

Chapter 4: Fire Risk Mitigation Strategies

Strategies for mitigating fire risk are applied at three scales: planning area (in this case, the area covered by the CWPP), community (i.e., communities "at risk" as identified by state and federal agencies) and individual property. In this chapter, strategies at the community and individual property scales are described. The dominant vegetation, weather, and other conditions affecting risk in the various communities covered by the CWPP and current efforts underway to reduce risk have been described in previous chapters of this CWPP.

4.1 Fire Risk Mitigation Strategies for Communities

Some relevant measures of the status of a community with respect to fire risk include the average age of structures in the community (as it relates to whether the structure was built under current WUI building codes), community design (particularly lot size, density and internal road systems), communitywide compliance with defensible space provisions, general property hygiene (i.e., community "pride in appearance"), presence of community fuel breaks or other fire defense projects, and community involvement in fire prevention education and outreach.

Given the status of a community and its inherent risk due to weather, topography, and vegetation type(s), mitigation strategies at the community scale generally include:

- Improving road access, generally and specifically for emergency response and evacuation
- Improving water supply and water delivery infrastructure
- Enforcing defensible space regulations and generally reducing risks due to accumulations of trash and other flammable material on commercial and residential properties
- Reducing hazardous fuels
- Public education and fire prevention measures

Different emphasis should be placed on different strategies based on site-specific or community risk assessments.

4.11 Improving Road Access

There are many aspects to the issue of roads and adequacy of access, but at the community scale, facilitating emergency response and evacuation in the event of a fire is essential. Respondents to the on-line survey done as part of this CWPP raised this issue with respect to road width to simultaneously accommodate evacuees and incoming fire equipment, bridge width and strength (to support fire apparatus), and grown-over or brushed-in roads. Steep terrain and narrow, steep roads, poorly maintained roads, locked gates, and dense roadside vegetation can all impair the movement of equipment in to fight a fire and movement out by affected people. In the worst of cases, "traffic jams" caused by the combination of poor access and heavy traffic can contribute to the spread of fire and fatalities. Many fatalities associated with the Oakland Hills "Tunnel Fire" in 1991 were attributed to residents being unable to evacuate due to impaired access. The responsibility for evacuation rests with law enforcement and the county Office of Emergency Services. In emergencies, methods such as the Emergency Alert System, the "Wildfires Near Me" website (<https://wildfiresnearme.wfmrda.com/>), public announcements over the television

and radio and direct phone or e-mail contacts may be used to inform people in harm's way. Alerting residents when fire is eminent may not always be sufficient; they must be informed in advance to the degree possible about favored community ingress and egress routes and about the option of "sheltering in place" until a fire passes.

There are many dirt-surfaced roads in El Dorado County that are not maintained and many have locked gates where they traverse private properties. Although law enforcement and fire fighters may have keys or combinations for these locks, that may not be the case for evacuating residents. Consequently, any designated community ingress and egress route must be free of these obstacles.

Evacuation of animals, particularly livestock and horses can be an especially vexing problem during a wildfire emergency. The availability of stock vehicles, accessibility on narrow country roads, potential conflicts with fire-fighting equipment transport, and evacuating residents can all cause ineffective rescue attempts. After a wildfire there are often lost or abandoned animals needing care and shelter. In El Dorado County the Office of Emergency Services, El Dorado County Animal Services, large animal rescue volunteers, and property owners coordinate animal rescue during emergencies. Pre-planning for large animal evacuation is an important part of pre-fire planning. For more information on large animal evacuation, please visit the El Dorado County Animal Rescue Services Web-site

(http://www.edcgov.us/AnimalServices/Disaster_Preparedness_-_Pet_and_Animal_Emergency_Planning.aspx).

All of these considerations in regard to emergency response and evacuation imply a need for adequate pre-planning and education at the community and individual property owner level on the part of all parties involved with wildfire prevention and abatement in El Dorado County.

4.12 Improving Water Supply and Delivery Infrastructure

Rural communities in El Dorado County depend on a variety of water supplies and associated infrastructure. In many instances, water supply is the responsibility of the individual property owner who may or may not have a storage facility (e.g., tank, pond, or swimming pool) that can provide a source of water for fighting a fire. In other cases, communities and groups of properties depend on inherited water delivery systems such as flumes and ditches. Flumes and ditches are susceptible to failure and obstructions, particularly during large fires where they may be physically burned or impacted by falling trees. For example, in an evaluation of historic failures along the water conveyance facility associated with one of El Dorado Irrigation District's water supplies, numerous breaches due to excessive flow, landslides, and trees toppling into the open ditch were observed (Harris, personal observations). Water supply and infrastructure is considered a serious potential constraint on response to wildfire in El Dorado County. The El Dorado Irrigation District (EID) is currently underway on a project to replace a 3-mile section of a water supply ditch with a buried pipeline. Objectives of this project include; reduction of water loss due to seepage and vegetation water-use, protection of drinking water quality, and a reduction operations and maintenance costs. Meeting these objectives will thereby contribute to EID's overall water conservation efforts and protect the supply from impacts of wildfire and associated hazards. More info can be found at: <http://www.eid.org/about-us/project-updates/upper-main-ditch-piping-project>

4.13 Enforcing Defensible Space Regulations

Enforcement of policies, codes and ordinances can have an important impact on risk. For example, the extension of defensible space provisions from 30 feet to 100 feet from a structure had a positive effect that was triggered in part by the requirements of insurance companies. Strategies implemented in other counties, such as Placer County, include provisions for defensible space treatments beyond a property line onto adjacent property. Consistently mentioned in the community survey was an overall concern of overgrown and un-managed vegetation on vacant lots owned by absentee landowners. Location of these lots and taking action to get them cleaned up is of great importance to many local community members.

4.14 Reducing Hazardous Fuels

Projects aimed at reducing fuels and creating community fuel breaks are described in section 4.3 of this CWPP. Several communities such as Logtown, Grizzly Flats, Auburn Lake Trails and others have been aggressive about seeking funding and implementing fuel treatments to reduce risk in their communities. One of the goals of this CWPP is to increase awareness among communities that have not been as active in this regard and to encourage increased efforts to reduce hazardous fuels.

4.15 Public Education and Fire Prevention Measures

Public education on wildfire risk and prevention is carried out in El Dorado County by the Fire Safe Councils, Fire Districts and Departments, Office of Emergency Services, Resource Conservation Districts, University of California Cooperative Extension, U.S. Forest Service, and CAL FIRE. There is an abundance of information on wildfire risk and prevention, though it can be difficult to filter and distribute it to the public in a way that encourages them to use on their property. A list of resources is available in Appendix 8; some of them include:

- EL Dorado County Fire Safe Council <http://www.edcfiresafe.org/>
- Community fact sheets for fire prevention (http://calfire.ca.gov/communications/communications_factsheets)
- Child-focused activities (http://calfire.ca.gov/communications/communications_justforkids)
- PreventWildfireCA.org
- Firewise communities (<http://www.firewise.org/usa/index.htm>)
- California Wildland Coordinating Group (preventwildfireca.org)
- Other publications, webinars, and fact sheets (<http://ucanr.edu/sites/forestry/Wildfire/>)

There are several events at which wildfire awareness and prevention are showcased. These include the National Fire Prevention Week held annually in October (<http://www.nfpa.org/fpw>), Firewise workshops, and Community Wildfire Preparedness Day usually held in May.

One relatively new program is Ready, Set, Go! (<http://www.readyforwildfire.org/>) managed by the International Association of Fire Chiefs, which was launched in 2011. In this program, being “ready” means doing as much as possible to reduce risk on your property. Getting “set” for

evacuation during a fire means preparing emergency items and staying in touch with local media. “Going” when there is a fire means following your personal plan, which may include evacuation, sheltering in place, and/or other actions.

There are Firewise communities in El Dorado County that have met the standards of the program for being relatively aware of fire risk.

Preventing fire starts is an important mitigation strategy that is applied at the community scale. Since 1980, CAL FIRE's "volunteers in prevention" program has engaged many people in making classroom presentations, disseminating information on preventative measures to the public, and developing procedures for reducing ignitions in areas where they have been historically common. During periods of high to extreme fire danger, signs may be used to inform people of the danger. There may also be bans on open burning and adjustments in fire agency personnel schedules. There are many instances where extensive wildfires have been caused by accidental ignitions due to campfires or trash burning during prohibited weather conditions.

As previously noted, there is no lack of information available on reducing community risk of wildfire. The greater issue is whether this information is reaching potentially affected community members in meaningful ways that catalyze action for readiness. Recommended ways to effectively engage the public in the educational process include workshops, media campaigns, informational booths at local fairs and events, and person-to-person dialogue. Effective information transfer is a critical challenge and experience shows that a "one size fits all" approach doesn't work. Seizing opportunities when they arise demands skill and attentiveness on the part of service providers.

For mitigation strategies such as improving emergency access and roads generally, improving water supply, enforcing regulations, and implementing fuel treatments there must be concerted and sometimes costly efforts spearheaded by local agencies and entities such as the county Fire Safe Council. Public education can play a role in rallying support for projects that reduce risk. Ultimately, prioritization of projects will be constrained by the availability of funding and/or assistance programs that can provide financial support.

4.2 Fire Risk Mitigation Strategies for Individual Property Owners

There are three general classes of property in El Dorado County: land that is developed with residential, commercial, or industrial uses; agricultural land (e.g., crop fields, pasture, vineyards); and undeveloped land. The focus of this CWPP is on protecting and defending developed land and infrastructure from wildfire and facilitating safe evacuation of residents through identified community ingress and egress routes. It should be acknowledged, however that unmanaged undeveloped land can contribute very significantly to community risk. The options for reducing fuel on public lands will not be addressed in this document but is being considered through other planning processes.

Confining the discussion to developed land, there are numerous factors affecting risk of ignition and losses during a wildfire. These include lot size, density and set-backs between buildings, the age of the structure and building materials, and defensible space. Some of these factors are

unalterable, at least until a fire occurs. Therefore, the focus of mitigation strategies is on those things that an individual property owner can do to reduce risk. These include:

- Implementing defensible space measures
- Providing adequate access for emergency vehicles
- Providing signage to identify the property
- Ensuring that structures are compliant with current building codes for structures in the WUI

4.21 Implementing Defensible Space

For developed properties, defensible space is the single most important strategy that an individual property owner can implement to reduce risk. In addition to county regulations, the State Board of Forestry has published general guidelines for defensible space (http://bofdata.fire.ca.gov/PDF/copyof4291finalguidelines9_29_06.pdf).

These guidelines address important topics such as the need for greater defensible space based on local conditions, the primary goals of defensible space, which are to reduce the chance of structural ignition and provide a safe environment for firefighters, and admonishments against excessive clearing of vegetation.

Effective defensible space consists of three components: an essentially fuel-free zone adjacent to the home, a treated secondary zone that is thinned and cleaned of surface fuels, and-if the parcel is large enough- a transitional third zone that is basically a managed forest area. These components are designed to work together in a proven and predictable manner. Zone 1 keeps fire from burning directly to the home; Zone 2 reduces the adjacent fire intensity and the likelihood of torching, crown fire, and ember production; and Zone 3 does the same at a broader scale, keeping the fire intensity lower by maintaining a more natural, historic condition.

Defensible space has important implications not only for personal and property safety, but also for insurance coverage. Property owners in fire-prone areas, and specifically homeowners in the Wildland-Urban Interface, face potential issues with obtaining and maintaining insurance coverage. Policies may be issued, denied or denied renewal based on inspections to determine effectiveness of defensible space, property hygiene, access, structural maintenance, and other factors. The consequences of being uninsured or underinsured provide a strong incentive for property owners to implement defensible space.

The El Dorado County Fire Safe Council currently has the following, ongoing programs to encourage and help residents create defensible space: (<http://www.edcfiresafe.org/>)

- Chipper Program
 - The EDCFSC has a program to provide chipping services for neighborhoods and individual homeowners on the west slope of El Dorado County who are willing to work to make their property fire safe. This program is available depending on current funding levels-please check the EDFSC website for current status (<http://www.edcfiresafe.org/>)
- Community green waste dumpster program

- Senior and disabled assistance

4.22 Providing Adequate Access for Emergency Vehicles

Emergency access to developed properties requires specified standards of road width, clearance, curvature, and grade. Although these standards are generally applied to new developments, existing roads in rural areas and even portions of developed towns in El Dorado County do not meet these standards. As with community ingress and egress routes, inadequate roads can create bottlenecks to emergency responders that can lead to delays in fire response, delayed evacuation, and potentially to losses of human life and property. Individual property owners can take steps to improve access to their properties by clearing roadside vegetation, maintaining surfacing, and if feasible, adjusting width and curvature. In cases where groups of homes or neighborhoods are served by inadequate emergency access, a coordinated effort is required. This may require seeking additional grant funding or forming a community road association that levies an assessment on individual properties for the purposes of improving and maintaining roads where funding is not immediately available.

4.23 Providing Signage to Identify Properties

Using signs to properly identify a property can be the difference between saving and losing a home during a wildfire. There are existing El Dorado county ordinances for address signs and homeowners are responsible for purchasing and installing signage in accordance with the county ordinance. Signs may also be used to advise residents and others about current risk of wildfire, road conditions, and distances to emergency response stations. In the latter case, local agencies and law enforcement may bear the responsibility for signage. The specific sign ordinance language is included below:

1274.09. Size of Letters, Numbers and Symbols for Addresses

Size of letters, numbers and symbols for addresses shall be a minimum 3 inch letter height, 3/8 inch stroke, reflectorized, contrasting with the background color of the sign.

15.04.040 -Assignment of house numbers.

C. The numbers shall be of a size not less than four inches in height, except on mailboxes, in which case the numbers shall be of a size which are readable from a distance of five feet, and displayed on a contrasting background.

D. Within thirty days of the effective date of the notice of number assigned, the owner of a dwelling unit or authorized agent then shall remove or obscure from public view any old or previous number not in accordance with the system.

1274.10. Installation, Location and Visibility of Addresses

(a) All buildings shall have a permanently posted address, which shall be placed at each driveway entrance and visible from both directions of travel along the road. In all cases, the

address shall be posted at the beginning of construction and shall be maintained thereafter, and the address shall be visible and legible from the road on which the address is located.

(b) Address signs along one-way roads shall be visible from both the intended direction of travel and the opposite direction.

B. All such numbers shall be placed in a horizontal sequence so as to be easily visible and legible from the road upon which the premises front. When the house is a substantial distance from a road, numbers shall be placed on a mailbox or post in a horizontal sequence, in a location adjacent to the driveway access intersection with the road. When the mailbox is on a road other than the road on which it fronts, then the house and road name shall be clearly marked on the mailbox, to ensure proper mail delivery, and a post displaying the house number shall be installed adjacent to the driveway access intersection with the road

4.24 Complying with Current Building Codes

Researchers have generally agreed that the potential for a structure to ignite during a wildfire is largely dependent on the building design and materials, flammability within 100 feet of the structure, and the susceptibility to ignition by firebrands (Reinhardt et al. 2008). The amendments to the Building Code implemented in 2008 require specific standards intended to improve the resistance of a building to ignition from either direct flame contact or airborne embers. These measures may determine whether or not a structure survives a fire when the number of structures at risk exceeds suppression capabilities. Risk, therefore, depends on whether or not structures meet current codes.

New developments within the WUI must meet the current building code standards. Retrofitting existing structures to improve their resistance to wildfire would include:

- Replacing exterior windows and skylights with tempered glass
- Replacing vents with vents approved for use in the WUI
- Replacing combustible roofs with non-combustible, fire-resistant roofing
- Treating wood with fire-retardant chemicals
- Replacing combustible siding with non-combustible siding

All of the mitigation strategies recommended for individual properties require an awareness on the part of the property owner that he or she needs to take steps to reduce risk; knowledge of the strategies that may be applied; commitment of time and money to implement the strategies; and in the case of defensible space, commitment to maintain the desired condition. For all of these, effective public education and engagement play an important role. The county and local Fire Safe Councils can provide that service as well as other assistance such as methods for disposing of green waste. In the case of upgrading structures to conform to current code, consideration can be given to seeking assistance through the Department of Housing and Urban Development for communities at risk (http://portal.hud.gov/hudportal/HUD?src=/topics/home_improvements).

4.3 Regional and County Wide Treatment Strategies

4.31 *Fuel Treatment Delineation*

Fuel treatment locations were derived from several sources. These included local fire management personnel and experts, local Fire Safe Councils, community-recommended treatments (via the on-line survey), existing fuel reduction projects, and other fire hazard reduction plans or programs (as available). Fuel reduction projects are summarized by name, treatment type, acreage, priority, and source for individual communities in Chapter 5.

4.32 *Fuel Treatment Prioritization*

There are potentially thousands of acres within the WUI on private lands that may be treated. A central goal of the CWPP is to help the El Dorado County and local Fire Safe Councils prioritize individual projects within the full spectrum of potential treatments over a 5-year period. Based on community survey results, collaborator input, and the fire risk, a prioritization approach for high priority (beginning implementation within 1-3 years), moderate priority (beginning implementation within 1-3 years), and lower priority (projects to begin in 5-10 years) are listed in table 10.

Table 10. Prioritization approach for fuel reduction projects

Rank of Importance Based on Community Surveys and Modeling Data (1= Highest Importance)	Highest Priority (Begin Implementation within 3 Years of CWPP Completion)	Moderate Priority (Begin Implementation within 3-5 Years of CWPP Completion)	Lowest Priority (Begin Implementation within 5-10 Years of CWPP Completion)
1)	The project creates or enhances ingress and egress routes along <u>secondary, subdivision, or community roads</u> , for residents to more safely access main highway networks such as Highway 49, Highway 50, Highway 193	The project protects Agricultural Use Water Distribution Ditches, Flumes, and Pipelines	The project protects Cemeteries
2)	The project provides direct protection for private residences	The project protects Places of Worship (Including accessory buildings and infrastructure)	The project protects Threatened and Endangered Wildlife Habitat
1)	The project creates or enhances fuel treatment networks along major roads and highways	The project protects other Community or Public Buildings (e.g. Fire Stations, Post Offices, Community Centers)	
4)	The project creates or enhances protection of power production and transmission infrastructure	The project protects Private Businesses	
5)	The project creates or enhances protection of Communication Infrastructure	The project protects Parks	
6)	The project reduces fire threat from Vacant (undeveloped) Parcels	The project protects Airports and/or Heliports	

Rank of Importance Based on Community Surveys and Modeling Data (1= Highest Importance)	Highest Priority (Begin Implementation within 3 Years of CWPP Completion)	Moderate Priority (Begin Implementation within 3-5 Years of CWPP Completion)	Lowest Priority (Begin Implementation within 5-10 Years of CWPP Completion)
7)	The project creates or enhances protection of Domestic Use Water Distribution Ditches, Flumes, and Pipelines		
8)	The project creates or enhances protection of Hospitals		
9)	The project creates or enhances protection of Watershed Lands Associated with Local Reservoirs		
10)	The project creates or enhances protection of Reservoirs and Associated Infrastructure		
11)	The project creates or enhances protection of Schools		

4.33 Fuel Treatment Types

Fuel treatments that may be implemented under this CWPP include mechanical whole tree harvest; underburning (“prescribed burning”); chainsaw cutting and piling for burning, chipping, and mastication; hand pile and burning; and mastication. Due to local and regional air quality issues, methods of slash disposal that do not result in open burning are encouraged. These disposal methods can include, but are not limited to, the use of woody material in efficient biomass electricity plants, heating facilities and/or boilers, chipping, composting, or mulching as local infrastructure and demand allows. Once completed, these fuel treatments can give fire managers “...a higher probability of successfully attacking a fire” (Agee et. al., 2005). A general description of fuel treatments are provided below.

Mechanical Harvest: Whole-tree yarding (transport to a lumber yard) is typically used for fuel treatments. Under a whole-tree yarding harvest system, individual trees are directionally felled using a mechanical cutting head attached to a tractor or similar unit. Smaller trees (less than 10 inches DBH) are cut, gathered in bunches, and left as “doodles” in the harvest unit; these smaller trees are not typically bucked or limbed within the unit. A rubber tired, track laying, or similar

machine is then used to yard these doodles to the landing. At the landing, trees are limbed and bucked to specified lengths. Bucked log sections are loaded onto a log truck and transported to the mill; limbs are typically either chipped and hauled away to a cogeneration (power) plant or burned at the landing. Treatment of residual slash (after whole-tree yarding) created during harvests is then disposed of where it exceeds desired levels. Slash may further be treated using underburning, pile burning, chipping, mulching, disposal at biomass facility, or other appropriate method.

Mastication: Mastication is implemented using a mastication head attached to an excavator (photo 1), small tractor, or other type of machine (Coulter et al. 2002). The mastication head is used to chip or shred ladder fuels from brush and small trees (up to ~9 inches DBH) in place. Shredded material is either incorporated into the duff layer during operations, left on site, or reduced using a prescribed burn following post-treatment evaluation. Mastication is typically implemented in areas of high brush cover or that need ladder fuel treatment where biomass removal is not feasible. An example of a mastication project pre- and post-treatment are shown in photos 1-3

Photo 1. A rotary masticator chipping small trees and shrubs on the Grizzly Flat Fuel Reduction Project



Photo 2 (top) and 3 (bottom). Before and after mastication treatment on the Grizzly Flat Fuel Reduction Project



Chipping: As an alternative to mastication, vegetative material may be chipped on site with the chips left as mulch or potentially hauled away. Chipping can be done using several types of machines that are both hand- or machine-fed.

Underburning: Underburning involves the use of intentionally lit fires used to burn surface and small ladder fuels within a designated unit under an approved burn and smoke management plan. Underburning may occur in conjunction with other mechanical treatments or as a stand-alone treatment where fuels, access, and topography allow.

Hand-thinning: Hand-thinning is typically used on trees up to 9" in diameter but most effective for trees up to 6" in diameter or shrubs. The treatment is completed by an individual or teams using chainsaws, with cut material either chipped, hauled, or piled and burned.