Characteristic	Incense cedar	Sugar pine	Ponderosa pine	Knobcone pine	Black oak	ALL	Snags > 15cm d.b.h.
> 15cm d.b.h.							
Trees per hectare	0	0	0	0	0	0	0
Basal area (m^2/ha)	0	0	0	0	0	0	0
Avg. d.b.h. (cm)	0	0	0	0	0	0	0
Avg. height (m)	0	0	0	0	0	0	0
Avg. crown base hght (m)	0	0	0	0	0	0	0
2.5 to 15cm							
Trees per hectare	0	0	99	0	0	99	0
Avg. height (m)	0	0	7	0	0	7	0

Fuel Model and Descriptive Narrative

Immediate area most represented by NFFL fuel model 4, a young emerging ponderosa pine stand.

Expected Fire Behavior

Though classified as fuel model 4, the primary carrier of fire would be the dense tree saplings that literally blanket the area. Fire intensity would be high and fast-spreading that would involve the foliage in the crowns of the saplings (dbh less than 2.5cm).

Remarks

This plot was not read at the location intended. Due to the difficulty of moving through the densely packed saplings, the original location was abandoned and this site (at edge of sapling growth and manzanita fields) was chosen.

DATA SHEET

Location **Foresta Photo Point 5** Elevation **4446 ft**

Northing: **4175597** Easting: **257210** (UTM, Zone 11, NAD83)

Woody Fuel Loadings

SIZE CLASS (inches)	Loading (tons/acre)
0 - 0.25	0.112
0.26 - 1	0.916
1.1 - 3	18.954
3+ sound	16.338
3+ rotten	22.632
Total	58.952

Other Measurements

Avg. litter depth (in.)	6.00
Avg. duff depth (in.)	0.25
Avg. sound diameter (in.)	5.08
Avg. rotten diameter (in.)	7.08
Tree canopy cover (percent)	43%

Stand Information

Characteristic	Incense cedar	Sugar pine	Ponderosa pine	Knobcone pine	Black oak	ALL	Snags > 15cm d.b.h.
> 15cm d.b.h.							
Trees per hectare	0	0	99	0	0	149	50
Basal area (m^2/ha)	0	0	2	0	0	11	9
Avg. d.b.h. (cm)	0	0	16	0	0	27	48
Avg. height (m)	0	0	29	0	0	9	9
Avg. crown base hght (m)	0	0	3	0	0	1	0
2.5 to 15cm							
Trees per hectare	0	0	149	0	99	249	0
Avg. height (m)	0	0	4	0	5	4	0

Fuel Model and Descriptive Narrative

Immediate area most represented by NFFL fuel model 10, an emerging mixed conifer/hardwood stand.

Expected Fire Behavior

Fires is this fuel type burn in the surface and ground fuels. Dead-down fuels include greater quantities of 3-inch or larger limbwood resulting from the recent fire that induced 100% mortality in the previous overstory. Crowning out, spotting and torching can be more frequent in this fuel type and can lead to potential fire control difficulties.

Remarks

This emerging forest seems to be farther along in age than the other plots, however, manzanita and ceanothus still dominate the understory. Plant species much more diverse in this plot than the previous ones.

DATA SHEET

Location **Foresta Photo Point 6** Elevation **4495**

Northing: **4175431** Easting: **257346** (UTM, Zone 11, NAD83)

Woody Fuel Loadings

SIZE CLASS (inches)	Loading (tons/acre)
0 - 0.25	0.064
0.26 - 1	0.304
1.1 - 3	0.000
3+ sound	9.638
3+ rotten	252.903
Total	262.909

Other Measurements

Avg. litter depth (in.)	9.50
Avg. duff depth (in.)	0.63
Avg. sound diameter (in.)	5.00
Avg. rotten diameter (in.)	16.5
Tree canopy cover (percent)	57%

Stand Information

Characteristic	Incense cedar	Sugar pine	Ponderosa pine	Knobcone pine	Black oak	ALL	Snags > 15cm d.b.h.
> 15cm d.b.h.							
Trees per hectare	0	0	298	0	0	298	0
Basal area (m^2/ha)	0	0	9	0	0	9	0
Avg. d.b.h. (cm)	0	0	20	0	0	20	0
Avg. height (m)	0	0	27	0	0	8	0
Avg. crown base hght (m)	0	0	6	0	0	2	0
2.5 to 15cm							
Trees per hectare	0	0	298	0	0	298	0
Avg. height (m)	0	0	6	0	0	6	0

Fuel Model and Descriptive Narrative

Immediate area most represented by NFFL fuel model 10, an emerging mixed conifer/hardwood stand.

Expected Fire Behavior

Fires is this fuel type burn in the surface and ground fuels. Dead-down fuels include greater quantities of 3-inch or larger limbwood resulting from the recent fire that induced 100% mortality in the previous overstory. Crowning out, spotting and torching can be more frequent in this fuel type and can lead to potential fire control difficulties.

Remarks

This plot is very similar to Photo Fuel Plot #5, however, it is situated next to a dense thicket of ponderosa pine saplings. Some manzanita, bear clover, and ceanothus with a fairly open canopy.

Appendix F

Subdivision Hazard Rating Form

Foresta, California

SUBDIVISION WILDFIRE HAZARD RATING FORM

Fire District: Mariposa FPD	Subdivision: **Foresta, YNP**	Number of Lots: Over 50
Rated by: Esther Mandeno/Carl Douhan	Date: July 2006	

A. FUELS AND TOPOGRAPHY

1. Fuels/Density

-Grass w/ scattered trees or brush	**1**	
-"Thinned" Conifers (10 ft. or more between trees – trimmed up 10 ft.)	**3**	
- Moderately dense conifers/brush	**5**	X
- Flammable brush	**7**	
- Dense, continuous conifers thick brush	**10**	

2. Topography

Predominant Slope:

- Less than 20%	**1**	
- Between 20 – 45%	**4**	X
- >45%	**7**	

B. SUBDIVISION DESIGN

1. Ingress/Egress:

- Two or more roads, primary route	**0**	
- One road, primary route, plus one alternate	**2**	
- One way in or out	**3**	X

2. Primary Road Width:

- Minimum 24 feet	**1**	X
- Less than 24 feet	**3**	

3. Accessibility – Primary Road:

- Smooth road, grade less than 5%	**1**	
- Rough Road, grade less than 5%	**3**	X
- Steep Grade, Tight Turns	**5**	

4. Secondary Road Terminus:

- Loop road or cul-de-sacs w/turn-around radius greater than 45 feet	**1**	X
- Cul-de-sacs w/turn-around radius less than 45 feet	**2**	
- Dead-end road < 200 ft in length	**3**	
- Dead-end road > 200 ft in length	**5**	

5. Average Lot size:

- Less than 1 acre	**1**	X
- Between 1 and 10 acres	**2**	
- More than 10 acres	**3**	

6. Street Signs

- Present	**0**	X
- Not Present	**2**	

C. STRUCTURE HAZARD

1. Predominant Materials:

- Roof and siding materials not wood	**1**	
-Flammable siding/non-flammable roof (Includes mobile homes)	**3**	X
- Flammable room	**5**	

2. Defensible Space Completed

- More than 70% of sites improved	**1**	
- Between 30–70% of sites improved	**5**	X
- Less than 30% of sites improved	**10**	

3. Utilities (Gas and/or Electric)

- All underground	**0**	
- One under ground – One above	**1**	
- All Above ground	**2**	X

D. FIRE PROTECTION

1. Response Time:

- Within 15 minutes	**1**	
- Within 16 – 30 minutes	**2**	
- Greater than 31 minutes	**3**	X

2. Hydrants:

- 500 gpm hydrants - <1000' spacing	**0**	
- Hydrants or pump-site - < above	**1**	
- No hydrants or pump-site	**2**	X

3. Drafting Sources

(Complete if no hydrant/pump-site)

- Sources w/in 20 min round-trip	**0**	X
- Sources w/in 21-45 min round-trip	**1**	
- Sources > 46 minutes round-trip	**3**	

Notes (Continue on Back):

Appendix G

Evacuation Plan

Foresta, California

(Reserved)

Until such time as a formal evacuation plan is developed, it may be appropriate to use the following guidelines that were developed for this plan.

3.2.3 Evacuation Plan

Part 5 of the *Mariposa County Emergency Operation Plan* spells out the procedures to be followed in the event the Mariposa County Sheriff orders an evacuation. No procedures for the evacuation of Foresta have been included by the Sheriff in the current county emergency operations plan. However, there are standard procedures for evacuations listed in the countywide evacuation plan that have been adapted and incorporated into this plan.

3.2.3.1 Evacuation Order

The authority to evacuate an area rests with the Mariposa County Sheriff. The decision to recommend that the area be evacuated is usually made by the Incident Commander in charge of the fire. The request is conveyed to the Sheriff. The Mariposa County Sherriff will determine the method of notice, which may be direct contact and/or reverse 911. Any evacuation order will balance the liability of possible loss of life or property with a desire to warn but not unnecessarily displace residents.

3.2.3.2 Evacuation Procedures

If an evacuation order is issued for Foresta, all residents and guests will assemble at the staging area located at or near Big Meadow, to be accounted for and informed of the evacuation route. The Park should assign a Public Information Officer to assist at the staging area.

3.2.3.3 Emergency Evacuation Route

The Oak Flat Road, which is known to all, is a relatively short distance from Foresta and provides a paved escape route to the north and to the east. Using the Oak Flat Road to escape a wildland fire is much preferable than driving on a primitive road that is unfamiliar to most, especially at night or during the confusion and chaos of a rapidly spreading wildland fire.

3.2.3.4 Safety Zone

Due to ingress and egress issues and the location of the community, it may be necessary for the inhabitants to move to a designated safety zone within the community. A suitable site for a safety zone is located just north of Foresta in Big Meadow. The Park has scheduled a prescribed fire for that area that is expected to improve the site and increase the amount of area available to provide a reasonable expectation of protection during a high-intensity, long-duration wildland fire.

3.2.4 Shelter-in-Place Plan

In addition to moving to a safety zone, there are ways to protect yourself if you have to stay where you are and a fire is rapidly approaching. One of these is staying in your own home. However, many of the houses in Foresta may not be particularly well sited or suited to shelter-in-place. Currently, no shelter-in-place procedures have been established for Foresta. For now, this practice should be discouraged and all residents are encouraged to evacuate the area well in advance of a fire. If evacuation is not a viable option, those still in the community should move to the Safety Zone in Big Meadow.

3.3 Post Fire

The community should meet with representatives of Mariposa County, the Park staff, and the Forest Service immediately after a wildland fire, to discuss the effectiveness of the fire prevention actions and suppression efforts that were taken. The meeting should be under the direction of a trained facilitator. In those cases where there has been loss of life or several homes have been damaged or destroyed, a Critical Stress Debriefing Team should be brought in to help victims cope with the situation.