CAL FIRE FUEL BREAKS AND USE DURING FIRE SUPPRESSION

Fuel Break Design, Construction, Environmental Protection and Case Studies in Community Protection

Abstract

This document explains common fuel break design, construction, and protection standards and contains historical case studies examining the use of vegetation treatments to help mitigate the impacts of wildfires. They document and discuss the utilization of pre-planning and community involvement, as well as, wildland firefighting strategies and their impacts. The purpose of these case studies is to offer a look at the practical application of vegetation treatments and community planning efforts supported by CAL FIRE.

CAL FIRE

March 21, 2019

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Fuel Break Design, Construction, and Environmental Protection

A fuel break is generally wide strip of land on which vegetation has been modified so that a fire burning into it can be more readily controlled. Fuel breaks are not designed to stop fire spread, especially during periods of strong winds when fire brands can be blown across these linear features. However, fuel breaks do provide opportunities for firefighting success under less extreme fire weather conditions by providing areas of lower fireline intensities, improved firefighter access, and enhanced fireline production rates. The concept of a fuel break is simple, by providing areas of reduced fuel loading; reduced fire intensity can be created. In addition to reducing fire intensity, fuel breaks increase fireline construction rates, reduce the fire-retardant coverage level required to effectively coat vegetation, and provide for points of access and travel for ground-based firefighters. The lighter fuels, often grasses, associated with fuel breaks, also provide opportunities for indirect fireline construction through backfire or burn-out operations to consume fuel ahead of the spread of the fire.

CAL FIRE commonly designs and constructs fuel breaks in a variety of vegetation types throughout the State. There are multiple objectives that a fuel break can achieve including creating strategic control points to allow firefighters to safely engage a wildfire, improving opportunities to control wildfire in the initial attack phase, and improving opportunity to control a wildfire prior to it reaching homes or other assets at risk. In addition, certain fuel breaks can act as part of a community fuel break system to protect the community, wildlife, and other watershed values. Fuel breaks can also be used to improve ingress and egress routes along existing roads and driveways, allowing for safe civilian evacuations and emergency responder access. Despite considerable variability in fuel types there are common design, construction, and environmental protection standards that CAL FIRE considers for all fuel breaks:

Fuel Break Design

- **Fuel Break Description**: Staff must identify the purpose for protection and provide a brief explanation of what is being protected, why it is being protected, and where the protection is specifically needed.

- **Fuel Break Width and Length**: The fuel break width and length must be sufficient to reduce fire spread and intensity. Width on level ground will vary based on fuel types; i.e., short widths are generally required in grasses (approx. 150 feet) and longer widths are required on forested sites (approx. 300 feet). Variation in width is largely determined by vegetation type, slope, access, and other site specific needs and objectives. Fuel break length will generally be designed to match the length of the ignition source to the extent feasible, such as along a road or highway.

- **Fuel Break Connectivity**: Fuel breaks are designed to connect with natural or artificial fire barriers such as large rock outcrops, wet meadows, roads, or areas with low fuel

loads or flammability. When possible, fuel breaks favor locations that are linked to road systems to facilitate firefighting access.

Fuel Break Construction

- **Standard Fuel Treatments**: To diminish the risk and/or rate of fire spread across the fuel break, specific techniques are used suitable to the material being treated (e.g., mowing, prescribed grazing, pruning, vegetation removal, chipping, prescribed burning, and masticating). Treatments focus on dead, diseased, and dying trees before any healthy trees are removed. When healthy trees are removed, the focus is on smaller diameter trees and trees that will help prevent fire from spreading from the forest floor into the tree canopy. Large diameter trees with unique structural features will be retained to support and promote wildlife species and habitat.

- **Dead Vegetation**: Generally, all downed dead trees and shrubs are removed if they are solid (not rotten) and are not yet embedded into the ground. Downed trees that are embedded into soil and which cannot be removed without soil disturbance are left in place. Chipping and masticating of dead material is often used as an alternative to removal.

- **Fuel Break Aesthetics**: When possible, fuel breaks are blended into the surrounding environment. This is accomplished by feathering the edges of the fuel break into the adjacent protected areas for aesthetic purposes.

- **Equipment Use**: Soils, site factors, and timing of application must be suitable for any ground-based equipment utilized for creating a fuel break to avoid excessive compaction, rutting, or damage to the soil surface layer. Equipment is used on the contour where feasible. For safety purposes and to protect site resources, treatment methods involving equipment are generally not applied on slopes exceeding 50 percent.

- **Maintenance**: Future regrowth of natural or planted vegetation is often controlled by pruning, mowing, or other techniques to maintain the specified reduced fuel load. Maintenance activities are generally less costly and time consuming than initial treatment activities.

Environmental Protection

CAL FIRE has a suite of comprehensive and robust natural resource and environmental protection programs. CAL FIRE employs various resource professionals including Registered Professional Foresters, Environmental Scientists, Archeologists, Hydrologists, Soil Scientists, Fire Scientists, and various other experts in natural resource protection. CAL FIRE uses the totality of its resource professionals to ensure environmental protection for any project it undertakes, including fuel breaks. To ensure environmental protection when designing and constructing fuel breaks, CAL FIRE utilizes the standard protection practice of identifying and avoiding sensitive resources. There is a great deal of flexibility in fuel break design and adjusting a fuel break location or time of construction is often all that is needed to avoid sensitive resources.

California's Forest Practice Act and Rules (Act and Rules) apply to all commercial timber operations (i.e., the cutting/removal of timber or other solid wood forest products from timberland for commercial purposes, PRC § 4527). The Act and Rules provide a variety of best management practices and protection measures designed to provide resource protection when conducting commercial timber operations. Although CAL FIRE's fuel break construction activities largely do not involve commercial activities and are not subject to the Act and Rules, several standard best management practices are commonly employed during fuel break construction. The following represent standard protection measures often used when constructing fuel breaks:

- Tractor or heavy equipment operations should not be conducted on slopes greater than 50%.
- Tractor or heavy equipment operations should not be conducted on known slides or unstable areas.

Watercourse and Lake Protection Zone (WLPZ) means a strip of land, along both sides of a watercourse or around the circumference of a lake or spring, where additional practices should be undertaken for protection of the quality and beneficial uses of water, fish, and riparian wildlife habitat, other forest resources, and for controlling erosion. The following table may be used to identify the standard width of a WLPZ:

Procedures for Determining Watercourse and Lake Protection Zone Widths				
Water Class Characteristics or Key Indicator Beneficial Use	Class I 1) Domestic supplies, including springs, on site and/or within 100 feet downstream of the operations area and/or 2) Fish always or seasonally present onsite, includes habitat to sustain fish migration and spawning.	Class II 1) Fish always or seasonally present offsite within 1000 feet downstream and/or 2) Aquatic habitat for nonfish aquatic species. 3) Excludes Class III waters that are tributary to Class I waters.	Class III No aquatic life present, watercourse showing evidence of being capable of sediment transport to Class I and II waters under normal high water flow conditions after completion of tree operations.	Class IV Man-made watercourses, usually downstream, established domestic, agricultural, hydroelectric supply or other beneficial use.
Protection Width	150 feet	100 feet	50 feet	50 feet

- Fuel break construction within the standard width of a watercourse or lake protection zone should be designed to avoid impacts to riparian and aquatic function, and shall comply with any required Lake and Streambed Alteration Agreement. Dead or dying trees within a WLPZ should be marked by, or under the supervision of, a Registered Professional Forester prior to tree removal operations. Removal of vegetation within a WLPZ should be limited to situations where it is necessary to create and maintain fuel

break function and effectiveness. A CAL FIRE Registered Professional Forester or designee will determine the necessity for removal of vegetation from within a WLPZ.

- Known sites of rare, threatened, or endangered plants or animals shall not be disturbed, threatened, or damaged during the construction of a fuel break. Information on some of these sites may be available from the California Department of Fish and Wildlife's Natural Diversity Database. CAL FIRE queries this database during project scoping and will also have a Registered Professional Foresters or designee onsite sufficiently during operations to evaluate the presence of biological resources and ensure biological resource protection through avoidance.
- Fuel break construction shall avoid damaging or otherwise disturbing significant archaeological or historical sites. Information on some of these sites may be available from the Information Centers of the California Historical Resources Information System within the California Department of Parks and Recreation. CAL FIRE queries this system during project scoping and will also have a Registered Professional Foresters or designee onsite sufficiently during operations to evaluate the presence of cultural resources and ensure cultural resource protection through avoidance.

Prescribed Fire Practices and Protection Measures-CAL FIRE uses a variety of standard practices and protections measure to develop and implement prescribed fire projects. The following represent commonly used prescribed fire practices and protection measures:

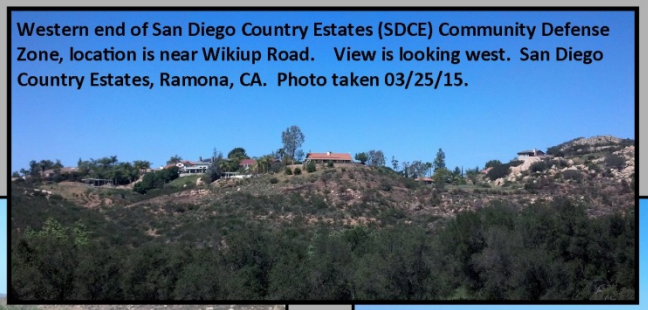
- Burn Plan Development: A burn plan is developed that includes a fire behavior model output of First Order Fire Effects Model (FOFEM) and BEHAVE or other fire behavior modeling simulation that predicts fire behavior, calculates consumption of fuels, tree mortality, predicted emissions, GHG emissions, and soil heating. The results of the analysis are included with the burn plan. The burn plan is created with input from the appropriate local CAL FIRE Unit personnel.

- Burn Prescription: The prescribed fire burn prescription is designed to initiate a surface fire of sufficient intensity that will only consume surface and ladder fuels while protecting soil resources from direct soil heating impacts.

- Standard Public Notifications: Approximately two weeks prior to the commencement of prescribed burning operations, the project coordinator will: 1) post signs along the closest major road way to the area describing the activity, timing, and requesting for smoke sensitive persons in the area to contact the project coordinator; 2) publish a public interest notification in a local newspapers or other widely distributed media source describing the activity, timing, and requesting for smoke sensitive persons in the area to contact the local CAL FIRE Unit; 3) send the local county supervisor a notification letter describing the activity, its necessity, timing, and summarize the

measures being taken to protect the environment and prevent escape; and 4) develop a list of smoke sensitive persons in the area and contact them prior to burning.

FUEL BREAK EXAMPLE #1-Standard CAL FIRE Community Fuel Break



Western end of San Diego Country Estates (SDCE) Community Defense Zone, location is near Wikiup Road. View is looking west. San Diego Country Estates, Ramona, CA. Photo taken 03/25/15.

Before:
Eastern end of San Diego Country Estates (SDCE) Community Defense Zone. USFS Cleveland National Forest's San Vicente Community Defense Zone parallels (as shown on right side of photo) a portion of SDCE Community Defense Zone. View is looking west. San Diego Country Estates, Ramona, CA. Photo taken 07/31/14.

After:
Eastern end of San Diego Country Estates (SDCE) Community Defense Zone. USFS Cleveland National Forest's San Vicente Community Defense Zone parallels (as shown on right side of photo) a portion of SDCE Community Defense Zone. View is looking west. San Diego Country Estates, Ramona, CA. Photo taken 03/25/15.

San Diego Country Estates Fuel Break

The purpose of this project was to provide enhanced defensible space to homes and properties along the northern perimeter of the San Diego Country Estates (SDCE), located in the San Vicente Valley, six miles southeast of the unincorporated community of Ramona in San Diego County. The intent of this project was to reduce a potential fire's intensity, and decrease the threat of fire originating from the adjacent urban area. Requiring a collaborative approach due to the array of property ownerships the fuel break would be constructed on, the project incorporated lands owned by the Bureau of Land Management (BLM), San Diego Country Estates Association, and private landowners. Width of the proposed zone varied from 150 feet to 400 feet wide and is approximately six miles in length. The average width of the of the defense zone is approximately 200 feet wide, and increases to 400 feet wide for a distance of approximately 1,500 feet at the eastern boundary where it parallels the Cleveland National Forest's San Vicente/Barona Mesa Community Defense Zone.

FUEL BREAK EXAMPLE #2-Standard CAL FIRE Community Fuel Break

Example of a WUI project:

This project area consists of oak woodlands, low elevation pockets of Ponderosa Pine, and chaparral vegetation with a large number of homes scattered throughout. The Auburn Lake Trails subdivision is situated on a plateau that rests along the south rim of the American River Canyon over the location that was to be a lake created by the Auburn Dam. This subdivision was planned to be a lake side development. At this time, the Auburn Dam project is likely to never be completed, and even if it were, vegetation treatment would still be necessary due to the ignition potential posed by lake side access by recreational users.

The areas directly below the subdivision are covered with heavy vegetation on slopes that are extremely steep. To complicate things, the area is a State Recreation Area with heavy use by river rafting enthusiasts, hikers, bikers, and horse back riders. The ignition potential below the subdivision is extreme as evidenced by the approximately 600 acre Mammoth Bar fire of July 16, 2009. The area has been identified by the local CAL FIRE Battalion Chief as a high priority for fuels management in the Unit Fire Plan.

A primary goal of this project is to maintain and continue to create a Shaded Fuel Break on private and publicly owned lands along the rim of the American River Canyon along topographic features that will allow fire suppression operations to safely occur in the event of wildfire. The Bureau of Reclamation, California Department of Parks and Recreation, and the California Department of Forestry and Fire Protection (CAL FIRE) will be cooperating on the development of this project. CAL FIRE is preparing this VMP to address CEQA on the privately owned lands that will be included in this project. Those lands that are managed or owned by other agencies will be covered by that agencies respective environmental planning process.

A minimum 300' wide shaded fuel break will be maintained and constructed along the edge of the subdivision, utilizing topography as the primary criteria for determining the final location of the fuel break. CAL FIRE inmate crews will be utilized from the Growlersburg Camp to complete the work. Fuel break maintenance and construction will be done by hand and any resulting material will be pile burned or chipped on site by the hand crew.

The Objectives of this WUI project:

1. To reduce wildfire hazard.
2. Maintain & construct a perimeter shaded fuel break on private lands at a location that will provide the maximum safety and benefit to fire suppression operations in the event of wildland fire.
3. Protect residential structures from the wildland fire threat that exists in the area.

CASE STUDY– Community Pre-planning

Firewise Community in San Luis Obispo 2010-2013

Before Treatment

After Treatment

2010

In 2010, CAL FIRE began discussions with the Oak Shores Community Association (OSCA) General Manager about the hazardous fuel situation in and around the community. After assessing the situation, it was agreed that OSCA should apply to become a Fire Safe Council Focus Group in order to use San Luis Obispo County Community Fire Safe Council (FSCSLO) resources to help implement a fuel management program in cooperation with CAL FIRE. In early 2011 OSCA was accepted as a Focus Group in accordance with Fire Safe Council policies. OSCA immediately began working with CAL FIRE to establish priorities for the Hazardous Fuel Reduction Program, which was then successfully incorporated into the annual FSC Clearinghouse Grants process. 140 acres consisting primarily of OSCA open space parcels and the 2 ½ mile entry road (Oak Shores Drive) were identified as high risk areas in need of fuel removal or reduction.

In 2011, the OSCA Focus Group, through the efforts of the Fire Safe Council, received a grant to begin fuel modification work adjacent to the 2 ½ mile main entry road and within a 16 acre portion of the main drainage that divides the community into two areas. The work was performed by CAL FIRE Hand Crews from Cuesta Camp in San Luis Obispo. This initial phase of the project lasted 9 months.

In 2012, the OSCA Focus Group received additional funding to continue the second phase of the fuel reduction program priorities outlined in 2011. This work was also was done by CAL FIRE Hand Crews from Cuesta Camp. The methods used consisted of cutting/chipping and cutting/piling/burning. Concurrently, OSCA also started a yard waste disposal program allowing owners to bring their trimmings and debris to a common location with the intent of creating a burn pile. This effort was so successful and so much material accumulated that chipping was used to reduce the size of the pile while waiting for fire season to end.

In 2013, additional funding was awarded to complete the third phase of the projects outlined in 2011. As of January 2014, fuel treatment on 120 of the 140 acres identified by CAL FIRE as high fire hazard areas has been completed. This work was done on OSCA property and on adjacent property outside of the community. The support of CAL FIRE with the Cuesta Camp Crews and the financial support from the Fire Safe Council have allowed the Community to be able to continue with follow-up maintenance of this area now and into the future.

CAL FIRE PRE-ATTACK PLANNING

CASE STUDY– Pre-Attack Planning

The benefits of Pre-Attack Planning

July 16, 2012

On July 16, 2012 a wildfire started around 11:35 am at the intersection of Highway 58 and Pozo Road, 5-8 miles east of the town of Santa Margarita. The CAL FIRE San Luis Obispo Unit dispatched a full wildland fire response to the incident. The fire, which was burning in very rough terrain making access difficult for firefighters, eventually grew to 640 acres. Evacuations took place along Parkhill Road between Highway 58 and Seven Oaks Road. During the fire, the Parkhill Area pre-attack plan (developed by the San Luis Obispo County Fire Department, GIS Department) was used to efficiently deploy resources around the fire.

According to the Incident Commander, Battalion Chief Phil Veneris, the pre-attack plan allowed for everyone involved to be looking at the same operating plan. The pre-attack plan allowed firefighters to easily locate safety zones, staging areas, water sources, proposed dozer lines, hazards, and other important features. Additionally, all of the residences in the area had been checked and verified prior to the fire during the creation of the pre-attack plan allowing for a timely evacuation. The pre-attack plan enabled the IC to focus firefighting efforts in areas where control lines could easily and safely be held. Lastly, the ICS symbology of the maps allowed everyone to easily read and locate points of interest on the maps.

For firefighters stationed in the area, everyone had seen and gone over the pre-attack map, as well as having double-checked to ensure the map was correct. This allowed for faster deployment when the fire did start and created a safer operating area. Not only was the pre-attack plan useful in the fire, it has also been useful in search and rescue operations and vegetation management plans. The pre-attack plan has also been given to other agencies that are stationed in the area, in order for them to learn the best points around the area for holding a fire.

WHITTIER FIRE, 2017

Two past burned areas played a significant role in the suppression strategy of the Whittier Fire by allowing incident management to focus resources on other areas of the fire.

The Whittier Fire was ignited on July 8, 2017 along Highway 154 in Santa Barbara Co. and burned unto land managed by the Los Padres National Forest. The ignition occurred in an area that had not seen significant fire activity in over 60 years.

During this initial fire run the fire hit the Gap Fire scar (2008) which became the southeast corner of the fire. When the fire hit this fire scar it lost most of its energy and for the most part stopped all forward fire spread to the southeast. What active fire remain in this area was either extinguished or kept in check with aircraft. It should be noted that much of this area never had ground crews take direct suppression action on it and was placed in a monitor status.

The fuels in the Gap Fire scar are discontinuous.

Several days the later the Whittier Fire made another significant run this time towards the southwest corner. Again, a previous burned area played a significant role in the suppression strategy. This time it was the Sherpa Fire (2016). Off shore winds began pushing the fire towards the southwest on the morning of July 14. Fire intensity grew to the point that crews working in this division were pulled back from the line before noon. The Division Supervisor wanted to begin a firing operation however, the Operations Chief and Fire Behavior Analyst were overhead and made the decision to let the fire burn to the primary containment line which was the Sherpa Fire.

Once the fire hit the burned area again it lost most of its energy and most of the forward fire progression stopped. There were only few small spot fires in the in the past burned area and they were easily picked up by ground resources. The largest was less than a half acre in size. Full containment on this area of the fire was achieved by just two hand crews cold trailing the fires edge in less than two days.

The mix of fuel age classes on these two areas of the fire provided opportunities to the incident management team to focus firefighting efforts and resources to those areas of the fire that proved to be more resistant to control. It was not beyond possibility that if these two burn areas had not been there that the Whittier Fire could have matched the size of the 1955 Refugio Fire.

The fuels in this one year old burn area are sparse.

NYE FIRE, 2016

Highway 162 Fuel Break Success Story
Nye Fire - June 3, 2016

The Highway 162 Fuel Break was tested during a road side fire that was started on Friday June 3, 2016. The success of establishing this fuel break is made crystal clear when one views the photos. They say a picture is worth a thousand words.

Figure 1 Hwy 162 fuelbreak looking east - fuelbreak is located adjacent to the fenceline

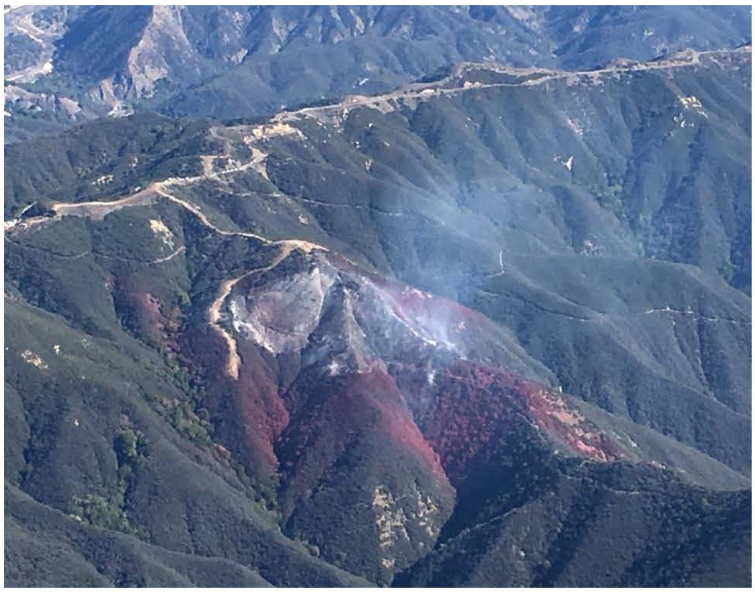
The fourteen mile Hwy 162 fuel break was partially constructed in 2015 within the CAL TRANS ROW on the north and south sides of this highway between Willows and the community of Elk Creek. The Glenn Co. RCD received a grant from the CAL FIRE SRA FIRE PREVENTION FUND PROGRAM to oversee the construction of this fuel break. CAL FIRE conservation camp crews were employed to complete the construction.

Fuel breaks such as this one aid fire suppression resources responding to roadside fires by slowing the forward motion and intensity to allow sufficient time for resources to respond and provide initial attack. This has proven to prevent wildfires from becoming established in the wildlands adjacent to the highway thus providing protection to the many residences located adjacent to the highway In addition, providing protection to transmission lines, and highway 162, itself a critical infrastructure providing an evacuation route for Elk Creek residents and rural landowners.

Figure 2 Spot of grass adjacent to the road ignited and was slowed when it hit the fuelbreak.

The Gibraltar Fire and East Camino Cielo Fuel Break Effectiveness

The Gibraltar fire as seen from a Montecito beach just before sunrise.



The East Camino Cielo Fuel break along the ridgeline just above the final perimeter of the Gibraltar Fire.

The Gibraltar Fire was reported at approximately 5:15 am on Thursday, October 29, 2015. The fire was located directly below the East Camino Cielo road above the community of Montecito in Santa Barbara County, California. The fire was burning in an area with a Mediterranean climate and in a chaparral ecosystem considered to be one of the most fire hazardous landscapes in North America (Schroeder et al, 1964). This fact has been proven with the numerous catastrophic wildfires which have occurred along the Santa Barbara front country over the years. These fires include the 2009-Jesusita (78 homes lost), 2008-Tea (210 homes lost), 1990-Paint (585 homes lost), 1971-Romero (4 Firefighter fatalities), and the 1964-Coyote (1 Firefighter fatality). All of these fires have burned under a local weather phenomenon called a "Sundowner" wind, which occurs when the pressure gradient is perpendicular to the axis of the Santa Ynez Mountains. This event causes strong, dry air and consequently fire to be pushed from the mountains down towards the communities below. A similar weather pattern was in place during the Gibraltar wildfire. The closest Remote Area Weather Station logged wind gusts of 44 mph out of the north/northeast and a relative humidity of 24% at 05:47 the morning the fire started.

The East Camino fuel break has been in existence since the 1960's and was last treated in 2009 during the Jesusita Fire. The fuel break is a portion of the larger Camino Cielo Defensible Fuel Profile Zone project. This last year, the US Forest Service completed a "Strategic Fuel Break Assessment" for the Los Padres National Forest where 166 identified fuel breaks on the forest were analyzed. The East Camino fuel break received the #1 ranking for the prioritization of maintenance treatments. The purpose of maintaining the fuel break as described in the project proposal documents are to: reduce the wildfire severity in treated areas; create zones where fire suppression efforts can be conducted safely and effectively; break up the continuity of fuels over the landscape; and become anchor lines for further area-wide treatments.

The Gibraltar fire is an example of how strategic hazard reduction projects have direct results on the safety and effectiveness of fire suppression efforts. Even with the extreme weather conditions, the critically dry chaparral fuels (the fuel moisture reading for the area was 61%), and the age-class of the fuels (the area last burned in the 1964 Coyote fire) the fire was suppressed at 21 acres with no reportable injuries. The effectiveness of the initial attack was due to the prompt air attack on the fire and the ability for the ground resources to make quick access to the fire along the fuel break to reinforce the retardant drops. Access for the fire fighters was much quicker and safer due to the hazardous fuels reduction efforts which have occurred along the Camino Cielo road.

BUTTE FIRE, 2015

BUTTE FIRE – FUEL BREAK UTILIZATION

Pine Acres Fuel Break

Projects like the Pine Acres Fuel Break conducted in CAL FIRE's Amador- El Dorado Unit as part of the Community Wildfire Protection Plan was conceived, constructed and has been maintained through the cooperative efforts of CAL FIRE, the Amador Fire Safe Council and approximately forty private landowners since 2002.

The primary objective for this project is to maintain a strategically placed shaded fuel break along the rim of the Mokelumne River Canyon intended to support fire suppression and structure defense in the event of wildfire. In addition to reducing vegetation density and providing enhanced protection to residential structures and communities at risk from the spread of wildland fire into the Pine Grove area, the Pine Acres Fuel break was also designed to protect an important portion of the Mokelumne River watershed that provides water to the downstream Pardee and Camanche Reservoirs.

On September 9, 2015, the Butte Fire had started. At the time the fire was contained, 70,760 acres had been burned. Of this, 3,680 acres were in Amador County. Within the 3,680 acres, 1,458 acres were within the perimeter of the Pines Acres Fuel Break. Approximately 3.3 miles of the Butte Fire perimeter control lines utilized this fuel break. Originally, a single dozer line was constructed along the previously treated parts of the fuel break and then this line was improved later. Defensive firing techniques were used with no additional pretreatment to save structures. On the third day of this incident, the fire made a run towards the Pine Acres Subdivision. The community had already been evacuated and dozers were able to continue to improve the fuel break. Several strike teams of engines were in place along the fuel break scouting and prepping the subdivision. Consequently, this pre-designated fuel break location allowed fire crews to conduct a successful firing operation while holding and improving the line reporting no structures lost or damaged within this area.

TORO FIRE, 2013

CASE STUDY-Fuel Break

Toro Creek Fire - Fuel Break Utilization

November 8, 2013

At 10:30am on November 8, 2013, CAL FIRE San Luis Obispo Unit (SLU) dispatched a full-scale wildfire response to a 20 acre fire near Toro Creek Road and Highway 41, west of Atascadero in San Luis Obispo County. This area is characterized as mountainous terrain that is heavily covered in brush, set within the northwestern tip of the Los Padres National Forest.

During the operational planning of this fire, the West Atascadero Wildland Fire Pre-Plan map created by the SLU Pre-Fire Division was utilized. The Incident commander successfully utilized this map and explained that the map helped in "gathering situational awareness on the same operating plan."

Another equally important component in this success story was the presence of the West Atascadero Fuel Break which was completed in 2012 just north of the Toro Fire location. This fuel break was created under the CAL FIRE HFT2 grant program funded by the USFS. The fuel break was constructed using mastication equipment and a limited amount of hand crew work. This fuel break was used exactly as it was designed, to offer a strategic location from which to conduct aggressive control operations. Fortunately, the fire was stopped prior to reaching the fuel break, because the fuel break providing easier access to the fire location. Consequently, suppression resources, especially dozers, could quickly access the ridge on the east side of the fire and build a control line down the gas line. The local knowledge gained from building the fuel break and having accurate maps and firsthand knowledge of exactly how to safely and quickly access this area was why the fire was held to just 51 acres. Were it not for the existence of the fuel break and the knowledge of the local road system, the dozer line would not have been constructed nearly as quickly and the fire would have likely grown substantially larger.

CASE STUDY– Shaded Fuel Break

West Fire and Critical Defensible Space Lessons

July 28, 2010

The West Fire started on July 28, 2010 at 14:14 hours in Kern County. The fire was human caused and started along Blackburn Canyon Road 3 miles south of Highline Road. First arriving units reported a fast moving vegetation fire 1-2 acres in size with an immediate structure threat. Within the first 15 minutes the fire was exhibiting extreme fire behavior, with moderate duration crown runs and spotting a ½ mile ahead of the main fire and around several structures. The fire was burning in a north direction down-canyon which is not typical for this area, as the typical wind pattern is west to east.

Vegetation management projects within the community of Old West Ranch started in 2004 when the Fire Safe Council receiving their first grant for vegetation management work to develop the Blackburn Canyon Escape Route. Kern County Fire crews spent the next two summers clearing overgrown vegetation. The project consisted of removing dead and overgrown vegetation, limbing up existing live trees, and removing dead trees within 25 feet of both sides of the road. The purpose of this project was to reduce the fuel build up along the side of the access roads to allow the residents a safe way to evacuate the community and allow emergency vehicles a safe way into the community. In 2010 additional project work consisting of a 150 foot wide shaded fuel break along Wildhorse Ridge to the south of the Old West Ranch community. Kern County fire crews utilized a masticator and were able to complete the majority of the work in three months.

These projects were used effectively in the efforts to control the West Fire. The shaded fuel break along Wildhorse Ridge stopped the southern progression of the fire with no re-enforcement and the escape route project proved to be invaluable in the evacuation and safety of the residents and the safety of emergency equipment accessing the fire.

Defensible space was the key to structure survivability during this fire. During initial attack firefighters were battling an intensely burning, fast moving wildfire, with flame lengths in excess of 150 feet and numerous spot fires ¼- ½ mile ahead of the main fire. Kern County Fire Department enforces the 100 feet defensible space requirement in PRC 4291. In this case the minimum provided to be inadequate in areas due to the intensity of this fire. The 100 feet did suffice in some areas, but in the areas of extreme fire behavior larger clearances were needed to insure survivability.

LA BREA FIRE, 2009

La Brea Wildfire Fuel Treatment Effectiveness
Los Padres National Forest

Three burn units within the Brookshire Prescribed Fire Project played a significant role in containing the northwestern portion of the La Brea Fire. The 5,800 acre Pine Unit burn was completed in January 2009, while the 7,370 acre Colson Unit, completed in December of 2005, was burned during a firing operation to enhance the protection of Tepusquet Canyon. The fuels within the Colson Unit would not support a continuous flaming front and burned at low intensities in a mosaic pattern. The La Brea Fire was held on the south end of the Madre burn unit along the Treplett Fuelbreak.

Figure 1 The western spread of the La Brea Fire (foreground) was stopped by the Pine Burn (background)

The Pine prescribed burn was a moderately high intensity prescribed fire that consumed upwards of 80% of the standing brush in the project area. The Pine burn stopped the forward spread of the fire in Division P of the La Brea fire and also served as an anchor point for fireline construction and a firing operation between Miranda Pines and Treplett Mountain.

The Colson burns of 2005 (Figure 6) were also burned at a moderately high intensity. A firing operation was conducted in the Colson burn unit, with the treated fuels proving resistant to high intensity fire spread. While some burning occurred in the treatment area, it was spotty in nature.

The 2004 Madre burn, a unit of the Brookshire project, was located north of the fire area. A fuelbreak on the southern end of the burn was used as part of a firing operation to control fire spread. The La Brea fire had only minimal interaction with the Madre burn unit.

Figure 2 The La Brea Fire's mosaic burn pattern in the Colson prescribed fire treatment. The treated fuels would not support a clean burn.

This case study is adapted from USFS Region 5 Fuel treatment effectiveness analysis.

PETERSON FIRE, 2004

Before Treatment

After Treatment

Before Treatment

After Treatment

CASE STUDY-Shaded Fuel Break

Peterson Fire

July 12, 2004

On July 12, 2004 in eastern Fresno County a wildland fire was reported. The initial attack Incident Commander arrived at the scene and found the fire rapidly spreading uphill, threatening structures above and on each flank. Reported temperature was 89 degrees Fahrenheit, wind was from the southwest at 5-11 mph, with 17% relative humidity, and fuel moistures were 4.7%. In addition, the fire was rapidly spreading towards the recently completed Cressman Road Fuel Modification Zone (FMZ), a shaded fuel break.

CAL FIRE, in cooperation with the Pine Ridge Property Owners Association, the Highway 168 Fire Safe Council, and the California Department of Corrections, developed the Cressman Road FMZ. A FMZ is an area where selected vegetation has been removed in such a way as to break the horizontal and vertical continuity of forest fuels. The Cressman Road FMZ involved 60 parcels and 57 different landowners.

The purpose of this project was to try to increase the level of safety for both residents and firefighters that may be entering and/or leaving the Cressman Road area under wildfire conditions. This increased level of safety has been achieved through the selective removal of vegetation along Cressman Road. The Cressman Road area was selected for this project because of several reasons:

1. The Fresno/Kings Unit of CAL FIRE had identified the Pine Ridge area as a priority area for fuel reduction projects. This area was selected as a priority because of its high fuel loading, its potential for a large damaging fire, and its high population density intermixed within the wildland.
2. The Highway 168 Fire Safe Council had identified the Pine Ridge area as a priority area for fuel reduction projects for similar reasons.
3. Cressman Road is a single lane road, open to the public, which accesses approximately 113 parcels and 75 residences.
4. At the initial discussion stages of this project, the Pine Ridge Property Owners Association expressed interest in and support of the proposed project.

The Incident Commander on the Peterson Fire states that the Cressman Fuel Modification Project provided him with:

- The confidence that the head of the fire would be stopped or slowed when it reached the FMZ;
- That it would serve as a safe point of attack for firefighters even at the head of the fire;
- That firefighters could “anchor-in” at the FMZ and safely make a downhill hose lay along the flank of the fire;
- Significantly reducing the number of firefighting resources ordered for the incident;
- Significantly reduced fire intensities and subsequent resource damage in the FMZ compared to the non-treated areas in the fire perimeter.

CASE STUDY– Shaded Fuel Break

Goat Fire

July 18, 2000

The Goat Fire was caused by a campfire on July 18, 2000. Located in steep, rocky terrain along State Highway 44 in Lassen County, the fire spread rapidly toward the community of Lake Forest Estates. Because of extreme fire conditions, and as a precaution, evacuations were started.

Over 1,100 fire fighting resources were called in to battle the flames which were racing through heavy timber, jumping from treetop to treetop in the form of a crown fire. The land had been owned by Roseburg Resources timber company before purchase by Sierra Pacific Industries. Roseburg had completed a thinning and chipping project in the area back in 1991. When the Goat Fire reached this thinned area flames dropped from the crown of the trees to the ground where firefighters were able to attack it.

In addition to the thinned area, Roseburg had completed a 1,000 foot shaded fuel break along one side of Lake Forest Estates in 1990. The fire reached within a mile of the community. Firefighters were able to safely stop the fire in the thinned forest keeping the flames out of Lake Forest Estates.

CASE STUDY– Prescribed Fire Fuel Reduction

Winton Fire

September 9, 1999

California is prone to dry lightning in the late summer months. Lightning-caused fires can cost taxpayers millions of dollars because lightning often ignites multiple fires at one time in remote mountainous areas.

Lightning started the Winton Fire outside of the Stanislaus National Forest in Calaveras County on September 9,1999. When fire crews responded to the call, they already knew that as many as 40 homes could be threatened if they were unable to quickly contain it.

The work of those crews was made easier because of logging and prescribed fire projects that had been done in 1996 by Sierra Pacific Industries. Due to reduced fuel on the northwestern side of the fire, where a prescribed burn had been completed, the flames burned at a much lower intensity and spread slower. In addition, the main road used by fire personnel to access the head of the fire ran through this treated area. This allowed fire crews safe access and an escape route should they need one. Because of these factors, the Winton Fire Incident Commander was able to concentrate crews and equipment on more actively burning areas of the fire.

While one home and 115 acres were burned, fire commanders estimated that 40 homes and 300 acres of timber were saved due to the ability of the crews to quickly contain the fire. This is an example of how pre-fire planning and treatment saves homes, resources and money. One of the major benefits of the pre-fire efforts taken in this area was improved firefighter safety. Crews were able to safely access the Winton Fire from the west due to the prescribed fire done earlier. It was not safe for crews to access the flames from any other side due to the high fire intensity in those areas.

RANCH FIRE, 1999

CASE STUDY– WUI

Ranch Fire

December 21, 1999

Ventura County's Ojai Valley has long been considered an area especially susceptible to wildland fire. The valley is known for its high winds and dense vegetation. These conditions were made worse in the winter of 1999 when a lack of rainfall made high intensity wildland fire even more likely.

On the night of December 21, 1999 firefighters got the call that they had long been expecting: fireworks had ignited the Ranch Fire in the upper Ojai Valley and in its path lay homes, schools, and agriculture. As Santa Ana winds roared through the valley, the situation looked dire and left many local residents expecting a terrible disaster to be left in the Ranch Fire's wake.

However, almost seven years earlier a process was started that would ultimately save the community and save the taxpayers millions of dollars. The Ventura County Fire Protection District's Vegetation Officer started a five-year plan to reduce the threat in areas with the greatest potential for costly damaging wildfires. A large percentage of the cost of the project was provided by the Federal Emergency Management Agency after severe firestorms ravaged areas of Southern California in 1993.

The upper Ojai Valley had specifically been included in the plan, and by the spring of 1993 a comprehensive action plan was put together with the cooperation of landowners, the U.S. Forest Service, CAL FIRE, local schools, businesses, and residents.

Cooperators used prescribed burns to create defensible space between vegetation and homes. Further vegetation was cut and stacked in many areas and was burned in low intensity prescribed fires during the winter. Maintenance of this new community protection fuel break was the next issue. Property owners fenced the area and used livestock to eat the chaparral regrowth. Almost all of the homeowners in the community pitched in by cleaning flammable vegetation from around their homes. Fire department inspectors reported 99 percent compliance with local and state fire hazard clearance laws.

During the first few hours of the incident many success stories unveiled themselves. The weed abatement and pre-fire work made the disaster much less damaging than it otherwise would have been. While 4,400 acres and one home had burned, crews were successful at saving the other 67 homes in the area. Efforts by this committee freed up fire fighting forces to attack the fire before it could enter the community of Ojai. This is an example of how insightful planning and interagency teamwork can save communities from certain destruction by wildland fire.