Deer Valley Estates
Property Owners Association

Community Wildfire Protection Plan

Bayfield, Colorado
December 2009

Prepared by: Les Kole, DVE Resident and Firewise Ambassador

Maps Prepared by: Scott Wagner, Paragon Consulting

Collaborative support from:

- Kent Grant, District Forester, Colorado State Forest Service
- Craig Goodell, Fire Mitigation and Education Specialist, USFS / BLM
- Rich Graeber, Chief Upper Pine River Fire Protection District

Neighborhood support from:

- John Beebe, DVE Resident and President, DVE Board of Directors
- Terry Beebe, DVE Resident
- Jon Robison, DVE Resident and Member, DVE Board of Directors
- Paul Romere, DVE Resident and Vice President, DVE Board of Directors
- Linda Kole, DVE Resident
- Tristen K. Amador, PhD., Technology Consultant

Approval

The Durango District of the **Colorado State Forest Service** has reviewed this Community Wildfire Protection Plan and approves its content and certifies that it meets or exceeds CSFS Community Wildfire Protection Plan minimum standards.

D. Kent Grant, District Forester — 9/4/09 Date

The following entities have reviewed and approved this Community Wildfire Protection Plan and agree with the content and recommendations.

Deer Valley Estates Property Owners Association — 11/10/09 Date

Upper Pine River Fire Protection District — 10 Nov 2009 Date

San Juan Public Lands (USFS/BLM) — 10/15/09 Date

La Plata County Office of Emergency Management — Nov 10 09 Date

TABLE OF CONTENTS

List of Tables

List of Figures

List of Maps, Appendices and Reference Information (attachments)

I. Community Identification and Description

The Deer Valley Estates (DVE) community area is in La Plata County, approximately 5 miles east of Bayfield, Colorado on the south side of US Highway 160. DVE covers approximately 360 acres and the elevation ranges from 7,150 to 7,410 feet. US Highway 160 provides the only access to DVE.

Deer Valley Estates contains eighty four (84), 3.0 to 6.6 acre lots, with fifty five (55) having structures on them. Approximately one to two new homes are built each year. Four (4) miles of good dirt and gravel roads provide year-round access. Thirty four (34) of the lots immediately adjoin the San Juan National Forest, Saul's Creek recreation area.

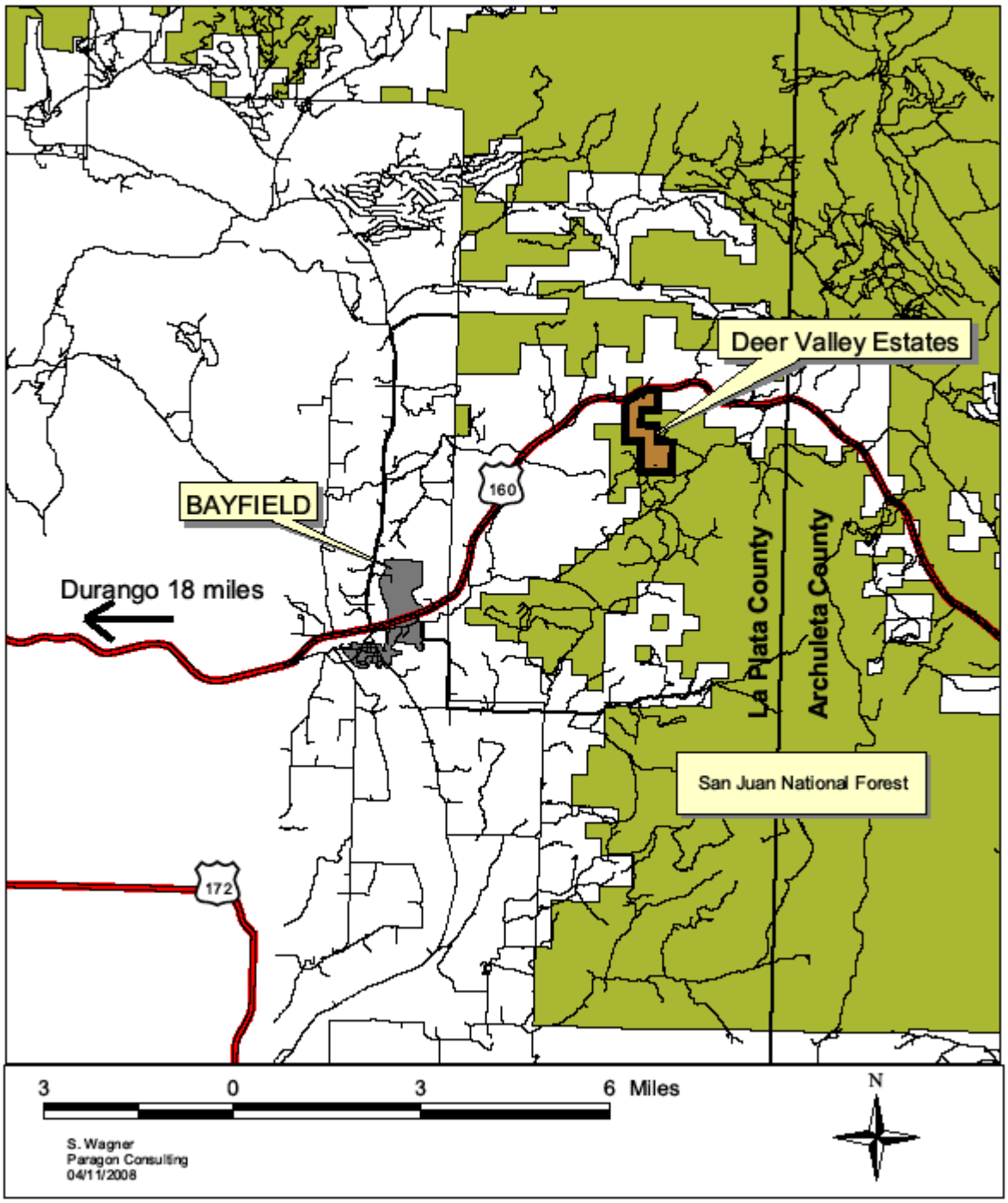
DVE is managed by a very active Board of Directors on behalf of the Association, which meets monthly to carry out required business. Defensible space around structures has been a top priority of the Board of Directors, but evacuation planning has only recently begun.

Numerous fires in the area have created a cross section of vegetation of ponderosa pine in the overstory with a principal shrub understory of Gambel oak, chokecherry, and serviceberry. The vegetation of DVE is broadcast over moderately dissected series of ridges, draws and open meadows. Slopes range from ten to forty percent, the average being approximately twenty percent.

Wildfires are not at all unusual in the area and are of a seasonal nature. The most predominate fire threat is to the south and west of DVE on the San Juan National Forest within the Saul's Creek area. Fires within the development are most unusual, with only one occurring in the last 25 years which was contained to approximately one (1) acre. The Missionary Ridge fire of 2002 (although not close to DVE), forced the local residents living in forested environs to further assess the hazards of living in the Wildland Interface. The initial attack for wildland and structure fires in DVE is provided by the Upper Pine River Fire Protection District.

At the annual meeting of the POA held on August 1, 2009, the draft Community Wildfire Protection Plan (CWPP) was reviewed and changes suggested by property owners have been incorporated into this document.

Deer Valley Estates
Vicinity Map



II. DVE Wildland-Urban Interface

The Wildland-Urban Interface (WUI) is most commonly described as that zone where structures and other features of human development meet and intermingle with wildland or vegetative fuels. Communities within or adjacent to the WUI face significant risk to life, property and infrastructure.

Wildland fire within the WUI can be one of the most dangerous and complicated situations firefighters face. Both the National Fire Plan (NFP), a response to catastrophic wildfires, and *A Collaborative Approach for Reducing Wildland Fire Risk to Communities and Environment, 10-Year Comprehensive Strategy* (2001) place a priority on working collaboratively with communities in or adjacent to the WUI to reduce their risk from large-scale wildfire. The Healthy Forests Restoration Act of 2003 (HFRA) builds on existing efforts to restore healthy forest conditions in the WUI by empowering local communities or POAs by authorizing expedited environmental assessment, administrative appeal, and legal review for qualifying projects on federal land. The DVE community is recognized as an "at risk" community for catastrophic wildfire, as identified in the *La Plata County CWPP- Communities – at Risk and Communities of Concern* map and the *Federal Fuels Treatment* map. The DVE CWPP tiers to the La Plata County CWPP approved in 2006. This plan is consistent with the goals and strategies described within the La Plata County CWPP and provides further strategic and tactical direction specific to wildfire protection and mitigation for the DVE community.

The 360-acre DVE inhabited area containing critical human infrastructure is identified within the subdivision boundary on the attached Map A: Wildland Urban Interface Zone. The balance of the WUI area covers 22,918 acres and contains many private in-holdings. The total acreage within the WUI is 23,278 acres.

The WUI zone was determined based on USFS/BLM recommendations and fire behavior/incidence history, the risk of crown fires, topography and predominant south/southwest wind direction as deciding factors. The attached Map B: Wildfire Hazard and Mitigation Treatments on Forest Service shows areas that were thinned by the Forest Service in 2003 and areas planned for future thinning.

Current Conditions and Recommended Measures

Representatives from the USFS/BLM have conducted the required assessment of the WUI which contains the Saul's Creek recreation area, where the DVE boundary is immediately adjacent to the San Juan National Forest (SJNF). Actions are needed to effect an immediate change in fire behavior, to reduce the rate of spread and intensity, and to increase forest and ecosystem diversity and resilience to disturbance. Some of the most critical areas that should receive treatment are those WUI areas located within and adjacent to DVE.

Mechanical thinning projects and prescribed burns have been conducted around Deer Valley in the past few years (2003), especially on the south and west sides, (see Map B). Based on SJNF recommendations, a variety of restorative treatments including mowing, thinning and prescribed burning with low intensity surface fires have been conducted in the WUI. The planned treatments shown on Map B refer to the Saul's Creek Fuels Reduction Project approved by the USFS/BLM. The treatment timetable will depend upon funding/contracting.

III. Community Assessment

The potential risk to DVE from a wildland fire is HIGH. This section discusses the factors considered and contributing to the overall rating.

Fuel Hazards

DVE is covered with rather dense conifer (ponderosa pine) and brush (Gambel oak and serviceberry). The abundant Gambel oak will lift a ground fire into the crowns of the overstory. There are a few scattered meadows and other natural open areas throughout DVE. Fuel Models 1, 6, 9 used for Estimating Fire Behavior (Anderson 1982) are all found in association with one another in DVE. Except for fuel model 9, the rest can have high rates of spread in mild weather situations. Table 1: Fuel Models Found in Deer Valley Estates offers a brief description of these three key fuel models.

Timber groves adjacent to structures that have crown closures greater than forty percent are most problematic. With this continuous ground and crown fuel arrangement, both vertical and horizontal, this area becomes susceptible to all types of wildland fires (crown, wind born embers, etc), even during moderate weather situations. The Fire Hazard and Triage maps (Maps B and C) show that at least seventy seven percent (77 %) of the vegetation in DVE is rated as high fire hazard.

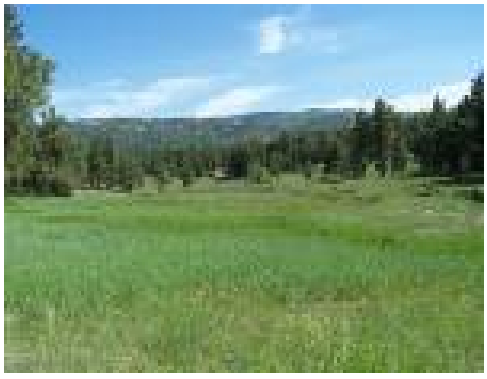
Fuel Models

Fuel models are a universally used means of describing a wide variety of combustible conditions found in the urban wildland environment. Fuel models used in wildfire behavior predictions are standardized into thirteen (13) different fuel models. When assigning a fuel model to a specific tract of land the fuel size class, fuel loading in tons/acre, fuel bed depth and continuity across a landscape must all be taken into consideration. Fuel models are most often combined by percentage of an area they cover. Figure l: Fuel Models found in Deer Valley Estates describes the fuel model coverage within the development.

Table 1: Fuel Models Found in Deer Valley Estates

Fuel Model	Description
1	Grasslands generally less than one foot deep
6	Shrub stands less than four feet tall
9	Closed stands of long-needled pine or hardwood stand with freshly fallen leaves

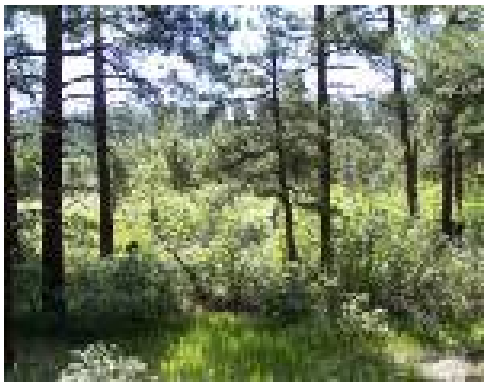
Some of the photos of fuel found in DVE:



Fuel Model l (foreground), 9 (background)

Fuel Model 6

Fuel Model 9



Fuel Model 9 and 6

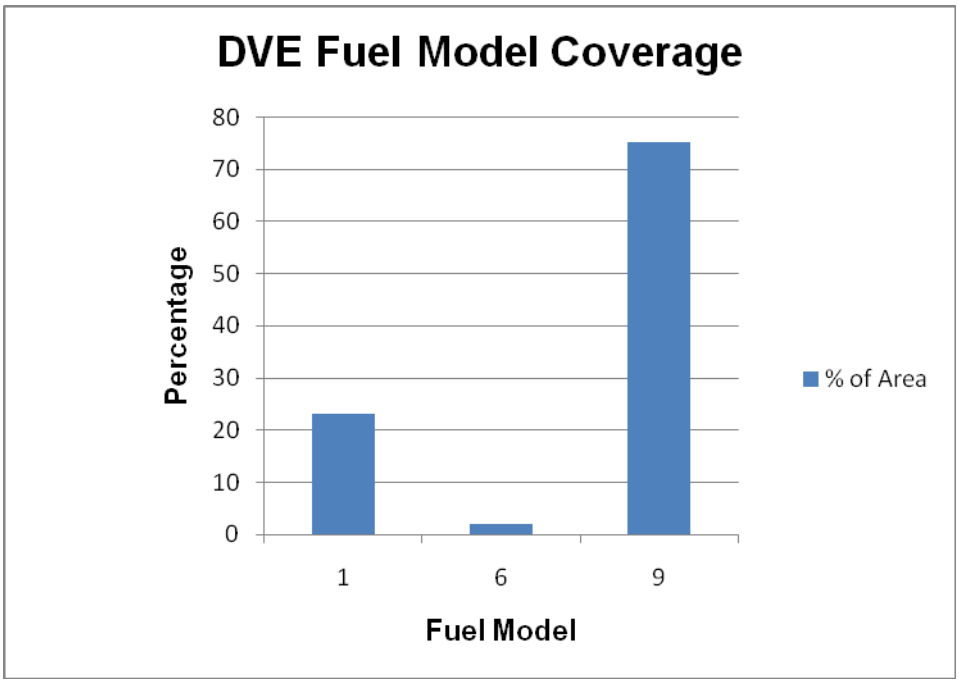


Figure 1: Fuel Model Coverage on Deer Valley Estates.

History - Fire History and Ecology of Ponderosa Pine in Southwestern Colorado

In southwest Colorado, ponderosa pine/Gambel oak (*Pinus ponderosa/Quercus gambelii*) forests grow at elevations from 7,000 to 8,500 feet. They are the archetypal fire-adapted forests of the southwest region. With thick insulating bark and self-pruning lower branches, ponderosa pine trees are well adapted to withstanding surface fires.

Gambel oak is the dominant shrub associate of ponderosa pine in southwest Colorado (and in other regions where ponderosa pine and Gambel oak coexist) and is ubiquitous throughout this area. Gambel oak is also well adapted to fire much like aspen. Periodic burning renews Gambel oak by top-killing the shrub. After a fire new stems sprout from the unharmed roots in the soil.

The natural fire regime in ponderosa pine/Gambel oak forest is a frequent low severity surface fire regime. Extensive surface fires occurred every few years to a few decades apart (Grissino-Mayer et al 2004, Brown and Wu 2005). Fire starts were frequent, caused mainly by lightning and likely augmented by indigenous people at certain times of the year. Most lightning fires were small because the live grasses and forbs during the summer fire season in years of average precipitation or more were too moist to burn. Small patchy burns were limited to flammable pine needle litter directly under trees. Frequent fires under trees may have helped limit Gambel oak establishment directly underneath the pines.

Large extensive fire events were and are driven by the El Niño-La Niña climate pattern that brings about years of abundant moisture followed by years of drought

(Swetnam and Baisan 1996, Swetnam and Betancourt 1998). This El Niño-La Niña pattern of one to two wet years to a drought year has been documented in the past (1700-1900) and still appears relevant today.

In major fire years before European settlement, multiple lightning ignitions across the ponderosa pine landscape probably burned thousands of acres throughout the summer, shrouding the region in smoke. A typical fire burned through needle litter and dry grasses and forbs leaving most of the dominant overstory intact. It killed most seedlings, some saplings, and low shrubs. Fire could also burn up pockets of dense pine if they lay in its path. However, crown runs were limited non-typical events because most of the ponderosa's open stand structure would not support an extensive crown fire.

These frequent surface fires played a major ecological role in maintaining open forest structure. They kept the forest floor relatively clear of coarse woody debris, excessive litter buildup, and regulated Gambel oak and ponderosa pine densities. Trees had a patchy or clumpy distribution. The forest was made up of trees of a variety of sizes and age classes (Cooper 1960, Fulé 1997). Pockets of high-density pine developed on moist sites, protected sites, or in sites that escaped fire for unusually long periods though sheer chance. However, dense stands of ponderosa pine before European-American settlement were relatively uncommon given the natural historic fire regime of these forests.

In ponderosa pine forests in southwest Colorado, fires, or more accurately large-scale surface fires, abruptly stopped in the mid to late 1800s. The actual date of the last fire varies from site to site, but tree-ring studies across southwest Colorado have shown 1880 to be a reasonable date to mark the beginning of fire exclusion for the area. 1880 was in the midst of European-American settlement but before land management agencies existed to implement fire suppression. Therefore the term fire exclusion is often used to refer to the cessation of fire due to European-American settlement activities that were not the result of a formal fire suppression policy.

During European-American settlement, the sudden end of fires elsewhere in the southwest has been attributed to widespread sheep and cattle grazing (Touchan et al 1995, Savage and Swetnam 1990). Grazing practices in southwest Colorado were no different. Hundreds of thousands of sheep and cattle grazed the area. Chronic overgrazing killed or stunted grasses and forbs that had formerly provided large connected fuel beds for large surface fires. Later in the early 1900s the Forest Service adopted a policy of total fire suppression because at the time fires were seen as a destructive force from which forests must be protected. Thus fires and the maintenance role they played in ponderosa pine forests were effectively removed from this forest type. Without fire and competing herbaceous cover, ponderosa pine trees and Gambel oak shrubs filled in the once open forest stands.

The current condition of ponderosa pine forests is now far from what was historically typical. The largest trees were logged in late 1800s and early 1900s

and stands have missed numerous fires due to fire exclusion and suppression. The most obvious and visible difference is that ponderosa forests are now uniformly denser and lack old growth trees. Instead of a predominantly open ponderosa pine landscape with infrequent dense stands, the landscape has developed into a mostly closed canopy ponderosa forest. Gambel oak dominates the understory. It now commonly grows directly underneath ponderosas and acts as a 'ladder' that makes it easier for surface fires to spread into the crowns of the overstory trees. Ponderosa pine's historic frequent, low severity surface fires are being replaced with high severity crown fires.

Recent fires across the landscape of southwest Colorado (see Table 2) demonstrate how fundamentally the ponderosa pine fire regime has changed. A good example is the Missionary Ridge Fire in 2002, one of the most severe drought years on record. It was a human-caused fire that started in the ponderosa pine and burned through all forest types. Of the roughly 12,000 acres of ponderosa pine that burned, 65% burned as high to moderate severity where 50-100% of all trees and shrubs were killed (BAER Report 2002). If frequent fires had continued through the 20th century, forest structure would have still been open and the majority of the ponderosa stands that burned would have burned as low severity surface fire.

Table 2: Recent Ponderosa Pine Fires Near Deer Valley Estates

Year	Fire	Total Acres
2000	Cabezon	330
2001	Martinez Canyon	15
2002	Missionary Ridge	70,121
2002	Valley Fire	939
2003	Devil Creek	235
2003	Trail Ridge	89
2003	Bolt	2,160
2004	Devil Mountain	60
2005	Ute Campground	5

Reintroducing fire back into ponderosa pine forests in their current condition is challenging for both ecological and social reasons. It is the forest type most in need of restoration work. Ponderosa forests are also where fire hazard mitigation is consistent with restoring forests to more historically typical conditions. Despite the social and ecological alignment, ponderosa forest restoration is hindered by social and ecological obstacles.

Ecologically, the greatest obstacle is the massive scale and the high degree that ponderosa forests are outside their historical condition. Under current forest conditions, large fires in the ponderosa pine are marginalized to extreme fire climate conditions because they are the conditions when suppression resources cannot control them. Large scale crown fires are uncharacteristic to the ponderosa pine fire regime. They can endanger lives, destroy homes and

property, damage soils, result in flash floods, and kill the large old growth trees that society wants to protect.

There are remnants of historic ponderosa pine stand structure in Forest Lakes and Saul's Creek to the north and east of Bayfield. However heavy logging in the Saul's Creek area makes it hard to find. If you search enough, eventually you will encounter some.

Fires that start in or near the DVE community are of immediate concern. However those fires that originate to the south and west (Saul's Creek) and to the north of Highway 160 can have a major impact upon DVE. Given the potential of a wind driven major fire in the WUI area with a rapid rate of spread and long distance spotting, a two to five mile run into DVE could happen very fast. Table 3 provides information into the potential fire behavior on a High Fire Danger Day in DVE.

Table 3: Deer Valley Estates Fire Behavior Prediction

Fuel Model	Rate Of Spread (miles/hr)	Flame Length (feet)	One Hour Fire Size (acres)	One Hour Fire Perimeter (miles)	Safety Zone Size (acres)
1/9	2.25	8	852	5.00	2
6	1.45	11	271	3.16	3
6/9	.61	9	64	1.39	2
9	.17	4	6	0.40	0.5
9/6	.80	10	95	1.78	2.5

Note: ***Shaded zones are well beyond hand crews and engine suppression threshold.***

Table 4: Fire Hazard Based On Rate of Spread & Resistance to Control

Fuel Model	ROS	RTC	Hazard	Percentage Of Area
1	High	Moderate	High	23
6	High	High	High	2
9	Moderate	Moderate	Moderate	75

Note: ***ROS = Rate of Spread and RTC = Resistance to Control***

Protection of Homes and Structures

The main principle concerning structure ignitability is that the structure is a source of fuel and may burn just a readily as oak brush or ponderosa pine. Structures lost to wildfire can occur by conduction, radiation, convection or firebrand. Conduction is the flame of the fire coming in direct contact with the structure. Radiation occurs when the structure becomes hot enough to combust without direct flame contact. Firebrands are embers or burning pieces of limbs, leaves or twigs that are blown onto a structure. Firebrands may lodge in crevices of roofs, eaves or side paneling and smolder for several hours before combustion.

Firebrands carried in the wind or on air currents resulting from the fire may be transported over a mile from the fire front. Recent studies have shown that structure ignitability is a principle cause of structure loss during a wildland fire and not always the character of the wildland fuel or fire intensity *per se*.

Critical factors that increase the chances of structure loss are flammable roofing materials (cedar shingles) and flammable vegetation (trees, shrubs and debris/wood piles) near the structure. A wildland fire does not burn a structure unless it meets fuel and heat requirements sufficient for ignition and continued combustion. With this understanding of fire behavior, the flammability of the structure and its immediate surroundings can be managed to reduce the chances of ignition and loss during a fire incident. The primary and ultimate responsibility for structure protection during wildland fires lies with the structure owner. The following are two actions that home owners can take to greatly reduce the chances of wildfire burning their structure:

- Develop a defensible space around the structure that is at least 30 feet wide, use low combustible plant material for landscaping and remove wood piles next to the structure.

- Use noncombustible construction material to the extent possible. The minimum is noncombustible roofing material.

DVE has in place an Architectural Review Committee that reviews and approves all building plans for the subdivision as per the Associations Covenants, Conditions, and Restrictions (CCRs). It is imperative that the Committee continues to only approve plans that follow the CCRs, including the use of noncombustible building materials.

Community Values at Risk & Hazard Assessment

Values: Fifty five (55) of the eighty four (84) or sixty-five (65%) percent of the lots in DVE have structures on them. These structures are all in the form of substantial permanent homes, numerous free-standing garages and some sheds. Those owners with horses also may have free-standing barns or loafing sheds. Approximately one to two (1-2) new homes are built on a yearly basis. Eighty nine percent (89%) of the permanent structures are occupied throughout the year, by approximately 150 residents.

DVE owners place a very high premium on the natural surroundings and the visual quality of the mountain landscapes. Large areas of heavily burned, charred forest are most objectionable whether the structures burn or not. When the views are seriously eroded much of the intrinsic value of the residence will also be lost.

A large fire will also degrade the watershed values and cause sediment and turbidity problems along Beaver Creek. Most of the small ponds in DVE which are impounded with earthen dams could be filled with sediment, compromising fish and wildlife opportunities.

Access: Four (4) miles of gravel and dirt roads provide good access to DVE. All roads are well marked/signed, and all residences have some type of posted address. There are only seven (7) named roads within DVE. There are only a few driveways that lead to empty lots. Address signage was not uniform, and one hundred percent (100 %) of the driveways had different types of signage; size, color and locations. First responders to DVE could be slow to reach an emergency under the above conditions. In the spring of 2009 DVE, La Plata County and the Upper Pine River Fire Protection District cooperated to bring all street address signage into uniformity.

Road grades are moderate, but can approach 37 %. Driveways can be as much as (35 %). The four (4) dead end roads do not have “No Outlet” signs at the junction of the main road. Turnarounds and cul-de-sacs (3) at the end of roads are largely inadequate for modern large structure fire equipment.

Risk: Numerous types of risk are associated with wildland fires; but three are of a major concern. The first concern is the risk to property owners attempting to evacuate with less than perfect conditions. The second is the risk to firefighters who are attempting to protect property. Third is the risk to the property from wildfire. The defensible space concept addresses both the second and third factors under one umbrella.

Defensible space is an area around a structure where fuel and vegetation are treated, cleared or reduced to slow the spread of wildfire towards the structure and reduce the intensity of the fire as it passes the developed area. This also reduces the chances of structure fires moving from building to surrounding vegetation. Defensible space provides room for firefighters to accomplish their jobs. A

structure is likely to withstand a wildfire if vegetation is managed to reduce a fire's intensity. Structure design and construction also influence its survivability when a wildfire passes through a community. Removing flammable material such as firewood, lumber and gasoline from decks and around structures will result in big dividends when an ember storm hits the home.

Triage: Structure triage was conducted on each structure within DVE. Triage is the concise decision-making process that is used if/when a wildfire threatens multiple structures at the same time. See Appendix H: Structure Triage for a brief description of the triage process. The following observations were gleaned from on site visits (see Maps C and D: Wildfire Hazard and Triage).

Ninety-six (96%) percent of the structures are defendable while another four (4%) percent are marginally defendable depending upon the fires' intensity. This "Defendability" rating is a summary of all the factors listed below.

- Seventy eight (78%) percent of the lots had adequate space to turn fire control apparatus around.
- A safety zone was immediately available at ninety-six (96%) percent of the structures.
- One hundred (100%) percent of the driveways are in good enough condition to be considered escape routes for firefighting resources.
- Thirty one (31%) percent of the structures received a good triage rating, sixty five (65%) percent were rated as fair and four (4%) percent are marginal.
- One hundred (100%) percent of the lots with structures (55) have propane tanks and very few are underground.

It is important to understand the role of triage in this Community Wildfire Protection Plan. It is a very quick, inexpensive way to determine overall community wildfire risk and helps to identify areas to focus improvement efforts. Its utility during an actual wildfire depends upon the nature of the wildfire. When only one structure is threatened, firefighting resources are usually assigned to protect that single structure, unless it is totally undefendable.

During a large wildfire scenario when more structures are threatened than there are firefighting resources to protect them, this triage work will help those in charge assign scarce resources to the locations where they have the best chance for success. Maps C and D (Wildfire Hazard and Triage) show all structure locations. The CWPP will be an ever evolving document and will be revised on a regular basis to reflect new information about structure defendability and other important fire control issues in DVE.

Evacuation: There is only one way in and out of the DVE community, hence this will lead to a traffic jam during an evacuation. The main entrance road (Beaver Creek Drive) is the only access to Hwy 160 for the entire subdivision. Additionally four locked gates lead directly into National Forest lands and cannot be used as evacuation routes. In fact there are no connecting roads in the National Forest to or from these gates. Investigation into the creation of alternative routes out of DVE other than Beaver Creek Drive needs immediate action. This should be done soon.

Local Preparedness and Protection Capability

Upper Pine River Fire Protection District (UPRFPD) has 19 line fire fighters that staff 2 stations, Station 1 (Clover Dr) and Station 2 (Vallecito Dam), with 3 persons daily at each Station, 24 hours a day. Staff includes 3 Chief Officers that are also available for response as needed. There is also a volunteer group of 36 throughout the district available by pager. The District has 8 stations located throughout the service area with Station 8 being located approximately 1 mile east of DVE on Highway 160. Currently this is not a staffed station, but houses an engine and tanker as well as several volunteers that respond from the area when available. The above staffing and equipment is at best approximately fifteen to twenty minutes from DVE gated entrance (which has a Knox Box). Additional reinforcements from UPRFPD and other equipment and manpower from nearby departments (Los Pinos Fire, Durango Fire & Rescue) that have mutual aid agreements with UPRFPD are at least forty-five minutes to one hour away with availability based upon work load at the time of the request. At the present time, the Deer Valley has no internal fire protection equipment. A few of the residents are trained volunteers for the local fire district.

Water Supply: All residents currently have their own well or haul water if they have no well. No community water system, is available, nor is one contemplated for the foreseeable future. Some residents have cisterns in conjunction with their wells, but they are not ready to be hooked up and used by the Fire District. There are three perennial ponds in DVE that are close to roads and may be counted on for wildfire suppression purposes. These three ponds are shown on the Wildfire Hazard and Triage maps (Maps C and D).

IV. Deer Valley Estates Fire Mitigation Treatments

Wildfire behavior is dependent upon three elements: weather, topography, and fuels. Little can be done to alter weather and topography, but fuels can often be modified, and this is where many wildfire hazard mitigation treatments are focused.

Defensible Space

Defensible space is an area around a structure where fuels and vegetation are treated, cleared, or reduced to slow the spread of wildfire towards the structure. It also reduces the chance of a structure fire moving from the building to the surrounding forest. Defensible space provides room for firefighters to effectively and safely do their jobs. A house is more likely to withstand a wildfire if grasses, brush, trees, and other common forest fuels are managed to reduce a fire's intensity.

The measure of fuel hazard refers to its continuity, both horizontal (across the ground) and vertical (from the ground up into the crowns of vegetation). Fuels with a high degree of both vertical and horizontal continuity are the most hazardous, particularly when they occur on steep slopes. Heavier fuels (brush and trees) are more hazardous (i.e., produce a more intense fire) than light fuels such as grass. Mitigation of wildfire hazards focuses on breaking up the continuity of horizontal and vertical fuels. Additional distance between fuels is required on slopes.

The construction of defensible space involves developing a series of management zones in which different treatment techniques are used. The actual design and development of defensible space depends on several factors: size and shape of buildings, materials used in their construction, the slope of the ground upon which the structures are built, surrounding topography, and sizes and types of vegetation on the property.

Defensible Space Management Zones:

> **Zone 1** is area of maximum modification and treatment and consists of 15 feet immediately around structure of which the first 3-5 feet is non-combustible.
>
> **Zone 2** is an area of fuel reduction that extends 75-125 feet or more out from the structure. Tree crowns should be spaced an average of 10-20 feet from each other.
>
> **Zone 3** is an area of traditional forest management zone that extends beyond the defensible space to the property boundary. Tree trunks in this zone should be spaced an average of 10-20 feet apart.

Specific prescriptions for each zone are listed in the CSU Extension/Colorado State Forest Service fact sheet "*Creating Wildfire-Defensible Zones, #6.302*".

Examples of Wildfire Hazard Mitigation Measures (see *Creating Wildfire-Defensible Zones, #6.302; Firewise Construction – Design and Materials; and Fuelbreak Guidelines for Forested Subdivisions and Communities*)

- Creating defensible space as previously described.
- Separating crown distance between coniferous trees to lower the likelihood of their sustaining a crown fire.
- Removing branches overhanging the roof and chimney.
- Removing or lowering ladder fuels, such as brush and small trees (i.e., Gambel oak, Rocky Mountain juniper) from beneath tree crowns.
- Creating small scattered clumps of brush spaced at an appropriate distance from each other.
- Removing lower tree limbs to a height of 8-10 feet from the ground.
- Irrigating the lawn to keep green or mowing tall grasses.
- Cleaning combustible debris from under decks, roofs, gutters, next to structures, and within defensible space area.
- Positioning stacks of firewood and propane tanks away from structures (ideally above or at the same level) and clear combustible vegetation from around them.
- Using chimney screens and maintaining them in good condition.
- Screening attics, roof eaves, and foundation vents to keep out burning embers.
- Screening, enclosing, or walling up stilt foundations and decks to prevent burning embers from landing beneath and starting a fire.
- Using fire-resistant building materials in the construction of new buildings and when remodeling.
- Making sure driveways are designed and constructed to adequate width, grade, and curve radius, and that they have turnouts and turnarounds where appropriate. Clear overhanging branches that may interfere with taller firefighting apparatus.
- Having an outdoor water supply, complete with hose and nozzle.
- Keeping fire extinguishers of adequate type and size in good operating condition.
- Having easily accessible tools such as shovels, rakes, hoes, axes for use in case of a fire.

Firebreaks and Fuelbreaks

Firebreaks and fuelbreaks, shaded or otherwise, along boundaries, roads, driveways, ridge tops, etc., serve as potential fire line locations, a point to attack an advancing fire, or to make ingress and egress safer.

General Forest Stewardship Treatments

Other forest stewardship treatments can be incorporated into wildfire hazard mitigation efforts to help accomplish a variety of other goals.

Examples include:

- Thinning to enhance overall forest health by reducing competition between trees for sunlight, nutrients, and moisture.
- Brush cutting or mastication to reduce competition with trees.
- Control of noxious or troublesome weeds.
- Enhancement of wildlife habitat or aesthetic qualities.

Deer Valley Estates Fuels Treatment Areas

Deer Valley Estates was divided into six wildfire hazard mitigation treatment areas (see Map E: Wildfire Mitigation Treatment Areas) and the number assigned to each area is its treatment priority relative to the rest (1 highest priority, 6 lowest). Although landowners are encouraged to implement wildfire hazard mitigation treatments on their property at their earliest convenience, these rankings can be used for setting larger project priorities. Since defensible space/fuel mitigation treatments have already been implemented on scattered lots within the areas, due to this and other differences all lots will not require the same level of treatment. However, the need to maintain fuel mitigation treatments over time applies to each lot within the subdivision. Some lots at Deer Valley Estates are located outside of or partially within treatment areas. In most cases, the predominant vegetation on these lots is mountain grassland, but defensible space and wildfire hazard mitigation are still warranted, especially where timber and brush occur on these lots. Although the greatest perceived need(s) by lot within each treatment area is listed below, other wildfire hazard mitigation measures on these properties should not be ignored.

Desired Future Condition:
The desired future condition of each treatment area is a healthy ponderosa pine overstory with tree crowns spaced 20 feet apart on average within the defensible space zones and 10-20+ feet between stems on average outside defensible space zones. Ladder fuels such as Gambel oak and Rocky Mountain juniper will be kept from beneath tree crowns. Occurrence of juniper will be reduced to a level representative of what would be present if fire had been allowed to play its traditional role in this fire-adapted ecosystem. Oak will be left in scattered clumps, retaining the best stands, especially those with a tree-like growth form, at an appropriate distance from one another. Openings between clumps will be mowed, brush hogged, masticated, and/or treated with herbicide to prevent oak from filling back in between clumps. Grass in the openings should be mowed, or at least that closest to structures, especially after it cures in late summer. In addition to mechanical treatments, prescribed broadcast burns may be conducted under appropriate conditions by competent personnel with adequate resources under conditions set forth in an approved burn plan and smoke permit.

Thinning ponderosa pine stands:
It is recommended that a non-uniformed spaced thinning be conducted in the ponderosa pine stands not only for reduction of fire hazard but to enhance the visual quality of the stands and to replicate the natural structure found in ponderosa pine stands in the southwest. This type of thinning is more appropriate outside of the defensible space zones for structures. Trees should be spaced from 10 to 30 feet between crowns depending on the size of the tree (i.e. the larger trees should have greater spacing). Some trees may be left in small clumps with interconnected crowns but to compensate, greater spacing should be created between the clumps. Tree clumps are essential habitat for several wildlife species that inhabit ponderosa pine stands including Abert's squirrel. Small openings between the clumps of trees should also be created. Existing openings can be enlarged or maintained by removed trees from around the perimeter. The openings can be up to ½ acre in size and are also very important for wildlife habitat.

Thinning ponderosa pine stands not only reduced fire hazard but also will enhance individual tree and forest health. Thinned forests are at lower risk of bark beetle infestations, a major threat to all pine forests. Homeowners are advised to contact the Colorado State Forest Service or a private forester for help in designating trees for removal during thinning operations.

Treatment Area 1:
Located in the east-central portion of the subdivision, Treatment Area 1 is comprised of all or parts of lots 33-37 and 42-46, and totals 23.4 acres (the smallest of the treatment areas). The north end of Elk Valley Road is within the treatment area and provides access. It is bordered by the San Juan National Forest on the north and south, and by meadow and Treatment Area #2 on the south.

Priority Treatment Needs by Lot for Area 1

Lot	Treatment(s)
33	Pine thinning
34	Pine thinning
35	Oak mowing and pine thinning
36	Oak mowing and pine thinning
37	Pine thinning
42	Pine thinning
43	Oak mowing
44	Oak mowing and pine thinning
45	Pine thinning
46	Pine thinning and oak mowing

Treatment Area 2:
Located in the southeast portion of the subdivision, area 2 is comprised of all or parts of lots 40-41 and 47-66, and totals 85.3 acres (the largest of the treatment areas). A portion of Elk Valley Road, the last section of Beaver Creek Drive, and all of Log Cabin Lane are located within the treatment area and provide access. The treatment area is bordered by the San Juan National Forest on most of its northern boundary and along the eastern and southern boundaries, and by Treatment Area 3 and grassland on the west side.

Priority Treatment Needs by Lot for Area 2

Lot	Treatment(s)
40	No treatment needed
41	Pine thinning
47	Pine thinning and oak mowing
48	Oak mowing and pine thinning
49	Pine thinning and oak mowing
50	Major pine thinning and oak mowing
51	Pine thinning and oak mowing
52	Oak mowing and pine thinning
53	Oak mowing and pine thinning
54	Oak mowing and pine thinning

55	Pine thinning and major oak mowing
56	No treatment needed
57	Oak mowing
58	Minor oak mowing
59	No treatment needed
60	Pine thinning
61	Oak mowing
62	Oak mowing
63	Oak mowing
64	No treatment needed
65	Oak mowing and pine thinning
66	Major oak mowing and pine thinning

Treatment Area 3:
Located in the southwest corner of the subdivision, Treatment Area 3 is comprised of all or parts of lots 67-76 and 79-80, and totals 39.7 acres. Part of Beaver Creek Drive and all of Stagecoach Road are within the treatment area, and a part of Elk Valley Road is the lower eastern boundary, and provides access. It is bordered by the San Juan National Forest on the south and west, other lots in DVE on the north, and other lots in DVE and the lower part of treatment area 2 on the east.

Priority Treatment Needs by Lot for Area 3

Lot	Treatment(s)
67	Pine thinning
68	Pine thinning and oak mowing
69	Pine thinning
70	Pine pruning and oak mowing
71	No treatment needed
72	No treatment needed
73	Pine thinning
74	Major pine thinning and oak mowing
75	Pine pruning and oak mowing
76	Pine pruning
79	Pine thinning
80	Oak mowing and pine thinning

Treatment Area 4:
Located in the west-central portion of the subdivision, Treatment Area 4 is comprised of all or parts of lots 1-5, 33-38, and 81-86 and totals 52.9 acres. Part of Beaver Creek Drive and all of Sawmill Circle are within the treatment area and provide access. It is bordered by treatment area 5 on the north, other lots in DVE on the east, and the San Juan National Forest on the south and west.

Priority Treatment Needs by Lot for Area 4

Lot	Treatment(s)
1	Major pine thinning
2	Major pine thinning
3	Minor pine thinning
4	Minor pine thinning
5	Pine thinning
33	Pine thinning
34	Pine thinning
35	Pine thinning
36	Pine thinning
37	Pine thinning
38	No treatment needed
81	Pine thinning
82	Pine thinning
83	Pine thinning
84	Minor pine thinning
85	No treatment needed
86	Oak mowing and major pine thinning

Treatment Area 5:

Located in the northwest portion of the subdivision, Treatment Area 5 is comprised of all or parts of lots 6-14 and 32, and totals 29.2 acres. Part of the northern section of Beaver Creek Drive and most of Spur Lane are within the area and provide access. It is bordered by private land outside of the subdivision on the west, other lots in DVE on the north and east, the San Juan National Forest on the lower east, and Treatment Area 4 on the south.

Priority Treatment Needs by Lot for Area 5

Lot	Treatment(s)
6	Pine thinning
7	No treatment needed
8	Oak mowing
9	Pine thinning
10	Oak mowing
11	Oak mowing and pine thinning
12	Oak mowing
13	No treatment needed
14	No treatment needed
32	Oak mowing and pine thinning

Treatment Area 6:
Located in the northeast portion of the subdivision south of U.S. Highway 160 and Beaver Creek, Treatment Area 6 includes all or portions of lots 19-29 and totals 35.1 acres. Wieland Drive is within the treatment area and provides access. It is bordered on the south by the San Juan National Forest, by private land outside the subdivision to the east, and by other lots within DVE on the north and west.

Priority Treatment Needs by Lot for Area 6

Lot	Treatment(s)
19	Pine thinning and oak mowing
20	Oak mowing in draw
21	Oak mowing
22	Oak mowing
23	Oak mowing and minor pine thinning
24	Oak mowing
25	Oak mowing and pine thinning
26	Pine thinning and oak mowing
27	Pine thinning and oak mowing
28	Pine thinning
29	Pine thinning

San Juan National Forest (North) Treatment Area:
This area totaling 3.8 acres, although it could be expanded, is located immediately south of Treatment Area 6 and includes the area immediately below lots 22-23. Access is from the end of Wieland Drive. This parcel of National Forest property has not been previously treated and is not within the future Saul's Creek Fuels Reduction Project area. The priority treatment need within this area is pine thinning.

During periods of high to extreme fire danger a wildfire will rapidly exceed the suppression capability of the local fire suppression forces. Table 3: Deer Valley Estates Fire Behavior Prediction (see page 14) shows the difficult position firefighters will face on a dry, windy day.

Homeowners should not expect much protection intervention if/when a large fire burns near or through DVE. The harsh realities of triage and coordinating attack with mutual aid forces will consume local fire forces for a considerable period of time**. Fire Wise rated defensible space is the key to structures surviving on their own**. It is highly recommended by all parties to this document, that all property owners make achieving and maintaining defensible space the highest priority. Vacant property owners are strongly encouraged to mitigate natural fuels both to protect the value of their property and to help defend neighboring structures and property.

The Board of Directors will encourage residents to set new homes back from the edge of steep brushy slopes using the guidelines provided in "Creating Wildfire Defensible Space Zones", Circular #6.302 (Dennis, 2003). For example, Figure 2 shows the distance from a home for the Zone 2 defensible area. This is the distance from the home

where heavy fuel reduction should occur. On a 0% slope the recommended distance is 75 feet but on a 30% slope the recommended distance is 125 feet.

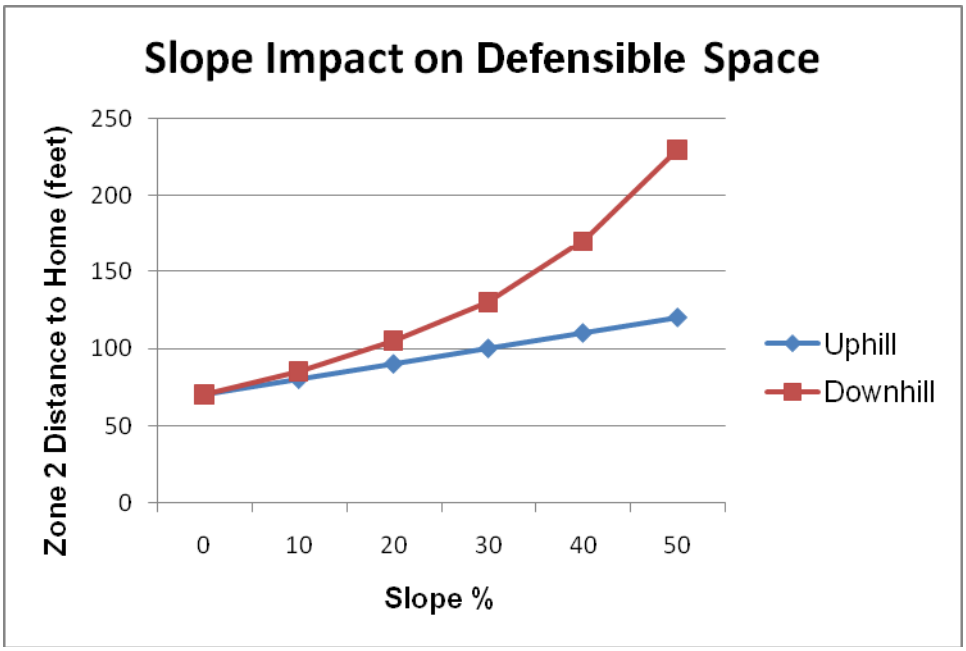


Figure 2: Slope Impact on Defensible Space.

Education and Information:

Deer Valley began participation in the Firewise Council in 2006 with the appointment of a "Neighborhood Ambassador". The mission of this participation is to keep homes, properties and lives from being damaged by wildfire. This is achieved through a neighborhood-based, citizen-driven approach, completing public education projects, encouraging and facilitating homeowners to undertake mitigation, and changing the public will to improve community safety.

The Neighborhood Ambassador, in cooperation with the Board of Directors has helped to produce (in 2008 alone); approximately 125 volunteer hours towards the clearing of the road right-of-ways throughout DVE. The Ambassador will be providing timely educational materials to residents of DVE, all year long and especially during Wildfire Prevention and Education Month every May.

Fuel Hazard Reduction:

The USFS/BLM recently cleared approximately two hundred feet (200) along three sides of the DVE boundaries. A shaded fuelbreak was formed through the

clearing of old growth Gambel oak and larger, older ponderosa pines. (A shaded fuelbreak is a fuelbreak which not completely void of vegetation).

Some roads in Deer Valley run along ridges and provide opportunities to make a stand against an aggressive fast-moving wildfire and thus are good locations for shaded fuelbreaks which can be created by thinning on both sides of the road. Road rights of ways (ROW) extend thirty (30) feet each side of the center of the road. A 60-foot wide break is a start towards an adequate break in fuel continuity but may not be adequate to provide the type of safety needed in this Wildland-Urban Interface area. Thinning of the ROW has taken place for several years by the DVE volunteer work days, but has usually only concentrated on Gambel oak. The dead or dying trees are removed on a yearly basis by LPEA as all of the overhead power lines and poles are within the ROW. Thinning to get the full 60-foot wide break will require the removal of a great number of ponderosa pines. It is crucial that the ROW be cleared as much as is feasible.

Table 5: Deer Valley Estates Potential Shaded Fuelbreaks and Map E: Wildfire Mitigation Treatment Areas provide the detail for the recommended fuel treatments.

This is an extremely ambitious shaded fuelbreak program and will be a challenge to accomplish across the multitude of ownerships; however, the project will help to break up the hazardous fuel continuity in DVE.

Table 5: Potential Shaded Fuelbreaks in Deer Valley Estates.

Fuelbreak Name	Length (miles)	Acres	Estimated Cost ($)	Priority
Wieland Drive	0.52	1.89	4,158	1
Beaver Creek Drive	1.85	6.73	14,806	2
Elk Valley Road	0.63	2.29	5,038	3
Spur Lane	0.16	0.58	1,276	4
Sawmill Circle	0.25	0.91	2,002	5
Stagecoach Road	0.12	0.44	968	6
Log Cabin Lane	0.07	0.25	550	7
Total	3.62	13.16	28,797	
Fuel Treatment Areas	**Length (miles)**	**Acres**	**Estimated Cost ($)**	**Priority**
Area 6	-0-	35.1	77,220	1
National Forest – North	-0-	3.8	8,360	2
Area 4	-0-	52.9	116,380	3
Area 2	-0-	85.3	187,660	4
Area 5	-0-	29.2	64,240	5
Area 1	-0-	23.4	51,480	6
Area 3	-0-	39.6	87,120	7
Total	-0-	269.3	592,400	

Fuelbreak Maintenance: Gambel oak is the most abundant understory species in DVE. Gambel oak also sprout vigorously after they are cut or trimmed. Keeping them under control after thinning will be a task. Two methods are effective to keep them under control. Mowing is effective but has to be done on a yearly basis. Herbicide treatment is also effective but is expensive and may be objectionable to some landowners. See Appendix G: Defensible Space Maintenance & Gambel oak for further information on herbicide control of Gambel oak.

DVE Board of Directors would be wise to have a maintenance option in mind before conducting a full ROW fuel break.

Treatment Cost: Defensible space and shaded fuelbreak treatment costs are highly variable depending on the amount of thinning and slash disposal to be accomplished and the relative care involved in doing the work. Hand crews working next to structures and chipping the slash will cost from $1,500 to $3,400 per acre. Mechanical thinning with hydro-ax type machine may cost from $600 to $2,000 per acre depending on the tree density, slope and rockiness (Mike Kane Sr. M&M Enterprises, Inc. 2009).

Prescribed Fire: Deer Valley Estates is well suited to the appropriate use of broadcast prescribed fire. The lot sizes are relatively large, resulting in a very low density of structures and improvements. The gentle topography of the area makes prescribed burning easier and reduces the potential rate of spread of the fire. Ponderosa pine and Gambel oak fuels within DVE burn readily under prescribed fire conditions but are also very consistent and predictable. Prescribed fire removes a large portion of the litter on the forest floor which lowers the intensity and slows the spread of wildfires. Prescribed fire top-kills the Gambel oak reducing or eliminating ladder fuels, while pruning the lowest branches of the ponderosa pine trees. These factors make the use of prescribed fire a very effective tool for fuel reduction and wildfire mitigation in DVE. Prescribed fire is best used in conjunction with mechanical treatments and as a cost effective and ecologically sound method to maintain and enhance treatments over time.

Wildfire Suppression Infrastructure: Turnarounds: Space is lacking to turn around large fire equipment at the end of most dead-end streets. In fact in most cases the terminus is even tight for full-sized SUV's. Accommodations for turning vehicles around near the ends of the road are critical for emergency service purposes. In some cases there is not adequate room to construct turnarounds at the end of the roads, so locating a turnaround as near to the end as feasible is the only option.

Fire Control Features/ Triage Maps: The maps developed for the CWPP provide valuable information for wildland firefighting. While the UPRFPD personnel may generally know DVE layout, reinforcements and mutual aid

personnel will not. Communications will be enhanced by providing quality maps that show important features.

The Deer Valley Board of Directors will provide a set of maps to local dispatchers, first responders, the Sheriffs Department, the Colorado State Forest Service, the USFS/BLM and La Plata County OEM. Several will be reserved to distribute during the inevitable emergency.

The two 10,000-gallon underground water tanks (these are dry hydrants) are set up for the fire districts use and are plumbed to their specifications. These tanks must be refilled after each use.

Uniform Street Addresses: Standardized, universally installed, visible, reflective street address signs or markers are absolutely imperative for first responders' effectiveness. La Plata County has already assigned the street numbers and presently the county is providing these signs free of charge. The DVE Board of Directors has facilitated the installation of these standardized address signs. The DVE Board will follow up to ensure all of these signs are posted properly, including those on vacant lots.

Utilizing Pond Water for Wildfires: The three ponds within DVE are adjacent to roads, however, due to seasonal precipitation these ponds should not be counted upon for fire suppression work. During an emergency situation the incident commander will need to make the on-site call whether the ponds can be used or not. Additionally, at the end of the summer season these ponds may be low and once pumped out do not replenish themselves by natural means until after the spring snow melt.

Evacuation Planning: The DVE community should have a pre-designated principal evacuation route. The principal evacuation route should:

- Lead away from the advancing wildfire to a safety zone.
- Be designed with consideration of prevailing winds and avoid areas of dense forest fuels.
- Be wide enough for two-way traffic (consider incoming fire emergency vehicles).
- Be well marked with standard signage. Road surface and grade should be suitable for two-wheel drive vehicles.

In most wildland-urban interface zones, the principal access route will also serve as the principal evacuation route. This currently is the case in the DVE development. All access routes should be built and maintained to a standard that allows them to be safely used for an evacuation.

Secondary evacuation roads are also important to DVE residents. They may be the only routes to safety in the event that the principal route is blocked by fire or emergency vehicles. Currently DVE has NO secondary evacuation routes. Researching this potential must be accomplished, but may prove to be a daunting task.

When an evacuation order is given by the local officials, just making sure that everyone is notified will be a major task. The current e-mail and phone trees may work for some, but time will be of the essence. Back-up plans should be in place when key individuals in the calling tree are unavailable, as wildland fires spread quickly depending upon a number of factors. An evacuation simulation would be a real test for DVE residents and should be addressed by the Board of Directors. A test run would give everyone involved a better sense of the task to be undertaken.

Strategic Recommendations: The Deer Valley Board of Directors/Firewise Committee is composed entirely of volunteers who are dedicated and committed to addressing pre-planning, hazard detection, follow up, communications, coordination, and/or implementation of improvements. The DVE community does have a mechanism for administering (Board of Directors) multiple demands, setting priorities, and insuring representation that benefits the community as a whole.

In order to strengthen the ability of DVE to implement the Community Wildfire Protection Plan, the Board of Directors should seek funds (through the Firewise Committee), to ensure implementation of the plan. These funds are principally available through the Colorado State Forest Service.

Table 6: Implementation Items Priority and Cost

Mitigation Action	Priority	Estimated Cost
Completion of Universal Street Addressing Signage	1	No Cost
Defensible Space Around 2 Structures ($5,500 per lot)	2	$ 11,000
Laminated Triage Maps (20 sets)	3	$ 1,300
Negotiate Emergency Routes Out of Deer Valley Estates	4	No Cost
Wieland Drive fuelbreak	5	$ 4,158
Prioritize and Construct (4 streets) Turnarounds on Dead End Streets	6	$ 28,000
Beaver Creek Drive fuelbreak	7	$ 14,806
Elk Valley Road fuelbreak	8	$ 5,038
Spur Lane fuelbreak	9	$ 1,276
Sawmill Circle fuelbreak	10	$ 2,002

Mitigation Action	Priority	Estimated Cost
Stagecoach Road fuelbreak	11	$ 968
Log Cabin Lane fuelbreak	12	$ 550
Evacuation Simulation	13	$ 1,500
Area 6	14	$ 77,220
National Forest (North)	15	$ 8,360
Area 4	16	$116,380
Area 2	17	$187,660
Area 5	18	$ 64,240
Area 1	19	$ 51,480
Area 3	20	$ 87,120
Fuel Break Maintenance	Ongoing	Variable
Seek Funds for the Plan	Ongoing	No Cost
Total		**$663,058**

V. Implementation & Monitoring

Implementation

Table 6 lists the mitigation action/projects identified in the CWPP. There are also an estimated two (2) homes that need to improve their defensible space so that they are defendable.

Table 7: Action Plan for Completing the Deer Valley Estates CWPP identifies the responsibilities and task necessary to accomplish the work at hand. The priorities and responsibilities have been negotiated and agreed to by the POA Board of Directors and the various individuals involved.

Monitoring

This CWPP will not just automatically complete itself. Monitoring is a crucial role of seeing the plan through to completion. Considering the values at risk in DVE, it will be important to take a reading of the accomplishments on an annual basis. The POA will revisit the CWPP and associated accomplishments each summer (prior to the annual meeting), and make adjustments to the Plan in form of revisions.

The Board of Directors and Firewise Committee will seek funds through the Colorado State Forest Service for the purpose of implementing this plan. In addition, the Board of Directors/Firewise Committee will do the following:

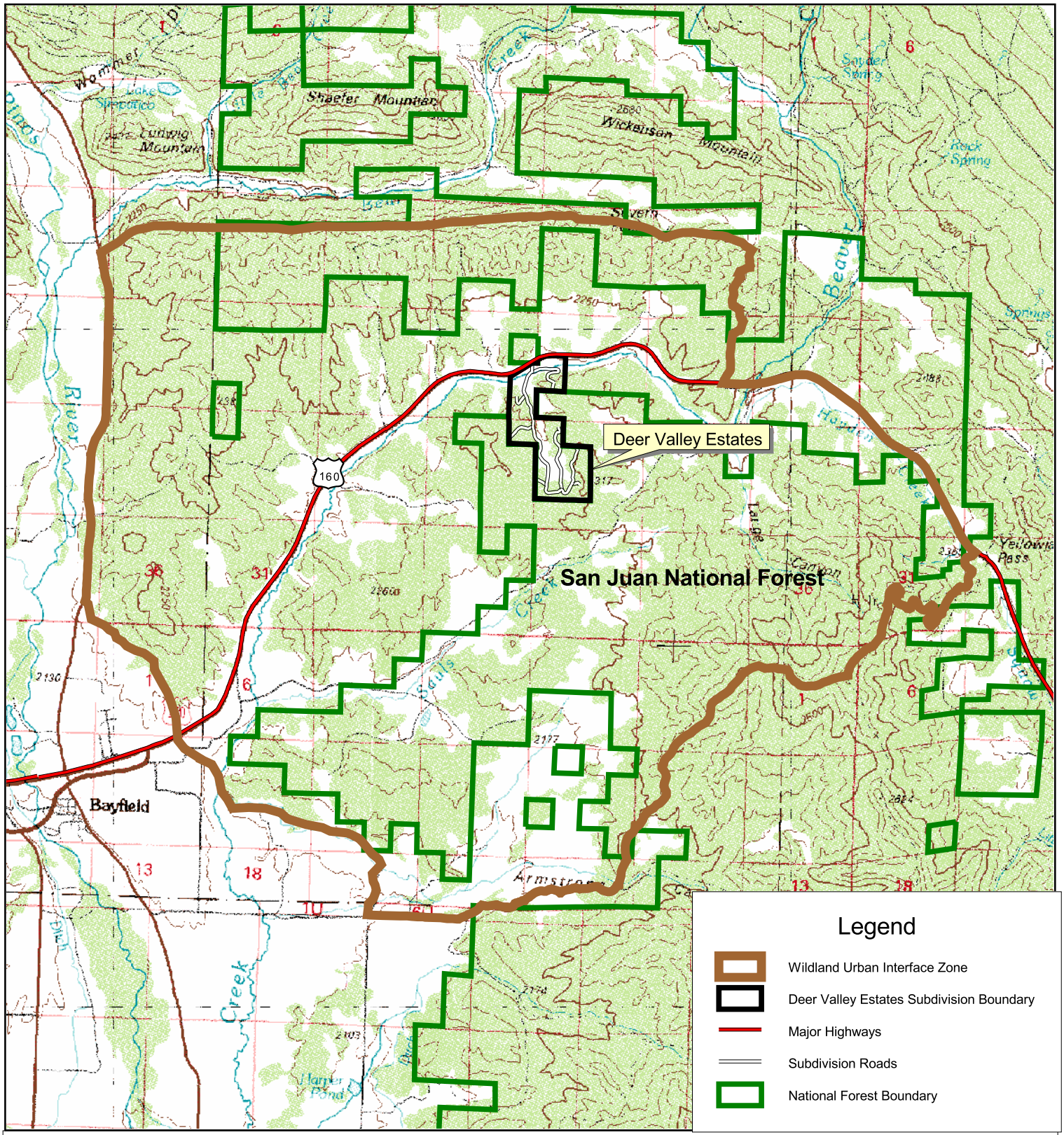
- Establish a prevention attitude in the community for wildfire.
- Strengthen public understanding and acceptance, and participating in UPRFPD operation and improvement proposals.

- Facilitate the ongoing cooperation between the DVE Board of Directors, UPRFPD Board of Directors, USFS/BLM, and La Plata County officials.

Table 7: Action Plan for Completing the Deer Valley Estates CWPP

Mitigation Action	Target Dates	Assigned to	Completed
Completion of Universal Street Addressing Signage	08/01/2009	Addressing Committee	
Defensible Space Around Structures	Fall 2010	Bd. of Directors	
Laminated Triage Maps(20 sets)	Fall 2009	Firewise Ambassador	
Prioritize and Construct Turnarounds on Dead End Streets	Fall 2012	Bd. of Directors	
Beaver Creek Drive fuelbreak	Fall 2009	Bd. of Directors	
Elk Valley Road fuelbreak	Spring 2010	Bd. of Directors	
Spur Lane fuelbreak	Spring 2010	Bd. of Directors	
Sawmill Circle fuelbreak	Spring 2010	Bd. of Directors	
Stagecoach Road fuelbreak	Spring 2010	Bd. of Directors	
Log Cabin Lane fuelbreak	Fall 2009	Bd. of Directors	
Wieland Drive fuelbreak	Fall 2009	Bd. of Directors	
Area1	07/01/2011	Bd. of Directors	
Area2	07/01/2012	Bd. of Directors	
Area3	07/01/2013	Bd. of Directors	
Area4	07/01/2014	Bd. of Directors	
Area5	07/01/2015	Bd. of Directors	
Area6	07/01/2016	Bd. of Directors	
National Forest (North)	07/01/2017	Bd. of Directors	
Fuel Break Maintenance	Ongoing	Bd. of Directors	
Negotiate Emergency Routes Out of Deer Valley Estates	ASAP	Firewise Ambassador	
Seek Funds for the Plan	Ongoing	Firewise Ambassador	
Evacuation Simulation	Spring 2010	Bd. of Directors	

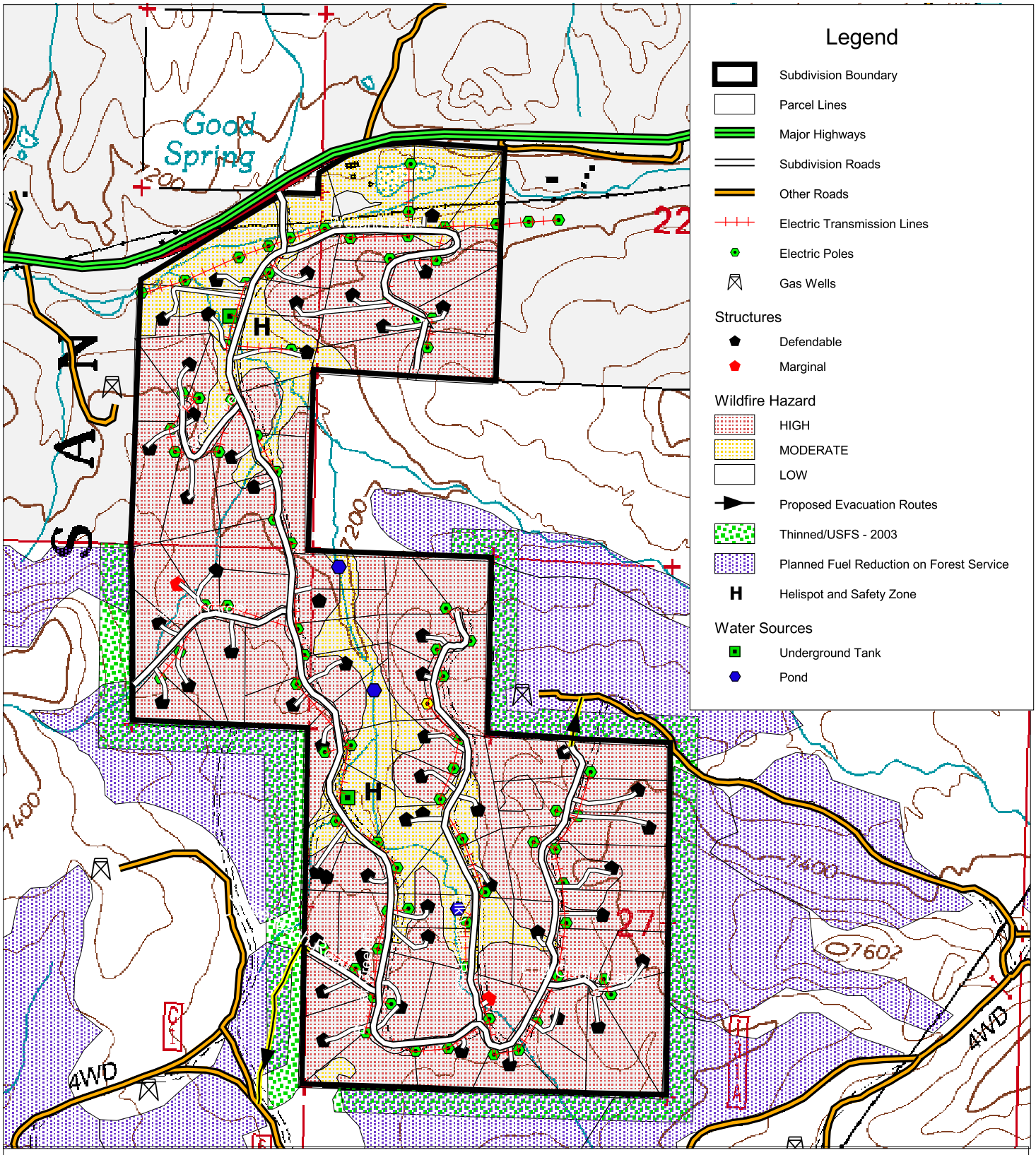
Deer Valley Estates
Community Wildfire Protection Plan
Map A: Wildland Urban Interface Zone



S. Wagner
Paragon Consulting
6/9/2009

Base Map USGS Topographic Quaduangle 1:100,000
Contour Interval 30 meters
Elevation in Meters

Deer Valley Estates
Community Wildfire Protection Plan
Map B: Wildfire Hazard and Mitigation Tratments on Forest Service



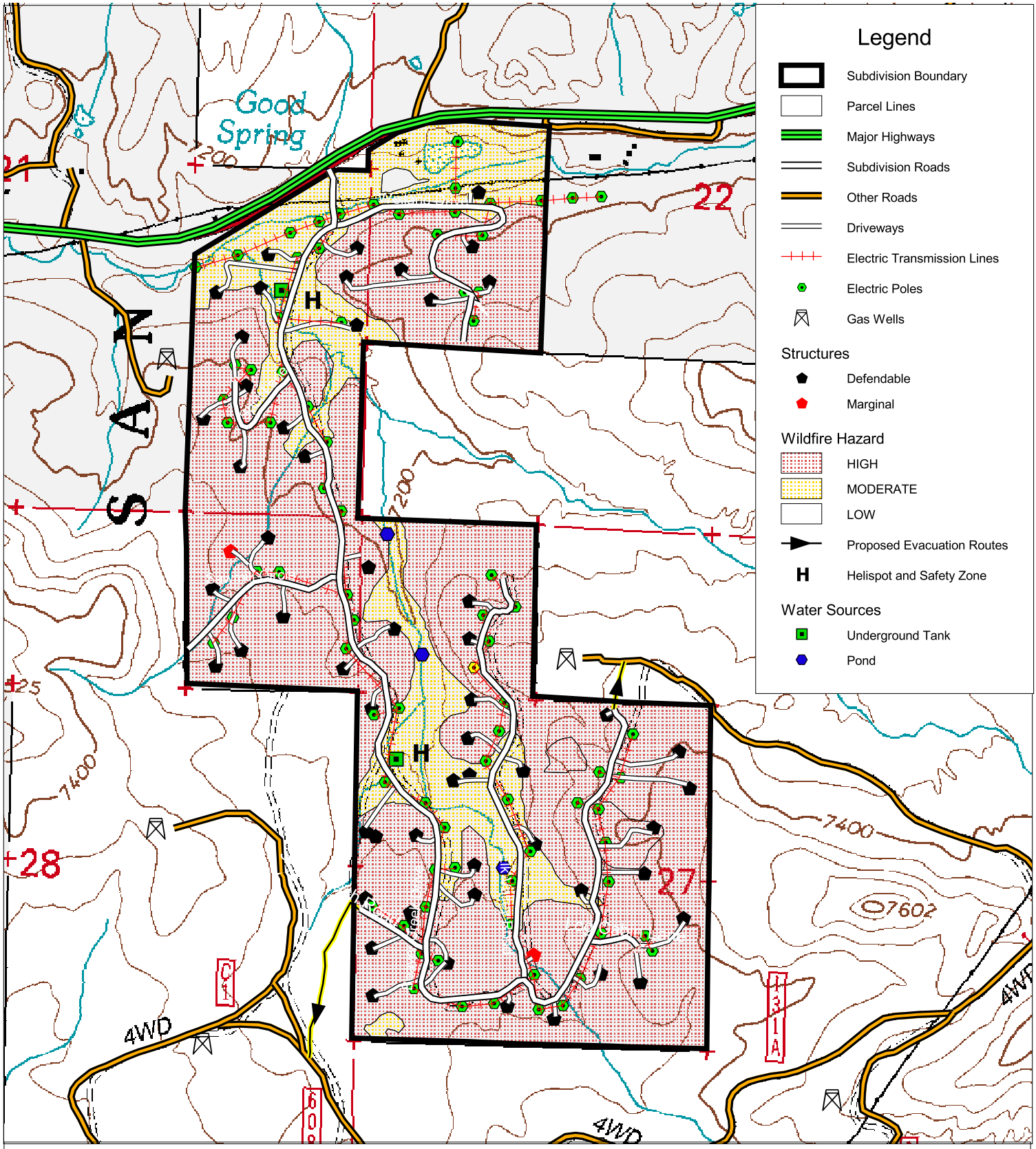
0.5 0 0.5 Miles

N

S. Wagner
Paragon Consulting
10/21/2009

Base Map USGS 1:24000 Topographic Quad
Contour Interval 40 feet Elevations in Feet

Deer Valley Estates
Community Wildfire Protection Plan
Map C: Wildfire Hazard and Triage



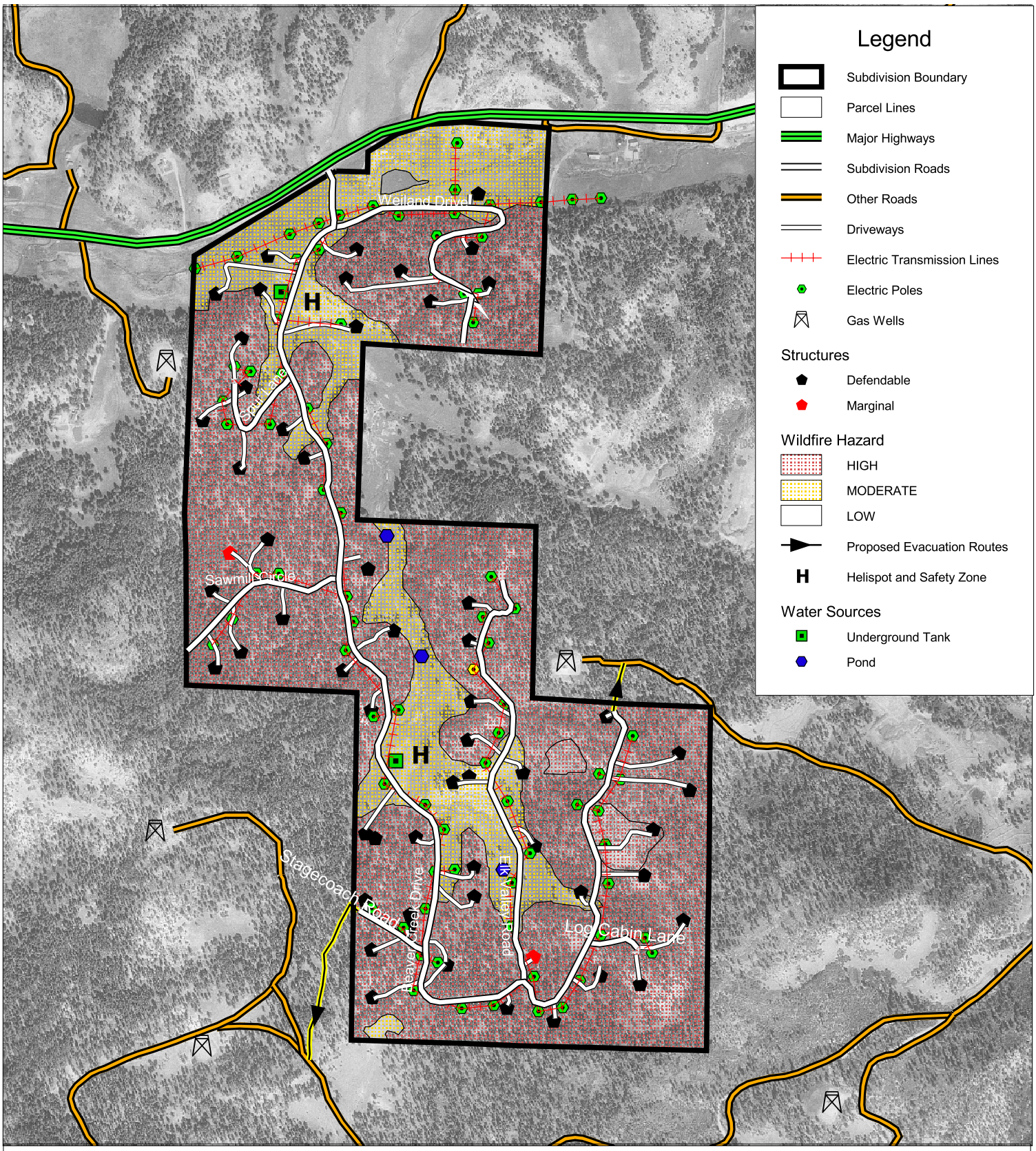
0.5 0 0.5 Miles

N

S. Wagner
Paragon Consulting
11/21/2009

Base Map USGS 1:24,000 Topographic Quad
Coutour Interval 40 feet. Elevations in feet.

Deer Valley Estates
Community Wildfire Protection Plan
Map D: Wildfire Hazard and Triage



0.5 0 0.5 Miles

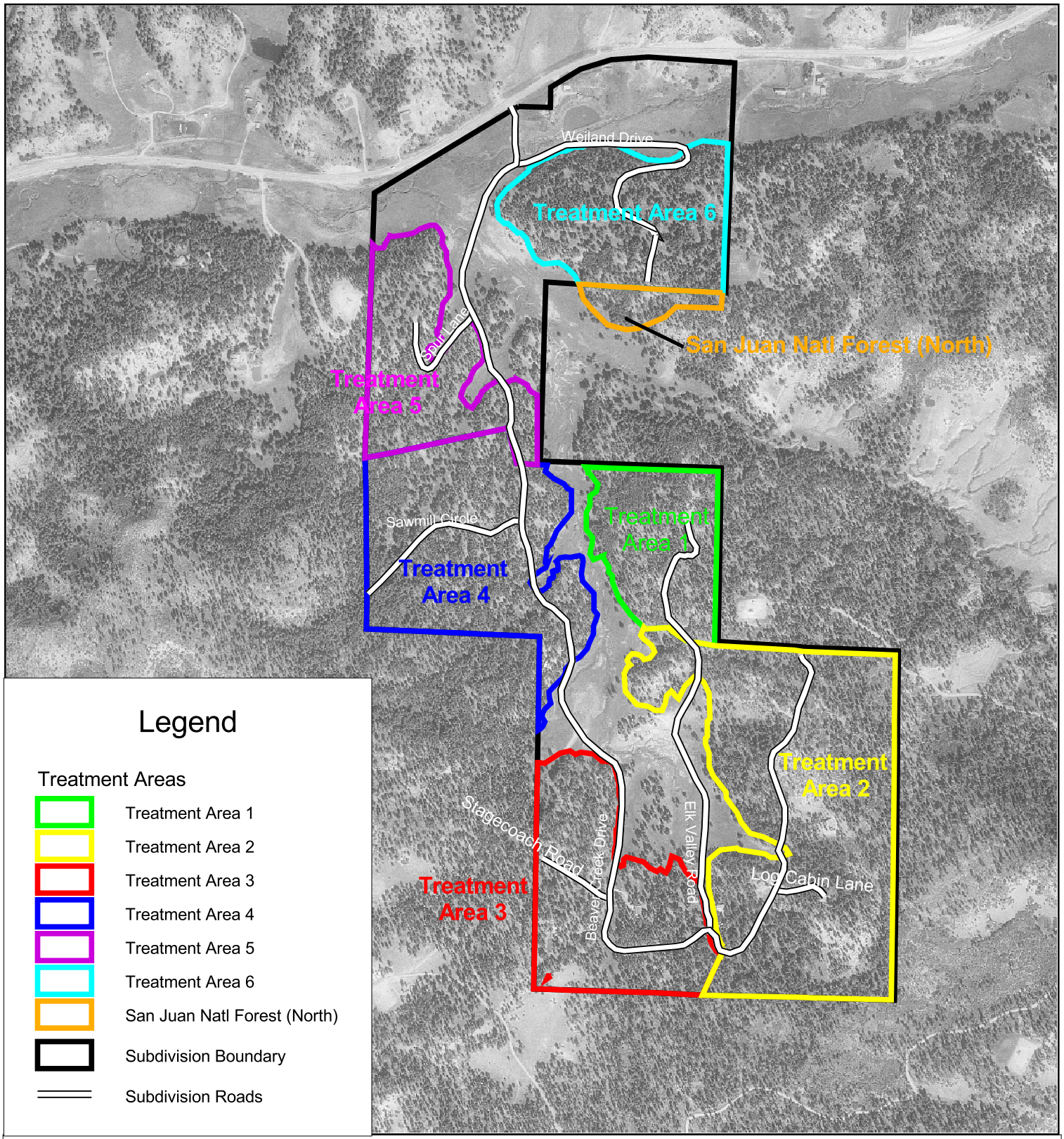
N

S. Wagner
Paragon Consulting
11/21/2009

Base Map USGS Digital Orthophoto

Deer Valley Estates
Map E: Wildfire Mitigation Treatment Areas

Community Wildfire Protection Plan



Legend

Treatment Areas

- Treatment Area 1
- Treatment Area 2
- Treatment Area 3
- Treatment Area 4
- Treatment Area 5
- Treatment Area 6
- San Juan Natl Forest (North)
- Subdivision Boundary
- Subdivision Roads

0.5 0 0.5 Miles

N

S. Wagner
Paragon Consulting
11/21/2009

APPENDIX F – Fuel Hazard Reduction Guidelines

MINIMUM TREE SPACING – RULE OF THUMB
Strive to reduce crown density to 40% or less.

<u>Ponderosa Pine/Douglas Fir</u>: Convert stem diameter from inches to feet and add 7 more feet.

> **Example:** A Ponderosa Pine 8" in diameter at DBH will have a spacing of 8 feet plus 7 feet for a total of 15 feet to the next tree.

Tree spacing does not necessarily need to be even. In fact, the fuel treatment area will look more natural if the spacing varies and small clearings are intermingled with small groups of trees. The important focus should be on breaking up fuel continuity – both horizontally and vertically.

If trees are very tall in relationship to their diameters, implement the thinning work over a long enough time to allow the standing trees to develop their wind firmness and resistance to snow bend. Thinning when trees are small helps reduce prevent these vulnerabilities. Thinning in patches and designing the thinning to minimize wind effect can be done depending on location. All of these can be used but can best be accomplished with the assistance of an experienced forester.

An important part of fuel hazard reduction is removal of the ladder fuels; particularly when adequate thinning cannot be accomplished. Therefore, the following is important to do within a timber canopy.

- ✓ Prune trees to 6 or 10 feet above the ground, depending on slope, leaving at least 1/3 live tree crown
- ✓ Remove tree reproduction from under the canopies of remaining trees
- ✓ Remove sagebrush, oak or any other flammable brush from under the canopies of remaining trees. Reduce the size and height of remaining clumps of brush
- ✓ Remove all dead forest debris within defensible space and fuelbreak areas.
- ✓ Reduce concentrations of dead forest debris within other areas
- ✓ Remove trees recently killed by mountain pine beetle* or other disturbances within defensible space and fuelbreak areas.
- ✓ Reduce numbers of trees recently killed by mountain pine beetle* or other disturbances in other areas. Only 1 to 3 dead

trees per acre are needed for wildlife habitat purposes.

***Note:** Proper slash disposal procedures should be implemented to avoid attracting Mountain Pine or other bark beetles to the project area.*

Appendix G: Defensible Space Maintenance and Gambel Oak

In general, residents in the Deer Valley Estates have made significant efforts to reduce fuels around their structures. They have and are continuing to thin trees, removing the lower limbs (ladder fuels) and attempting to clear the Gamble oak. The heavy woody material has been cut and stacked for firewood and the lighter material has been chipped and spread on the ground. While their efforts in reducing fuels provided by ponderosa pine have produced a more defendable space around their homes, clearings in the Gambel oak are more troublesome. Residents complain about the aggressive sprouting that occurs after clearing the oak and the continual clearing process that is necessary to hold the oak brush in check.

Gambel Oak is a native plant that is naturally associated with pinyon-juniper and ponderosa pine forests in southern Colorado. It is a deciduous shrub that is quite adaptable and easily finds a niche in the under story of these forest types as well as in relatively pure stands. It thrives on steep slopes as well as on more moderate sites and on a variety of coarse and medium textured soils. Gamble oak grows in clumps that are interconnected by an extensive root system that is characterized by both shallow rhizomes and deep-feeding roots. These rhizomes send up numerous sprouts when the mature stems are removed or when injury occurs.

Eradication of Gambel oak is rare by any method and without complete kill prolific sprouting may occur from roots, rhizomes and basal stems. Treated areas usually assume a "thicket" like appearance several years after the initial work (1). Numerous chemicals and combinations of chemicals have been used with limited success to control Gambel oak. Mechanical treatment, such as cutting stems and burning, are common methods of removing oak brush, but it usually results in aggressive sprouting. Biological control of sprout with repeated browsing by goats has proven to be an effective means of near elimination of oak sprouts, however, browsing by goats is not considered to be practical in all situations. Goats prefer Gambel oak leaves for forage, and after several years of repeatedly defoliating the oak during the period before the oak leaves reach full growth, most of the sprouts are killed (1).

On the Deer Valley Estates where Gambel oak has been cut and sprouting is occurring, the most likely treatment is one that repeatedly defoliates the oak during mid summer. The positive effect of this repeated defoliation has been demonstrated using herbicides (1), or prescribed burning (2). Defoliation may be accomplished by:

- Mowing or chopping sprouts during mid summer;
- Using goats to browse the leaves and young shoots during mid summer;
- Using an approved herbicide following instructions on the label kill or defoliate the sprouts during mid summer which coincides with the time when leaf growth is reaching maximum. Some herbicides are restricted and require an Applicator's License to use. It is suggested that the La Plata County Weed control Specialist be contacted for local advice and guidance prior to using a herbicide at (970) 382-6470).

New Mexico State University Cooperative Extension Service Circular 597 contains a list of herbicides for controlling Gambel oak and other undesirable brush species (3). Table 1 contains an excerpt from Circular 597.

Table 1: Herbicides for controlling Gambel oak (5):

Trade Name and Product Rate/Acre	**Herbicide Common Name and Active Ingredients**	**Spray Volume Per Acre Or Individual Plant**	**Time Of Application**	**Remarks**
Spike 20P ¼ oz. per 22 sq. ft. when treating\clump or thicket.	Tebuthiuron	Individual plant treatment. Anytime of year.	Optimum is prior to rainy season.	Distribute uniformly under canopy. Do not apply to frozen or snow covered ground.
OR Spike 20P 3 ¾ to 7 ½ lbs. pellets.	OR Tebuthiuron ¾ to 1 ½ lb.	Aerial broadcast	Anytime during the year. Optimum is prior to rainy season.	Distribute uniformly under canopy. Do not apply to frozen or snow covered ground.
OR Velpar L 2-4 ml. per 33 sq. ft. of canopy diameter.	OR Hexazinone	Individual plant treatment. Anytime during year.	Optimum is prior to growing season.	Apply undiluted Velpar L to soil within 3 ft. of stem base. Use exact delivery handgun applicator. Do not apply to frozen ground. Do not use on clay soil.
OR Arsenal 1 gal. per 100 gal. Water,	OR Imazapyr 2 lb. per 100 gal. water with 0.25% surfactant.	Individual plant treatment or ground application.	Anytime during growing season when growing conditions are good.	Spray to wet.

Bibliography

(1) Engle, D.M., C.D. Bonham, and L. E. Bartel. 1983. Ecological characteristics and control of Gambel oak. Journal of Range Management, 36(3).

(2) Harrington, M.E. 1989. Gambel oak root carbohydrates in roots of Gambel oak sprouts following herbicide treatment. Journal of Range Management, 42(6).

(3) Duncan, K. W., McDaniel and M. J. Renz. 2005. Chemical weed and brush control for New Mexico rangelands. New Mexico State University Cooperative Extension Service Circular 597. 18 p.

Appendix H

STRUCTURE TRIAGE

Triage is the determination of priorities for action during an emergency. This describes a concise decision making process that will be used if/when a wildfire threatens multiple structures simultaneously. It will be done rapidly and on the move. *This is a thought process that does not require completion of any paperwork.*

Structure:

Roof Type?	Siding?
Debris on Roof?	Fire Brand Traps?
Propane Tank?	Flammable Clutter?

Defensible Space:

Is There Any?	Adjacent Fuel Type ?
Water Supply?	Access/Turnaround?

Current & Expected Fire Behavior?

Available Firefighting Resources?

Firefighter Safety:

Escape Routes?	***Safety Zones?***

Quickly determine the status of each threatened structure and make decisions!

Clearly communicate the priorities and firefighter evacuation criteria!

Be ready to live with your decisions, they will be second guessed after the threat is over.

Your first priority is to live to fight fire another day!!

APPENDIX I – Evacuation Planning Guidelines

Background

The growth of urban development in forested wildland areas in recent years has resulted in a potentially hazardous situation. People are attracted to forested areas seeking solitude and to escape the pressures of every day life. Large land holdings have been subdivided into small affordable acreages for cabin sites or remote homes. At the same time wildfires have been aggressively suppressed allowing young trees to establish in high densities and dead fuels to accumulate to alarming levels. These ladder fuels provide a "leg up" for a wildfire to burn into the crowns and move rapidly under windy conditions. The new generation of small lot landowners value individual trees and have built their cabins under the cover of these overstocked forests. Cabins are constructed on prominent points or ridge tops for the view or they are tucked into the forest canopy seeking solitude. In order to minimize the impact of their presence on the land driveways are often narrow with inadequate opportunities to turn around at the building site. Little attention has been paid to the potential destructive capacity of an uncontrolled wildfire.

In an emergency wildfire situation that threatens the lives and property of residents in the area, the Upper Pine River Fire Protection District, in consultation with the fire suppression team and La Plata County Sheriff's Department, has the responsibility and authority for evacuation of residents to a safe area. Prior evacuation planning is essential to implement this action effectively.

By definition, evacuation is a protective action – moving people from a place of danger to a place of relative safety. As a phenomenon, it is a temporary mass movement of people that collectively emerges in coping with a threat to Deer Valley Estates residents and visitors.

An Evacuation Plan will facilitate this orderly evacuation during an emergency wildfire situation that threatens residents and facilities. Step by step actions provide critical information and guidance for fire suppression, and law enforcement personnel during an emergency situation. Deer Valley Estates has an evacuation plan for their area that should be revised to identify potential evacuation routes and critical information (locked gates, inadequate bridges, etc.) for a variety of wildfire threat scenarios.

Critical Contacts

County Sheriff	970-385-1324
Colorado State Patrol	970-385-1675
Colorado State Forest Service	970-264-5250
Interagency Dispatch Center	970-385-1324
Office of Emergency Management	970-382-6274
Upper Pine FPD Administration	970-884-9508

Local News Media
Red Cross
Local Towing Service
Others _____

Check List When Potential For Evacuation Exists

1) Close back country roads and trails at the trail heads.
2) Post on bulletin boards information regarding fire danger.
3) Set up a local Information Center where residents and visitors can access up to date information and status regarding wildfire that pose a threat to the area.
4) Provide routine updates on wildfire conditions for local radio and television stations as the threat increases.
5) When the fire suppression team and or Sheriff's Deputy believe evacuation may become necessary, notify the La Plata County Sheriff and Fire Warden.
6) Fire suppression team and Property Owners Association representative should meet with the Sheriff to decide if an evacuation is necessary. The decision to evacuate should be made and implemented well before the evacuation needs to be complete. Local conditions and the fire's rate of advance will dictate when to call for the evacuation.
7) Sheriff in consultation with the POA makes the decision to evacuate the threatened area and implements the actual evacuation.
8) Notify residents and visitors of the Order to Evacuate:
   - Siren to alert visitors in the back country;
   - Law enforcement patrol vehicles with public address systems announce evacuation order;
   - House to house verification that threatened home site development is completely evacuated;
   - Law enforcement vehicles and ATV's drive back country roads and trails to assure evacuation;
   - Use one color flagging to mark secondary roads/trails at their junction with the primary road (evacuation route) when notification is in progress then change to another color when verification is complete on that roads/trail.
9) Drive evacuation routes installing free standing traffic control signs at key road intersections and opening locked gates or cutting fences to allow exit.
10) Notify Federal Emergency Management Agency (FEMA).
11) Notify Colorado State Patrol.
12) Assign law enforcement to direct traffic at critical road junctions.

The officer in charge of the evacuation will make the decision regarding which evacuation route to use at the time. Depending on the situation the decision may be to use any or all of the routes to evacuate the threatened area.

Emergency Evacuation Routes
Primary emergency evacuation routes are suggested, but should be validated with landowners and land managing agencies involved prior to the onset of an emergency need for evacuation. These primary evacuation routes should provide multiple opportunities for evacuating traffic to exit the area. Hazardous fuel concentrations should be treated along primary evacuation routes to reduce canopy cover to 40 percent or less and remove slash and combustible debris within 150 to 200 feet of the road. Tributary roads should be identified in local developments and treated similarly to facilitate a safe and orderly evacuation.

Estimated Time to Implement an Evacuation
The decision to evacuate a threatened area must be made well in advance of the time the fire is expected to threaten residents, visitors and facilities.

Fire Behavior and Evacuation Timing
Rate of Spread (ROS) is the key fire danger component to monitor. The ROS is a numerical value derived from a mathematical model that integrates the effects of wind and slope with fuel bed and fuel particle properties to compute the forward rate of spread at the head of the fire. Output is in units of feet per minutes. A ROS of 31 indicates a worst-case, forward rate of spread of approximately 31 feet per minutes.

The inputs required to calculate the ROS are wind, slope, fine fuel moisture (including the effects of green herbaceous plants), and the moisture content of the foliage and twigs of living, woody plants.

Since characteristics through which the fire is burning are so basic in determining the forward rate of spread of the fire front, a unique ROS table is required for each fuel type.

When considering spotting the rich diversity of fuel types scattered throughout the County, and the likelihood of wind, it may be prudent, when fire danger is "Very High", to start an evacuation process when wind brings a fire to within 6-7 miles of the Deer Valley Estates or home site development area (urban interface area). Knowing the ROS for the most prevalent fuel type between where the fire is and where the home site developments are, can best refine this judgment call.

Spread Component (SC) is one of the National Fire Danger Rating System fire behavior outputs. It can be found in the daily Remote Automated Weather Station printouts. The Spread Component provides the fires forward rate of spread in feet per minute. With a SC of 44, a fire will cover two miles or more within four hours. If the SC is 22, the fire will cover at least one mile within four hours and two miles within eight hours. If the SC is 11, the fire will cover two miles within 16 hours.

If the SC is five, the fire can cover two miles within 32 hours.

Timing
Evacuation planning needs to take into account how long it will take to notify residents that an evacuation is necessary, how long it will take for them to get ready and start driving out of the area, and then how long it takes to actually drive to a safe area. This determination should be made locally, and then validated before it is used during an emergency.

Every situation will be different, but it is reasonable to estimate the minimum time required to be no less than four hours to complete the process. As much as three hours may be required to notify residents and visitors and get them started moving, and another hour to get everyone out of the area. Residents and visitors closest to the advancing threat should be notified first. Once they area driving out of the area it will take them up to half an hour in most cases to exit the area if traffic is flowing at a rate of 10 to 20 miles per hour.

Driving time should be measured on each of the potential evacuation routes by driving at a conservative speed depending on road conditions and how many people are expected to be evacuated.

Travel Time for Evacuation Routes

Beginning Point	Ending Point	Time Required	Miles Traveled	Average Speed

This table provides GPS coordinate locations for critical points referred to:

GPS Locations for Critical Features and Facilities

Feature	GPS Location

Recommendations
- Negotiate agreements with neighboring private land owners to allow evacuation across their property, on their roads, and through their locked gates.
- Negotiate an agreement to thin fuels along the evacuation route between the subdivision or home development area and safe areas.
- Upgrade roads on evacuation routes by widening curves, providing water bars to prevent erosion and thinning fuels along these emergency exits.
- Construct and store freestanding “Fire Exit Directional Signs” or “Evacuation Route” for use in marking evacuation routes.

- Develop a specific evacuation procedure and assign responsibilities to County staff and POA members.

APPENDIX J – Definition of Terms

Community Wildfire Protection Plan (CWPP) - The Healthy Forest Restoration Act of 2003 establishes CWPP's as the means for communities in the wildland-urban interface to address their wildfire hazard concerns and decide how they wish to deal with them. CWPPs provide a common footing for setting priorities for the expenditure of local, state and federal funding. They are developed in a collaborative environment with all interested parties involved.

Crown Closure - An expression of how dense a forest is based on the amount of surface are covered by the crowns of trees. It is useful in many forest applications including wildfire hazard assessments. Research has shown the crown closure of forty percent or less is unlikely to support independent crown fires.

Defendability – A judgment of the likelihood that firefighters can safely protect a structure during the passing of an intense wildfire front. It is based on structure construction, expected fire behavior in the structure vicinity, open space for firefighters to operate in, escape routes, and availability of space to turn fire engines around.

Defensible Space – Area around a structure where fuels and vegetation are treated, cleared or reduced to slow the spread of wildfire towards the structure. It also reduces the chance of a structure fire moving from the building to surrounding forest. Defensible space provides room for firefighters to do their jobs.

Flame Length – The distance from the ground to the tip of a flame is an indication of fire intensity. Fires with flame lengths less than four feet are normally thought to be controllable with hand crews. Fires with flame lengths more than four feet are usually much more difficult to control and require heavy equipment to make much progress in suppression.

Fuelbreak – A linear zone of modified fuel conditions designed to reduce wildfire intensity that provides a safe place for firefighters to make a stand. They are most likely to be located on ridgelines. This zone has had the ground fuels cleaned up and the crown cover reduced to around forty percent.

Fuel Ladder – Is the fuel that creates a continuous path from the ground into the crowns of trees or large shrubs. The more abundant fuel ladders are the more prone a forest is to a crown fire. When the limbs of the overstory trees and the understory vegetation intermix, there is a continuous fuel ladder.

Fuel Model – A means of describing various woody fuel arrangements in terms of fuel size, bulk density, fuel bed depth and tons per acre. The models are used in fire behavior prediction software.

Fuel Moisture – The amount of water in fuel per oven dry weight usually expressed in percent.

Fuel Treatment – Project to reduce or change fuel loading or type on a site. This can be accomplished by mechanical, manual, chemical, or fire use.

Initial Attack – An aggressive suppression action consistent with firefighter and public safety and values to be protected.

Insurance Services Office (ISO) Rating – An overall fire services rating developed for use in determining insurance premiums for residential and commercial property. Factors such s fire alarm systems, equipment, training, availability of water (hydrants), etc. are used to develop the rating. The rating is on a scale of class 1 to class 10, with 1 providing the best public protection and 10 providing the lowest public protection. See www.iso.com for more details.

Mitigation Actions – Thos on-the-ground activities that will serve to increase the defensibility of an area; check, direct, or delay the spread of fire, and minimize threats to life, property, and resources. Mitigation actions may include mechanical and physical non-fire tasks, specific fire applications, and limited suppression actions. These actions will be used to construct fire lines, reduce excessive fuel concentrations, reduce vertical fuel, and create black lines.

Preparedness – Activities that lead to a safe, efficient, and cost-effective fire management program in support of land and owners management objectives through appropriate planning and coordination.

Rate of Spread (ROS) – The forward rate that a fire will progress across a landscape usually expressed in chains (66 ft.) per hour. ROS has been converted to miles per hour in this report to e more meaningful to the intended audience.

Resistance to Control (ROC) – a means of describing how difficult it is to build and hold fireline in a particular area. It is a relatively subjective term based on fireline production rates, slope and fuel density. Usually described as high, moderate, or low.

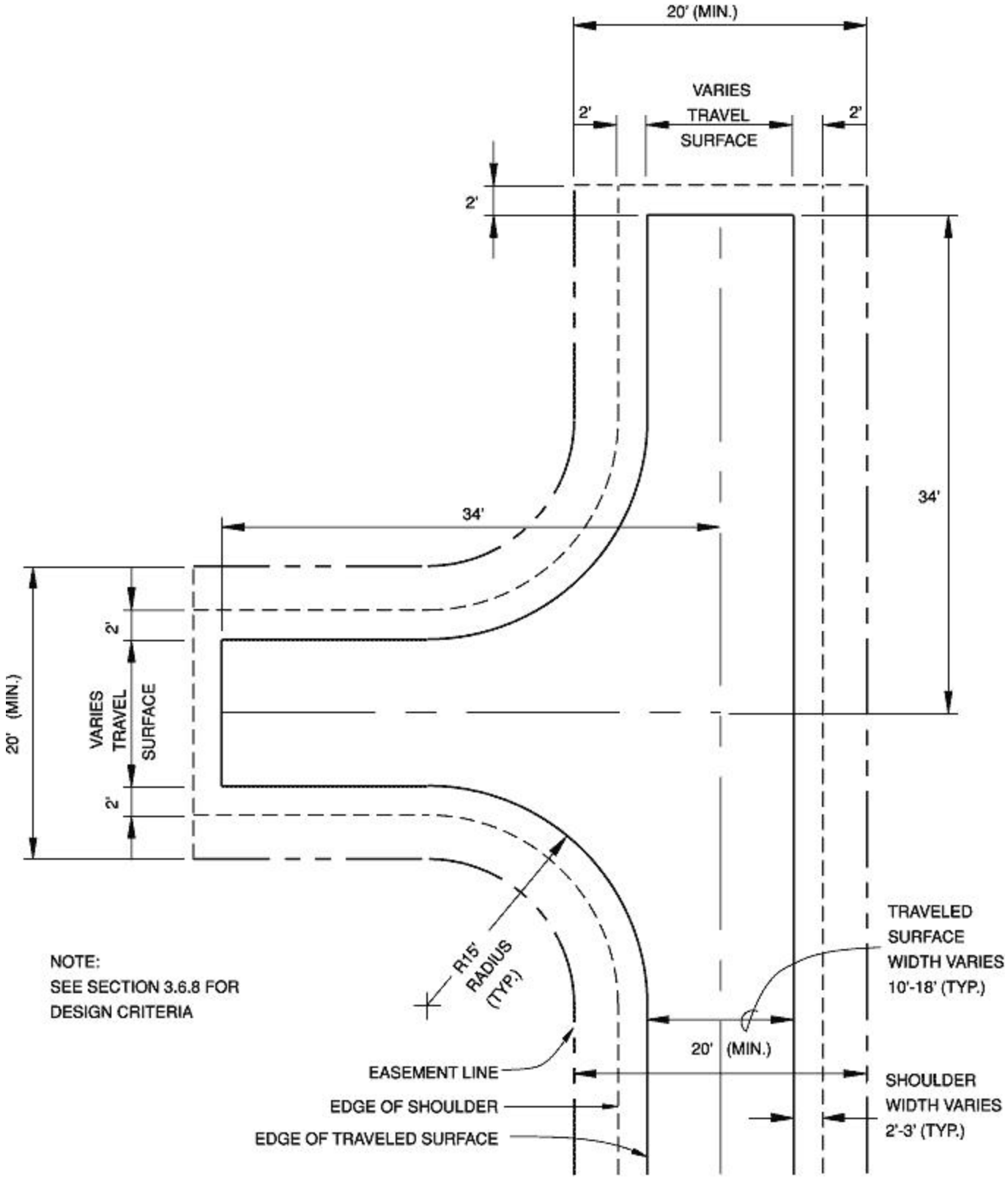
Spotting – One method by which wildfires spread by means of airborne embers landing in receptive fuel beds. Spot fires can travel unusual distances and often compromise firelines during periods of high fire danger.

Triage – A process of quickly setting priorities for action in emergency situations. It is particularly valuable when multiple structures are threatened and fire fighting resources are limited.

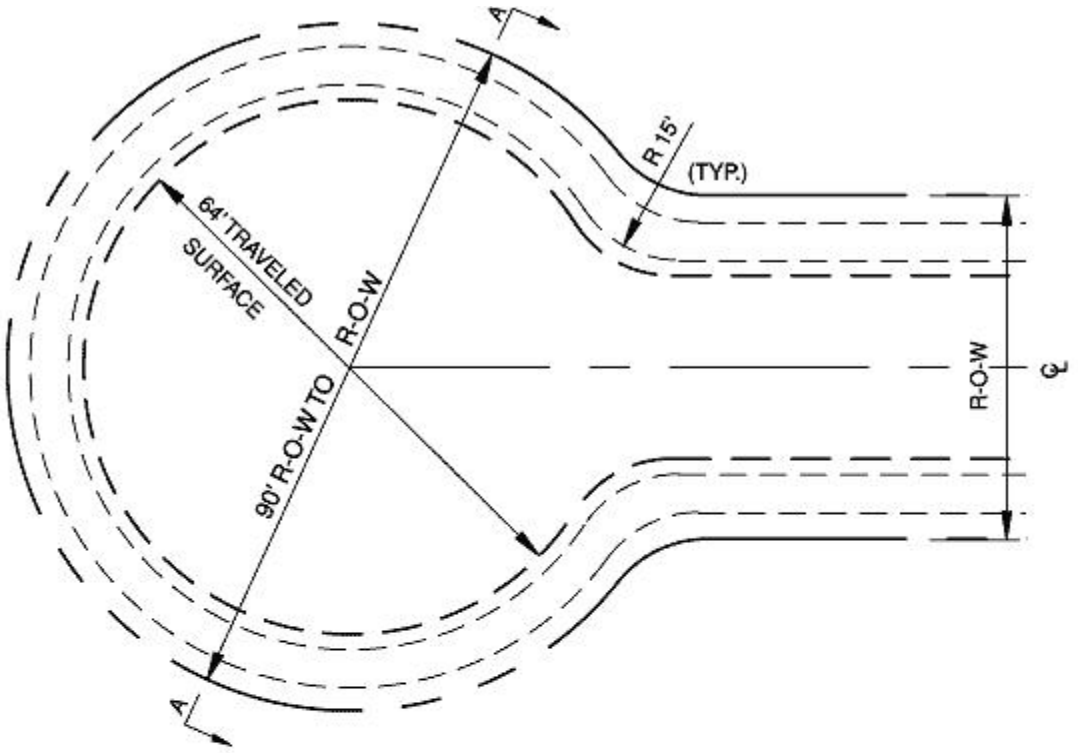
TSI – Stands for "Timber Stand Improvement" thinning to stimulate growth and improve residual tree health.

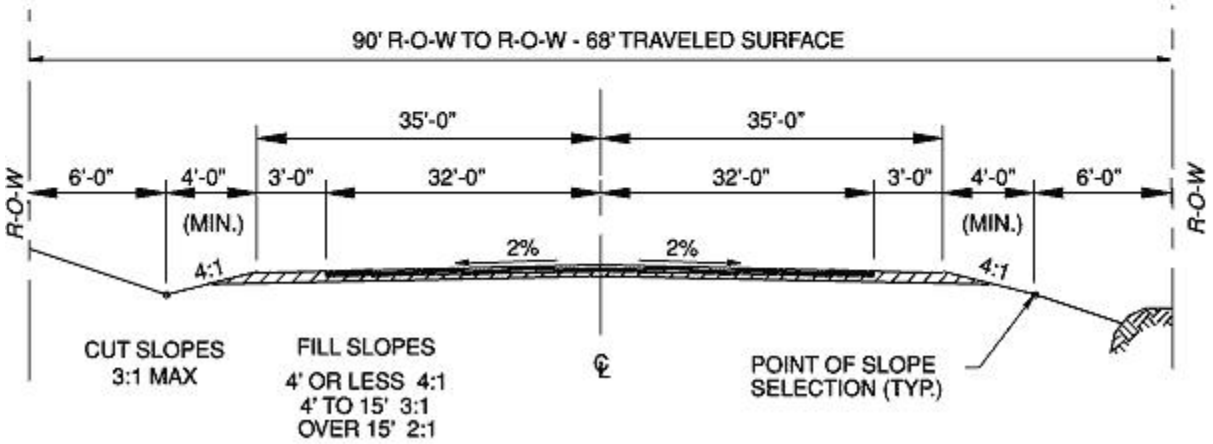
Wildfire – An unwanted wildland fire.

Appendix K: Sample Specifications for Turnarounds:
Hammer Head Turnaround:



Local Cul-de-Sac:





SECTION A - A

Appendix L - REFERENCES

Anderson, Hal E. 1982. Aids to determining Fuel Models for Estimating Fire Behavior. USDA Forest Service. General Technical Report INT-122, 22 p. Intermountain Forest and Range Experiment Station, Utah, 84401.

Andrews, Patricia; Bevins, Collin; and Seli, Robert. 2003. BehavePlus fire modeling system User's Guide. USDA Forest Service. General Technical Report RMRS-GTR-106WWW. Rocky Mountain Research Station.

Buckskin Heights CWPP, Masonville, Colorado, 2006.

Cooper, C.F. 1960, Changes in vegetation, structure, and growth of southwestern pine forest since white settlement. Ecological Monographs 30l:129-164.

Dennis F.C. 1999. Fire Resistant Landscaping. No. 6.303 Natural Resource Series. Colorado State University Cooperative Extension.

Dennis F.C. 1999. Forest Home Fire Safety. No 6.304 Natural Resource Series. Colorado State University Cooperative Extension.

Dennis F.C. 2002. FireWise Plant Materials. No 6.305 Natural Resource Series. Colorado State University Cooperative Extension.

Dennis F.C. 2003. Creating Wildfire-Defensible Zones. No 6.302 Natural Resource Series. Colorado State University Cooperative Extension.

Dennis F.C. 2005. Fuelbreak Guidelines for Forested Subdivisions & Communities. Colorado State Forest Service

Elk Stream Ranch CWPP, Montezuma County, Colorado, 2008.

Emergency Services Committee. 2003. Santa Fe Trail Ranch Emergency Services Handbook. Santa Fe Trail Ranch Property Owners Association.

Fule`, P.Z., W. W. Covington, and M. M. Moore, 1997, Determining reference conditions for ecosystem management of southwestern ponderosa pine forest. Ecological Applications 7:895-908.

Graham, Russell. 2003. Editor. Hayman Fire Case Study: Summary. USDA Forest Service. General Technical Report RMRS-GTR-115. Rocky Mountain Research Station.

Grissino-Mayer, H. D., W. H. Romme, M. L. Floyd, and D. HaNNA, 2004. Climatic and human influences on fire regimes in the southern San Juan Mountains, Colorado, USA. Ecology 85:1708-174.

Helms, John. 1998. The Dictionary of Forestry. Society of American Foresters.

International Urban-Wildland Interface Code. 2003. International Code Council, INC.

Keane, R. E., S. F. Arno, and J. K. Brown, 1990, Simulating cumulative fire effects in ponderosa pine/Douglas-fir forests. Ecology 71 (1): 189-203.

La Plata County CWPP, La Plata County, Colorado, 2006.

Romme, W. H., M. L. Floyd, D. Hannah, 2006. Landscape condition analysis for the south central highlands section, southwestern Colorado and Northwestern New Mexico. Final Report, April 30, 2006.

Santa Fe Trail Ranch CWPP, Las Animas County, Trinidad, Colorado, 2006.

Savage, M. and T. W. Swetnam, 1990. Early 19th-century fire decline following sheep pasturing in a Navajo ponderosa pine forest. Ecology 71 (6), pp. 2374-2378.

Swetnam, T. W., and C. H. Baisan, 1996. Tree-ring reconstructions of fire and climate history in the Sierra Nevada and Southwestern United States. Pages 158-195 in T. T. Veblen, W. Baker, G. Montenegro, and T. W. Swetnam, editors. Fire and climate change in temperate ecosystems of the western Americas. Ecological Studies. Volume 160. Springer, New York, New York, USA.

Swetnam, T. W., and J. L. Betancourt, 1998. Mesoscale disturbance and ecological response to decadal climatic variability in the American southwest. Journal of Climate 11: 3128-3147.

Touchan, R., T. W. Swetnam, and H. D. Grissino-Mayer. 1995. Effects of livestock grazing on pre-settlement fire regimes in New Mexico. In: Brown, J. K., (tech. coord). 1995. Proceedings: symposium on fire in wilderness and park management; 1993 March 30-April 1; Missoula, MT. Gen Tech. Rep. INT-GTR-320. Ogden, UT: USDA Forest Service, Intermountain Research Station.

Tusayan Community Wildfire Protection Plan, Coconino County, Arizona, 2005.

FORESTRY

Fire-Resistant Landscaping no. 6.303

by F.C. Dennis[1]

Quick Facts...

More people are moving into Colorado's rural areas, increasing the chances of wildfire.

"Defensible space" is the primary determinant of a structure's ability to survive wildfire.

Native species are generally the best plant materials for landscaping in defensible space, but others can be grown successfully in Colorado.

To be a FireWise homeowner, plan well, plant well and maintain well.

Colorado Colorado State University Cooperative Extension

Putting Knowledge to Work

Colorado's population is growing, its urban areas are rapidly expanding, and people are building more homes in what was once natural forest and brushlands. Newcomers to rural areas need to know how to correctly landscape their property to reduce wildfire hazards.

Improper landscaping worries land managers and fire officials because it can greatly increase the risk of structure and property damage from wildfire. It is a question of *when*, not *if*, a wildfire will strike any particular area.

Vegetative clearance around the house (defensible space) is a primary determinant of a home's ability to survive wildfire. Defensible space is, simply, room for firefighters to do their job. If grasses, brush, trees and other common forest fuels are removed, reduced, or modified to lessen a fire's intensity and keep it away from the home, chances increase that the structure will survive. It is a little-known fact that in the absence of a defensible space, firefighters will often bypass a house, choosing to make their stand at a home where their safety is more assured and the chance to successfully protect the structure is greater.

Landscaping Defensible Space

People often resist creating defensible space because they believe that it will be unattractive, unnatural and sterile-looking. It doesn't have to be! Wise landowners carefully plan landscaping within the defensible space. This effort yields a many-fold return of beauty, enjoyment and added property value. Development of defensible space is outlined in fact sheet 6.302, *Creating Wildfire-Defensible Zones*.

Colorado has great diversity in climate, geology and vegetation. Home and cabin sites can be found from the foothills through 10,000-foot elevations. Such extremes present a challenge in recommending plants. While native plant materials generally are best, a wide range of species can be grown successfully in Colorado.

Many plant species are suitable for landscaping in defensible space. Use restraint and common sense, and pay attention to plant arrangement and maintenance. It has often been said that *how* and *where* you plant are more important than *what* you plant. While this is indeed true, given a choice among plants, choose those that are more resistant to wildfire.

Consider the following factors when planning, designing and planting the FireWise landscape within your home's defensible space:

- Landscape according to the recommended defensible-space zones. That is, the plants near your home should be more widely spaced and lower growing than those farther away.
- Do not plant in large masses. Instead, plant in small, irregular clusters or islands.

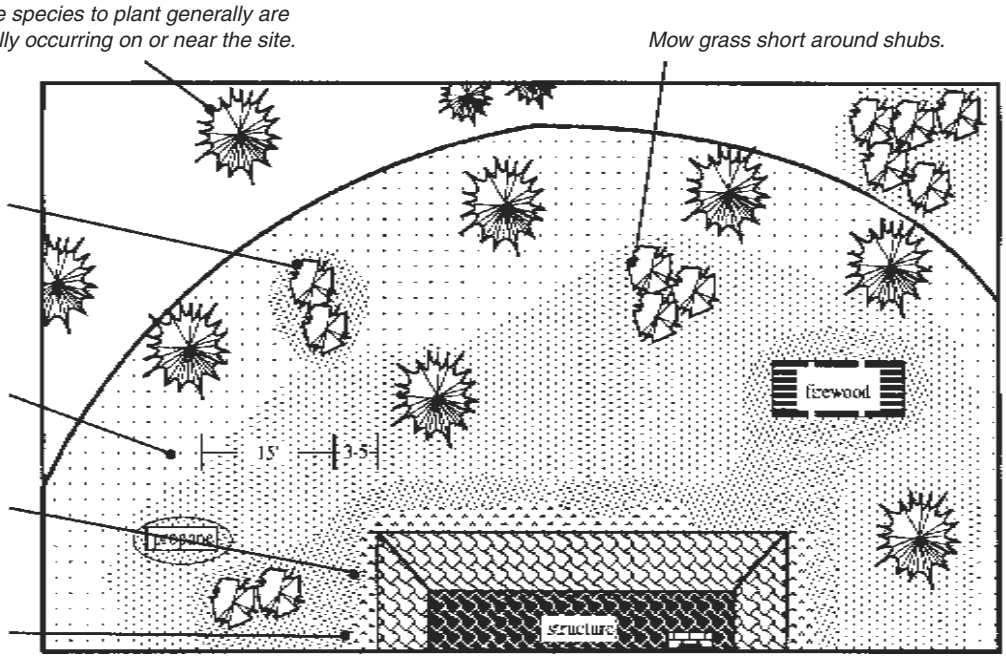


Figure 1: Forested property surrounding a homesite; shows optimum placement of vegetation near the structure.

- Use decorative rock, gravel and stepping stone pathways to break up the continuity of the vegetation and fuels. This can modify fire behavior and slow the spread of fire across your property.
- Incorporate a diversity of plant types and species in your landscape. Not only will this be visually satisfying, but it should help keep pests and diseases from causing problems within the whole landscape.
- In the event of drought and water rationing, prioritize plants to be saved. Provide available supplemental water to plants closest to your house.
- Use mulches to conserve moisture and reduce weed growth. Mulch can be organic or inorganic. Do not use pine bark, thick layers of pine needles or other mulches that readily carry fire.
- Be creative! Further vary your landscape by including bulbs, garden art and containers for added color.

Grasses

During much of the year, grasses ignite easily and burn rapidly. Tall grass will quickly carry fire to your house. Mow grasses low in the inner zones of the defensible space. Keep them short closest to the house and gradually increase height outward from the house, to a maximum of 8 inches. This is particularly important during fall, winter and before green-up in early spring, when grasses are dry, dormant and in a "cured" fuel condition. Given Colorado's extremely variable weather, wildfires can occur any time of the year. Maintenance of the grassy areas around your home is critical.

Mow grasses low around the garage, outbuildings, decks, firewood piles, propane tanks, shrubs, and specimen trees with low-growing branches.

Ground Cover Plants

Replace bare, weedy or unsightly patches near your home with ground covers, rock gardens, vegetable gardens and mulches. Ground cover plants are a good alternative to grass for parts of your defensible space. They break up the monotony of grass and enhance the beauty of your landscape. They provide a

References

- *6.302,* Creating Wild-Fire Defensible Zones
- *6.304,* Forest Home Fire Safety
- *6.305,* FireWise Plant Materials
- *6.306,* Grass Seed Mixes to Reduce Wildfire Hazard
- *7.205,* Pruning Evergreens
- *7.206,* Pruning Shrubs
- *7.207,* Pruning Deciduous Trees
- *7.233,* Wildflowers for Colorado
- *7.406,* Flowers for Mountain Communities
- *7.407,* Shrubs for Mountain Communities
- *7.408,* Trees for Mountain Communities
- *7.413,* Ground Covers for Mountain Communities

Figure 2: Ladder fuels enable fire to travel from the ground surface into shrubs and then into the tree canopy.

variety of textures and color and help reduce soil erosion. Consider ground cover plants for areas where access for mowing or other maintenance is difficult, on steep slopes and on hot, dry exposures.

Ground cover plants are usually low growing. They are succulent or have other FireWise characteristics that make them useful, functional and attractive. When planted in beds surrounded by walkways and paths, in raised beds or as part of a rock garden, they become an effective barrier to fire spread. The ideal groundcover plant is one which will spread, forming a dense mat of roots and foliage that reduces soil erosion and excludes weeds.

Mulch helps control erosion, conserve moisture and reduce weed growth. It can be organic (compost, leaf mold, bark chips, shredded leaves) or it can be inorganic (gravel, rock, decomposing granite).

When using organic mulches, use just enough to reduce weed and grass growth. Avoid thick layers. When exposed to fire, they tend to smolder and are difficult to extinguish. Likewise, while your property might yield an abundance of needles from your native pines or other conifers, don't use them as mulch because they can readily catch and spread wildfire. Rake, gather and dispose of them often within your defensible space.

Wildflowers

Wildflowers bring variety to a landscape and provide color from May until frost. Wildflower beds give a softer, more natural appearance to the otherwise manicured look often resulting from defensible space development.

A concern with wildflowers is the tall, dense areas of available fuel they can form, especially in dormancy. To reduce fire hazard, plant wildflowers in widely separated beds within the defensible space. Do not plant them next to structures unless the beds are frequently watered and weeded and vegetation is promptly removed after the first hard frost. Use gravel walkways, rock retaining walls or irrigated grass areas mowed to a low height to isolate wildflower beds from each other and from other fuels.

Shrubs

Shrubs lend color and variety to the landscape and provide cover and food for wildlife. However, shrubs concern fire professionals because, as the next level in the "fuel continuum," they can add significantly to total fuel loading. Because of the woody material in their stems and branches, they are a potential source of fire brands. When carried in the smoke column ahead of the main fire, fire brands can rapidly spread the fire in a phenomenon known as "spotting."

But the primary concern with shrubs is that they are a "ladder fuel" – they can carry a relatively easy-to-control surface grass fire into tree crowns. Crown fires are difficult, sometimes impossible, to control (see Figure 2).

To reduce the fire-spreading potential of shrubs, plant only widely separated, low-growing, nonresinous varieties close to structures. Do not plant them directly beneath windows or vents or where they might spread under wooden decks. Do not plant shrubs under tree crowns or use them to screen propane tanks, firewood piles or other flammable materials. Plant shrubs individually, as specimens, or in small clumps apart from each other and away from any trees within the defensible space.

Mow grasses low around shrubs. Prune dead stems from shrubs annually. Remove the lower branches and suckers from species such as Gambel oak to raise the canopy away from possible surface fires.

Structural Elements of a FireWise Landscape

When building a deck or patio, use concrete, flagstone or rock instead of wood. These materials do not burn and do not collect flammable debris like the space between planks in wooden decking.

Where appropriate on steeper ground, use retaining walls to reduce the steepness of the slope. This, in turn, reduces the rate of fire spread. Retaining walls also act as physical barriers to fire spread and help deflect heat from the fire upwards and away from structures.

Rock or masonry walls are best, but even wooden tie walls constructed of heavy timbers will work. Put out any fires burning on tie walls after the main fire front passes.

On steep slopes, consider building steps and walkways around structures. This makes access easier for home maintenance and enjoyment. It also serves as a physical barrier to fire spread and increases firefighters' speed and safety as they work to defend your home.

FIREWISE is a multi-agency program that encourages the development of defensible space and the prevention of catastrophic wildfire.

Trees

Trees provide a large amount of available fuel for a fire and can be a significant source of fire brands if they do burn. Radiant heat from burning trees can ignite nearby shrubs, trees and structures.

Colorado's elevation and temperature extremes limit tree selection. The best species to plant generally are those already growing on or near the site. Others may be planted with careful selection and common sense.

If your site receives enough moisture to grow them, plant deciduous trees such as aspen or narrow-leaf cottonwood. These species, even when planted in dense clumps, generally do not burn well, if at all. The greatest problem with these trees is the accumulation of dead leaves in the fall. Remove accumulations close to structures as soon as possible after leaf drop.

When site or available moisture limits recommended species to evergreens, carefully plan their placement. Do not plant trees near structures. Leave plenty of room between trees to allow for their growth. Spacing within the defensible space should be at least 10 feet between the edges of tree crowns. On steep ground, allow even more space between crowns. Plant smaller trees initially on a 20- to 25-foot spacing to allow for tree growth. At some point, you will have to thin your trees to retain proper spacing.

As the trees grow, prune branches to a height of 10 feet above the ground. Do not overprune the crowns. A good rule of thumb is to remove no more than one-third of the live crown of the tree when pruning. Prune existing trees as well as ones you planted.

Some trees (for example, Colorado blue spruce) tend to keep a full crown. Other trees grown in the open may also exhibit a full growth habit. Limit the number of trees of this type within the defensible space. Prune others as described above and mow grasses around such specimen trees.

Maintenance

A landscape is a dynamic system that constantly grows and changes. Plants considered fire resistant and that have low fuel volumes can lose these characteristics over time. Your landscape, and the plants in it, must be maintained to retain their FireWise properties.

- ☐ Always keep a watchful eye towards reducing the fuel volumes available to fire. Be aware of the growth habits of the plants within your landscape and of the changes that occur throughout the seasons.
- ☐ Remove annuals and perennials after they have gone to seed or when the stems become overly dry.
- ☐ Rake up leaves and other litter as it builds up through the season.
- ☐ Mow or trim grasses to a low height within your defensible space. This is particularly important as grasses cure.
- ☐ Remove plant parts damaged by snow, wind, frost or other agents.
- ☐ Timely pruning is critical. Pruning not only reduces fuel volumes but also maintains healthier plants by producing more vigorous, succulent growth.
- ☐ Landscape maintenance is a critical part of your home's defense system. Even the best defensible space can be compromised through lack of maintenance. The old adage "An ounce of prevention is worth a pound of cure" applies here.

Colorado State FOREST SERVICE

This fact sheet was produced in cooperation with the Colorado State Forest Service.

[1]*Wildfire Hazard Mitigation Coordinator, Colorado State Forest Service.*

FORESTRY

Forest Home Fire Safety no. 6.304

by F.C. Dennis[1]

Quick Facts...

Take steps now to protect your home from a future wildfire. This can spell the difference between your property's destruction or survival.

During a wildfire, law enforcement officials may ask you to evacuate with little warning. Take precautions now to prepare for that possibility.

Even if you are forced to evacuate your home, there are some things you can do to help firefighters defend it.

Fire Protection in Rural Areas

Colorado's rural areas are undergoing increasingly greater development. More people are building homes in forests or brushlands to take advantage of these natural environments.

Often, these sites are quite remote. However, people moving from urban settings expect traditional fire and emergency services. They do not understand the fire protection limitations that exist in rural areas:

- Most rural fire departments are volunteer. Firefighters are not generally present at the fire stations. In addition, the number of firefighters able to respond may be limited, especially during daytime hours during the traditional work week.
- Response time may be quite long. Volunteers must reach the fire station from home or work, start the fire vehicles and drive to the fire scene. The fire scene may be quite far from the station.
- Water supplies and firefighting equipment are limited. Often, the only significant water supply is that which the fire trucks themselves carry. Water shuttles or refill locations must be established and coordinated.
- Approaching the fire scene may be difficult. Narrow, steep roads and driveways may limit or even prevent access by emergency equipment. Bridges may have weight limitations that prevent large trucks and tankers from reaching the fire.

When wildfire does strike, it can occur with little warning and spread quickly. Fire crews and equipment often are overwhelmed by the task of fighting a rapidly advancing wildfire. There may simply not be enough personnel and equipment to defend every home.

Homeowner Preparations

Homeowners can do a great deal to prepare their property for wildfire. Some of these things are detailed in these fact sheets:

6.302, *Creating Wildfire-Defensible Zones;*
6.303, *Fire-Resistant Landscaping*;
6.305, *FireWise Plant Materials*; and
6.306, *Grass Seed Mixes to Reduce Wildfire Hazard*.

The following checklist and guidelines will help you prepare for fire safety, evacuation and home defense. Use it as a guide to enhance homesite safety.

This is an annual checklist. Don't wait until a fire is approaching to perform these tasks.

Colorado State University Cooperative Extension

Putting Knowledge to Work

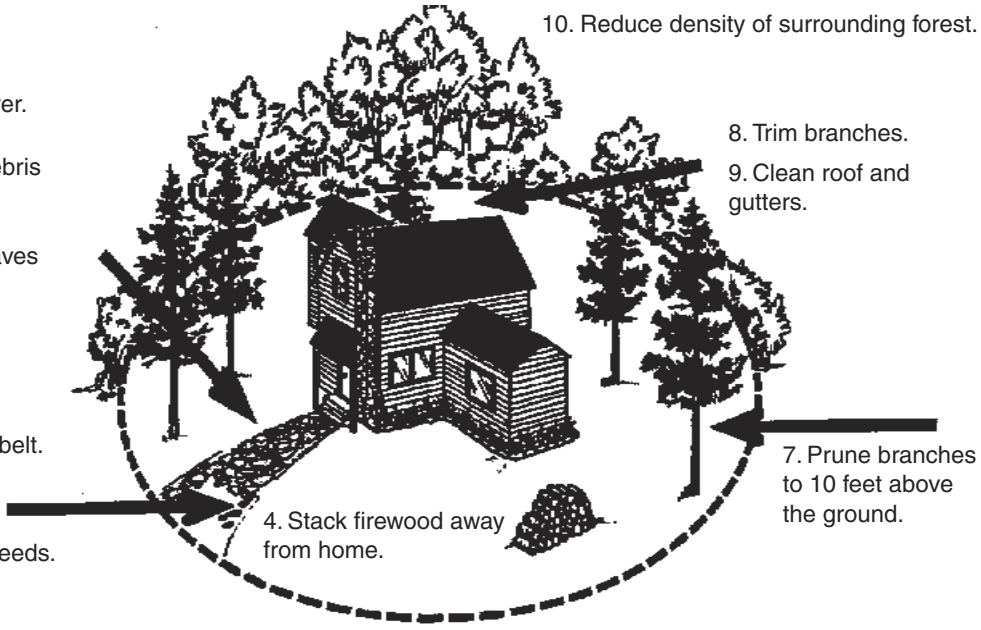
Annual Fire Safety Checklist

- ☐ Thin trees and brush properly within the defensible space.
- ☐ Remove trash and debris from the defensible space.
- ☐ Remove any trees growing through the porch.
- ☐ Clear roof and gutters of leaves and debris.
- ☐ Remove branches overhanging chimney and roof.
- ☐ Stack firewood uphill or on a contour away from the home.
- ☐ Use noncombustible roof materials.
- ☐ Place shutters, fire curtains or heavy drapes on windows.
- ☐ Place screens on foundation and eave vents.
- ☐ Enclose sides of stilt foundations and decks.
- ☐ Use a chimney screen or spark arrester.
- ☐ Clear vegetation around fire hydrants, cisterns, propane tanks, etc.
- ☐ Make sure an outdoor water supply is available, with hose, nozzle and pump.
- ☐ Make sure fire tools, ladder and fire extinguishers are available.
- ☐ Post address signs that are clearly visible from the street or road.
- ☐ Make sure the driveway is wide enough for fire trucks and equipment.
- ☐ Post load limits on bridges.
- ☐ Install and test smoke detectors.
- ☐ Practice a family fire drill and evacuation plan.

This is an annual checklist. Don't wait until a fire is approaching to perform these tasks.

Evacuation Tips

- ☐ If a wildfire is threatening your area, listen to your radio for updated reports and evacuation information.
- ☐ Confine pets to one room and make plans to take care of them in the event of evacuation.
- ☐ Arrange for temporary housing with a friend or relative whose home is outside the threatened area. Leave a note in a prominent place in your home that says where and how you can be contacted.
- ☐ If your home is threatened by wildfire, you will be contacted and advised by law enforcement officers to evacuate. If you are not contacted, or you decide to stay and help defend your home, evacuate pets and any family members not needed to protect your home.
- ☐ Remove important documents, mementoes, etc., from the possible fire area.



FIREWISE is a multi-agency program that encourages the development of defensible space and the prevention of catastrophic wildfire.

- ☐ When evacuating, wear protective clothing: sturdy shoes, cotton or woolen clothing, long pants, a long-sleeved shirt, gloves, and a handkerchief to protect your face.
- ☐ Choose a route away from the fire if possible. Watch for changes in the speed and direction of the fire and smoke.
- ☐ Take a disaster supply kit containing:
  - a supply of drinking water;
  - one change of clothing and footwear for each member of the family;
  - a blanket or sleeping bag for each person;
  - a first aid kit that also includes any prescription medications;
  - emergency tools including a battery-powered radio, flashlight and extra batteries;
  - an extra set of car keys and credit cards, cash or traveler's checks; and
  - extra pairs of eyeglasses and other special items for infant, elderly or disabled family members.

Defending Your Home

Whether you choose to stay to defend your home or to evacuate, complete as many of the following preparations as possible.

- ☐ Do not jeopardize your life. No material item is worth a life.
- ☐ Wear fire-resistant clothing and protective gear.
- ☐ Remove combustible materials from around structures.
- ☐ Close or cover outside vents and shutters.
- ☐ Position garden hoses so they reach the entire house. Have the hoses charged, with an adjustable nozzle, but turned off.
- ☐ Place large, full water containers around the house. Soak burlap sacks, small rugs or large rags in the containers.
- ☐ Place a ladder against the roof of the house on the opposite side of the approaching wildfire. Place a garden hose near the ladder, prepared as described previously.
- ☐ Place portable pumps near available water supplies, such as pools, hot tubs, creeks, etc.
- ☐ Close all windows and doors. Do not lock them.
- ☐ Close all inside doors.
- ☐ Turn on a light in each room and all outside lights.
- ☐ Leave them on even during daylight hours.
- ☐ Fill tubs, sinks and any other containers with water.
- ☐ Shut off the gas at the outside meter of the propane tank.
- ☐ Remove lace, nylon or any other drapes and curtains made from light material. Close Venetian blinds, heavy drapes or fire-resistant window coverings.
- ☐ Move overstuffed furniture into the center of the house, away from windows and sliding glass doors.
- ☐ Park your car in the garage, facing out. Close the windows but do not lock the doors. Leave the keys in the ignition.
- ☐ Close the garage door but leave it unlocked.
- ☐ Disconnect the automatic garage door opener.

Colorado State FOREST SERVICE

This fact sheet was produced in cooperation with the Colorado State Forest Service.

[1] *Wildfire Hazard Mitigation Coordinator, Colorado State Forest Service.*

FORESTRY

FireWise Plant Materials no. 6.305

by F.C. Dennis [1]

Quick Facts...

FireWise landscaping can be aesthetically pleasing while reducing potential wildfire fuel.

Plant choice, spacing and maintenance are critical.

Your landscape, and the plants in it, must be maintained to retain their FireWise properties.

Creating a "defensible space" around your home is one of the most important and effective steps you can take to protect you, your family and your home from catastrophic wildfire. Defensible space is the area between a structure and an oncoming wildfire where nearby vegetation has been modified to reduce a wildfire's intensity. (See fact sheet 6.302, *Creating Wildfire-Defensible Zones*.)

Many people resist creating defensible space around their homes because they believe these areas will be unattractive and unnatural. This is far from true. With careful planning, FireWise landscaping can be aesthetically pleasing while reducing potential wildfire fuel. It can actually enhance beauty and property values, as well as personal safety.

Fire Resistance

Many native plants are highly flammable during different seasons of the year. At such times, left unmanaged, they can accelerate the spread of a wildfire through your neighborhood, threatening homes, property and lives.

All vegetation, naturally occurring and otherwise, is potential fuel for fire. Its type, amount and arrangement has a dramatic effect on fire behavior. There are no truly "fireproof" plant species, so plant choice, spacing and maintenance are critical to defensible space landscaping. In fact, **where** and **how** you plant may be more important than **what** you plant. However, given alternatives, choose plant species that tend to be more resistant to wildfire.

General concepts to keep in mind when choosing and planting FireWise species are:

- A plant's moisture content is the single most important factor governing its volatility. (However, *resin* content and other factors in some species render them flammable even when the plant is well-watered.) Conifers tend to be flammable due to their oil and pitch content, regardless of their water content.
- Deciduous plants tend to be more fire resistant because their leaves have higher moisture content and their basic chemistry is less flammable. Also, when deciduous trees are dormant, there is less fuel to carry fire through their canopies.

In some cases, there is a strong correlation between drought tolerance and fire resistance. For example, a plant may shed its leaves or needles during extreme drought. Other drought-tolerant species may have smaller leaves or thick, succulent leaves. These plants offer less fuel or have a higher moisture content, both of which help reduce fire hazard.

There also appears to be a correlation between a plant's salt tolerance and natural fire resistance. Plants adapted to salty conditions, and actually growing in salty situations, may better resist burning.

Colorado State University Cooperative Extension

Putting Knowledge to Work

FireWise Plant List

The following list was prepared by Phil Hoefer, Colorado State Forest Service. It was reviewed by Jim Knopf, a landscape architect in Boulder, and two landscape architects on Colorado's Western Slope. Bloom time is approximate (observed in Boulder at 5,600 feet).

Key: Water needs: VL = very low L = low M = medium H = high
Sun/Shade: S = sun PS = part sun Sh = shade
Elevation: Y = Yes N = No ? = Questionable or unknown

Scientific Name	Common Name	Approx. Water Needs	Sun/Shade Preference	Approx. Mature Height	Elevation (1,000 ft.) 5	6	7	8	9	Approx. Bloom Month
Flowers and Ground Covers										
Achillea lanulosa [a]	Native yarrow	L-H	S/PS	1.5 - 2'	Y	Y	Y	Y	Y	Jul
Achillea tomentosa [b]	Woolly yarrow	M-H	S/PS	.5'	Y	Y	N	N	N	Jul
Aconitum spp.[c]	Monkshood	M-H	S	2'	Y	Y	Y	Y	Y	Jun-Jul
Aconitum columbianum [ac]	Columbian monkshood	M-H	S	2'	Y	Y	Y	Y	Y	Jun-Jul
Ajuga reptans [b]	Bugleweed	H	Sh	< .5'	Y	Y	Y	Y	Y	Jun-Jul
Alchemilla sp.	Lady's mantle	M-H	PS/Sh	1'	Y	Y	Y	Y	?	Jun-Jul
Allium cernuum [ac]	Nodding onion	L-H	S/PS	1'	Y	Y	Y	Y	Y	Jun
Allium geyeri [ac]	Geyer onion	L-H	S/PS	1'	Y	Y	Y	Y	?	Jun
Anaphalis margaritacea [a]	Pearly everlasting	L-H	S	1.5 - 2.5'	Y	Y	Y	Y	?	Aug
Anemone blanda	Windflower	M-H	S/PS	1'	Y	Y	Y	Y	?	Apr-May
Antennaria parvifolia [ab]	Small-leaf pussytoes	M	S/PS	<.5'	Y	Y	Y	Y	Y	Jun
Antennaria rosea [ab]	Rosy pussytoes	M	S/PS	<.5'	Y	Y	Y	Y	Y	Jun
Aquilegia spp.	Columbine	M-H	S/PS	1 - 2'	Y	Y	Y	Y	Y	Jun-Jul
Aquilegia coerulea [a]	Colorado blue columbine	M-H	S/PS	1 - 2'	Y	Y	Y	Y	Y	Jun-Jul
Aquilegia chrysantha [a]	Yellow columbine	M-H	S/PS	1 - 2'	Y	Y	Y	Y	Y	Jun-Aug
Arabis sp.[b]	Rockcress	L-H	S	< 1'	Y	Y	Y	Y	Y	May-Jun
Armeria maritima	Sea thrift	L-H	S/PS	.5'	Y	Y	Y	Y	Y	Apr-Jun
Artemisia caucasica	Caucasian sage	L-M	S/PS	1- 2'	Y	Y	Y	?	?	n/a
Artemisia frigida [ac]	Fringed sage	L-M	S	1 - 1.5'	Y	Y	Y	Y	Y	n/a
Artemisia ludoviciana [a]	Prairie sage	L-M	S	1 - 1.5'	Y	Y	Y	?	?	n/a
Aster laevis [a]	Smooth aster	L-H	S/PS	1 - 3'	Y	Y	Y	Y	?	Aug-Sep
Aster porteri [a]	Porter aster	L-M	S	1'	Y	Y	Y	?	?	Aug-Sep
Aubrieta sp.[b]	False rockcress	M	S	1'	Y	Y	Y	Y	Y	Apr-May
Aurinia sp.[b]	Basket of gold	M	S/PS	1'	Y	Y	Y	Y	Y	Apr-May
Calochortus gunnisonii [a]	Mariposa lily	M-H	S	.5 - 2'	Y	Y	Y	Y	?	Jul-Aug
Campanula rotundifolia [a]	Common harebell	M-H	S	.5 - 1'	Y	Y	Y	Y	Y	May-Oct
Centranthus ruber	Jupiter's beard	L-H	S/Sh	2 - 2.5'	Y	Y	Y	Y	?	May-Oct
Cerastium strictum [ab]	Mouse ear chickweed	M	S/PS	1'	Y	Y	Y	Y	?	May-Jun
Cerastium tomentosum [b]	Snow-in-summer	L-M	S/PS	1'	Y	Y	Y	Y	Y	May-Jun
Claytonia lanceolata [a]	Spring beauty	M	Sh	.5 - 1.5'	Y	Y	Y	?	?	Mar-Apr
Convallaria majalis [bc]	Lily-of-the-valley	H	Sh	< 1'	Y	Y	Y	Y	?	May-Jun
Delosperma nubigenum [b]	Hardy yellow iceplant	M-H	S	.5'	Y	Y	Y	?	?	Jun
Delphinium spp.[c]	Delphinium	M-H	S/PS	.5 - 3'+	Y	Y	Y	Y	Y	Jun-Jul
Dianthus spp.	Pinks	L-H	S	<.5' - 2'	Y	Y	Y	Y	Y	May-Aug
Doronicum sp.	Leopard's bane	H	S/PS	2 - 3'	Y	Y	Y	Y	?	Jul-Aug
Echinacea purpurea[a]	Purple coneflower	M	S	2 - 3'	Y	Y	Y	Y	Y	Jul-Aug
Epilobium angustifolium	Fireweed	H	S/PS	3'	N	Y	Y	Y	Y	Jul-Aug
Erigeron flagellaris [a]	Whiplash daisy, trailing fleabane	L-M	S	< 1'	Y	Y	?	?	?	Jun-Jul
Eriogonum umbellatum [a]	Sulphur flower	M	S/PS	<.5'	Y	Y	Y	Y	Y	Jun-Jul
Erysimum asperum [a]	Western wallflower	M	S/PS	1'+	Y	Y	Y	Y	?	Jun-Jul
Gaillardia aristata [a]	Blanket flower	L-M	S	1 - 1.5'	Y	Y	Y	Y	Y	Jul-Sep
Galium boreale [ab]	Northern bedstraw	M-H	Sh	<1'	Y	Y	Y	Y	Y	May-Jun
Geranium spp.	Hardy geraniums	M	Sh/PS	2'	Y	Y	Y	Y	Y	May-Oct
Geranium caespitosum [a]	Wild geranium	M	Sh/PS	2'	Y	Y	Y	Y	Y	May-Oct
Geum triflorum	Prairie smoke	M-H	S/PS	1.5'	Y	Y	Y	?	?	Jun
Helianthella quinquenervis [a]	Aspen sunflower	M	S	1'	?	?	?	Y	Y	?
Helianthemum nummularium	Rockrose	M-H	S	< 1'	Y	Y	Y	?	?	May-Jun
Helianthus pumilus [a]	Small sunflower	M	S	1 - 2'	Y	Y	Y	?	?	Jun-Jul
Heuchera spp.	Coral bells	M-H	PS/Sh	1 - 2'	Y	Y	Y	Y	Y	Jun-Aug
Ipomopsis aggregata [a]	Scarlet gilia	M	S/PS	1 - 2'	Y	Y	Y	Y	Y	Jun-Aug
Iris germanica	Bearded iris	L-M	S	1 - 3'	Y	Y	Y	Y	Y	May-Jun

Scientific Name	Common Name	Approx. Water Needs	Sun/Shade Preference	Approx. Mature Height	Elevation (1,000 ft.) 5	6	7	8	9	Approx. Bloom Month
Iris missouriensis [ac]	Missouri iris	M-H	S	1 - 2'	Y	Y	Y	Y	Y	May
Lamium sp.[b]	Dead nettle	M-H	Sh	< 1'	Y	Y	Y	Y	?	May-Jun
Lavandula spp.	Lavender	L-M	S	1 - 2'	Y	Y	Y	?	?	Jun-Nov
Leucocrinum montanum [a]	Sand lily	L-M	S	< 1'	Y	Y	Y	?	?	May
Liatris punctata [a]	Dotted gayfeather	VL-L	S	1 - 2'	Y	Y	Y	Y	Y	Aug-Oct
Linum lewisii [ac]	Wild blue flax	L-H	S/PS	1 - 2'	Y	Y	Y	Y	Y	May-Sep
Lupinus argenteus [ac]	Silver lupine	M	Sh/PS	1 - 3'	Y	Y	Y	Y	Y	Jun-Jul
Mertensia lanceolata [a]	Narrow-leaved chiming bells	M-H	Sh/PS	1 - 2'	Y	Y	Y	Y	Y	May-Jun
Mimulus guttatus [a]	Yellow monkey-flower	H	Sh	1'	?	Y	Y	Y	Y	?
Monarda fistulosa [a]	Native beebalm	M-H	S/PS	1 - 2'	Y	Y	Y	Y	Y	Jul-Oct
Oenothera caespitosa [a]	White stemless evening primrose	L-M	S	1 - 2'	Y	Y	Y	Y	Y	Jun-Aug
Papaver orientale	Oriental poppy	H	S/Sh	2 - 3'	Y	Y	Y	Y	Y	May-Jun
Penstemon caespitosus [ab]	Mat penstemon	L-M	S	< .5'	Y	Y	Y	Y	Y	Jun
Penstemon secundiflorus	Sidebells	L-M	S	1 - 2'	Y	Y	Y	Y	?	May-Jun
Penstemon teucrioides [a]	Germander penstemon	L-M	S	.5'	Y	Y	Y	?	?	Jun-Jul
Penstemon virens [ac]	Blue mist penstemon	M	S/PS	.5'	Y	Y	Y	Y	Y	May-Jun
Phlox subulata	Moss phlox	M	S	< .5'	Y	Y	Y	Y	Y	May
Polemonium sp.	Jacob's ladder	H	S/PS	1 - 2'	Y	Y	Y	Y	Y	May-Aug
Potentilla fissa [a]	Leafy potentilla	M-H	PS	1'	Y	Y	Y	Y	?	?
Potentilla verna [b]	Spring potentilla	M-H	PS	< .5'	Y	Y	Y	Y	Y	Mar-May
Pulsatilla patens [a]	Pasque flower	M	S/PS	1'	Y	Y	Y	Y	Y	Mar-May
Ratibida columnifera [a]	Prairie coneflower	L-M	S	2'	Y	Y	Y	Y	Y	Jul-Sep
Rudbeckia hirta [a]	Black-eyed Susan	M-H	S	2 - 3'	Y	Y	Y	Y	Y	Jul-Sep
Salvia officinalis	Cooking sage	L-M	S/PS	2'	Y	Y	Y	Y	?	Jun
Saxifraga hirsuta	Saxifrage	H	S/PS	.5'+	Y	Y	Y	Y	Y	May-Jun
Scutellaria brittonii [a]	Skullcap	M	S/PS	.5 - 1'	Y	Y	Y	Y	?	Aug-Sep
Sedum spp.[b]	Stonecrop	M	S/PS	1 - 1.5'	Y	Y	Y	Y	Y	Jul-Aug
Sedum lanceolatum [a]	Yellow stonecrop	M	S/PS	.5'	Y	Y	Y	Y	Y	Jul-Aug
Sempervivum sp.	Hens and chicks	L-M	S/PS	.5'	Y	Y	Y	Y	Y	n/a
Senecio spartioides [ac]	Broom groundsel	VL-L	S	2 - 3'	Y	Y	?	?	?	Sep-Oct
Solidago missouriensis [a]	Smooth goldenrod	L-M	S	1 - 2'	Y	Y	Y	Y	?	Jul-Aug
Thalictrum fendleri [a]	Fendler meadowrue	H	S/PS	2 - 3'	?	?	Y	Y	Y	Jul-Aug
Thermopsis divaricarpa [a]	Spreading golden banner	M-H	S/PS	2'	Y	Y	Y	Y	?	May
Tradescantia occidentalis [a]	Western spiderwort	M	S/PS	1.5'	Y	Y	Y	Y	?	Jun-Aug
Thymus spp.[b]	Thyme	L-M	S	< .5'	Y	Y	Y	Y	Y	Jun-Jul
Veronica pectinata	Speedwell	L-M	S	< .5'	Y	Y	Y	Y	Y	Apr-Jul
Vinca minor [b]	Periwinkle, myrtle	H	Sh	< 1'	Y	Y	Y	Y	?	Apr-Jun
Waldsteinia sp.[b]	Barren strawberry	M-H	Sh/PS	< 1'	Y	Y	Y	Y	?	May-Jun
			Shrubs							
Arctostaphylos nevadensis [ab]	Pinemat manzanita	M	S/PS	1 - 2'	Y	Y	Y	N	N	n/a
Arctostaphylos patula [a]	Greenleaf manzanita	M	S/PS	3 - 4'	Y	Y	Y	N	N	n/a
Arctostaphylos uva-ursi [ab]	Kinnikinnick, bearberry	M	S/Sh	1'	Y	Y	Y	Y	Y	n/a
Betula glanulosa [a]	Bog birch	H	S/PS	6 - 8'	Y	Y	Y	Y	Y	n/a
Calluna sp.	Heather	H	S/PS	2'	Y	Y	Y	?	?	Jul-Aug
Ceanothus fendleri [a]	Buckbrush, mountain lilac	M	S	2'	Y	Y	Y	?	?	Jul
Cercocarpus intricatus [a]	Little-leaf mountain mahogany	VL-L	S	4 - 6'	Y	Y	Y	Y	?	n/a
Cercocarpus montanus [ac]	True mountain mahogany	L-M	S	4 - 6'	Y	Y	Y	Y	?	n/a
Chrysothamnus spp.[a]	Rabbitbrush	VL-L	S	2 - 6'	Y	Y	Y	Y	Y	Jul-Aug
Cornus stolonifera [a]	Redtwig dogwood	H	S/Sh	4 - 6'	Y	Y	Y	Y	Y	n/a
Cotoneaster horizontalis	Spreading cotoneaster	M	S/PS	2 - 3'	Y	Y	Y	Y	?	May-Jun
Daphne burkwoodii	Burkwood daphne	M	S/PS	2 - 3'	Y	Y	Y	?	?	Apr-Jun
Erica sp.	Heath	H	S/PS	1'	Y	Y	Y	?	?	Jan-Mar
Euonymus alatus	Burning bush euonymus	M	S/Sh	1 - 6'	Y	Y	Y	?	?	n/a
Fallugia paradoxa [a]	Apache plume	VL-L	S	2 - 4'	Y	Y	Y	Y	Y	Jun-Oct
Holodiscus dumosus [a]	Ocean spray, cliff/rock spirea	L-M	S/PS	4'	Y	Y	Y	Y	Y	Jun
Jamesia americana [a]	Wax flower	M-H	S/Sh	2 - 6'	Y	Y	Y	Y	Y	Jun
Lonicera tatarica	Tatarian honeysuckle	M	S/PS	4 - 6'	Y	Y	Y	Y	Y	May-Jun
Mahonia aquifolium	Oregon grape holly	M-H	S/Sh	4 - 6'	Y	Y	Y	?	?	May-Jun

Scientific Name	Common Name	Approx. Water Needs	Sun/Shade Preference	Approx. Mature Height	Elevation (1,000 ft.) 5	6	7	8	9	Approx. Bloom Month
Mahonia repens [ab]	Creeping grape holly	L-H	S/Sh	1 - 2'	Y	Y	Y	Y	Y	Mar-May
Philadelphus microphyllus [a]	Little-leaf mockorange	M	S	2 - 3'	Y	Y	Y	Y	?	Jun
Physocarpus monogynus [a]	Mountain ninebark	M	S/Sh	2 - 4'	Y	Y	Y	Y	Y	Jun
Potentilla fruticosa [a]	Shrubby cinquefoil	M	S/PS	2 - 3'	Y	Y	Y	Y	Y	May-Sep
Prunus besseyi [a]	Western sand cherry	L-M	S	1 - 3'	Y	Y	Y	Y	?	May
Purshia tridentata [a]	Antelope bitterbrush	L-M	S	1 - 2'	Y	Y	Y	?	?	Jun-Aug
Ribes aureum [a]	Golden currant	M	S/PS	2 - 3'	Y	Y	Y	Y	Y	Apr-May
Rosa woodsii [a]	Woods' or native wild rose	M	S/PS	2 - 3'	Y	Y	Y	Y	Y	Jun-Jul
Shepherdia canadensis [d]	Russet buffaloberry	M-H	S	5 - 6'	Y	Y	Y	Y	Y	n/a
Symphoricarpos spp. [d]	Snowberry, coralberry	M	S/PS	2 - 3'	Y	Y	Y	Y	Y	n/a
Viburnum edule [a]	Highbush cranberry	H	S	6 - 8'	Y	Y	Y	Y	Y	May-Jun
Yucca baccata [a]	Banana or broad-leaf yucca	VL-L	S/PS	2 - 3'	Y	Y	Y	N	N	Jun
Yucca filamentosa	Adam's needle	M	S/PS	2 - 3'	Y	Y	Y	N	N	Jun
Yucca glauca [a]	Spanish bayonet, small soapweed, Great Plains yucca	VL-L	S/PS	2 - 3'	Y	Y	Y	Y	?	Jun
Large Shrubs and Trees										
Acer ginnala	Ginnala maple	M-H	S	6 - 10'	Y	Y	Y	Y	Y	n/a
Acer glabrum [a]	Rocky Mountain maple	M-H	S/Sh	6 - 10'	Y	Y	Y	Y	Y	n/a
Acer grandidentatum [a]	Wasatch maple	M	S/PS	10 - 20'	Y	Y	Y	Y	?	n/a
Alnus tenuifolia [a]	Thinleaf alder	H	S/PS	6 - 8'	Y	Y	Y	Y	Y	Apr
Amelanchier alnifolia [ac]	Saskatoon alder-leaf serviceberry	M	S/PS	6 - 8'	Y	Y	Y	Y	Y	Apr-May
Amelanchier utahensis [a]	Utah serviceberry	VL-M	S	4 - 6'	Y	Y	N	N	N	May
Betula fontinalis [a]	River birch	H	S/PS	6 - 8'	Y	Y	Y	Y	?	n/a
Cercocarpus ledifolius [a]	Mountain mahogany	VL-L	S	6 - 15'	Y	Y	?	N	N	n/a
Corylus cornuta [a]	Filbert, beaked hazelnut	H	S/Sh	5 - 6'	Y	Y	Y	?	?	n/a
Crataegus spp.[a]	Hawthorn (several native)	M	S	6 - 8'	Y	Y	Y	Y	?	May
Fraxinus pennsylvancia	Green ash	M-H	S	20 - 25'	Y	Y	Y	Y	?	n/a
Gleditsia triacanthos	Honeylocust	M-H	S	60 - 70'	Y	Y	N	N	N	May
Malus sp.	Crabapple	M	S	10 - 15'	Y	Y	Y	Y	N	Apr-May
Physocarpus opulifolius [a]	Tall ninebark	M	S/PS	4 - 6'	Y	Y	Y	?	N	May
Populus tremuloides [a]	Aspen	M	S	8 - 25'	Y	Y	Y	Y	Y	n/a
Prunus americana [a]	American wild plum	M	S/PS	4 - 6'	Y	Y	Y	Y	N	Apr
Prunus cerasifera[c]	Flowering plum	M	S/PS	8 - 10'	Y	Y	Y	?	N	Apr
Prunus pensylvanica [ac]	Pin/fire/wild/red cherry	M	S/PS	6 - 8'	Y	Y	Y	?	N	May
Prunus virginiana melanocarpa [ac]	Western chokecherry	M-H	S/PS	6 - 8'	Y	Y	Y	Y	Y	Apr-May
Rubus deliciosus [a]	Boulder raspberry, thimbleberry	M	S/Sh	4 - 6'	Y	Y	Y	Y	Y	Apr-May
Salix amygdaloides [a]	Peachleaf willow	H	S/PS	20 - 30'	Y	Y	Y	Y	?	n/a
Shepherdia argentea [a]	Silver buffaloberry	M	S/PS	4 - 6'	Y	Y	Y	Y	?	Apr
Sorbus scopulina [a]	Western mountain ash	M-H	S/Sh	6 - 8'	Y	Y	Y	Y	?	May
Syringa vulgaris	Common lilac	M	S	6 - 8'	Y	Y	Y	Y	Y	May

[a] Native species.

[b] Ground cover plant.

[c] This species, or some species in this genus, may be poisonous to livestock, pets, wildlife and/or people under some conditions. Before planting, check with Colorado State University Cooperative Extension, Colorado State Forest Service, or other knowledgeable personnel.

[d] Several species of symphoricarpos are native.

Plants for a FireWise Landscape

Plants that are more resistant to wildfire have one or more of the following characteristics:

- They grow without accumulating large amounts of combustible dead branches, needles or leaves (example: aspen).
- They have open, loose branches with a low volume of total vegetation (examples: currant and mountain mahogany).
- They have low sap or resin content (examples: many deciduous species).
- They have high moisture content (examples: succulents and some herbaceous species).
- They grow slowly and need little maintenance (do not need frequent pruning).
- They are short and grow close to the ground (examples: wildflowers and groundcovers).
- They can resprout following fire, thus reducing relandscaping costs (example: aspen).

Conifers

In Colorado, conifers make up much of our natural forest. Because of their high resin content, they are more susceptible to fire.

Even though conifers are flammable, you do not need to remove all of them from around your home. Wildfire hazards usually can be effectively reduced through proper thinning and pruning of existing trees and shrubs.

When choosing conifers for your defensible space, consider those with characteristics that make them better able to survive fire:

- *thick bark,*
- *long needles, or*
- *self-pruning. (Self-pruning trees lose lower branches naturally, leaving a greater distance between ground and canopy.)*

Additional FireWise Guidelines

Some additional tips to follow when planning a FireWise landscape include:

- Landscape according to the recommended defensible-space zones. The plants nearest your home should be more widely spaced and smaller than those farther away.
- Plant in small, irregular clusters and islands, not in large masses.
- Break up the continuity of the vegetation (fuel) with decorative rock, gravel and stepping stone pathways. This will help modify fire behavior and slow its spread across your property.
- Plant a variety of types and species. Besides being aesthetically pleasing, this will help ensure a healthier forest by reducing insects and diseases. Healthy, vigorous, thinned forests can better resist catastrophic fires than unhealthy ones with insect and disease problems.
- In the event of drought and water rationing, prioritize the plants you wish to save. Provide supplemental water to those nearest your home, perhaps using “gray water.”
- Mulch to conserve moisture and reduce weed growth. Mulch can be organic (wood chips or small bark pieces) or inorganic (gravel or rock). Avoid pine bark, thick layers of pine needles or other materials that can easily carry fire.

Don’t Forget Maintenance

A landscape is a dynamic, constantly changing system. Plants considered “fire resistant” and that have low fuel volumes can lose these characteristics over time. Your landscape, and the plants in it, must be maintained to retain their FireWise properties.

FIREWISE is a multi-agency program that encourages the development of defensible space and the prevention of catastrophic wildfire.

Be aware of the growth habits of the plants on your land and of the changes that occur seasonally. Keep a watchful eye for the need to reduce fuel volumes and fuel continuity.

- Remove annual, herbaceous plants after they have gone to seed or when the stems become overly dry.
- Rake up and dispose of litter as it builds up over the season.
- Mow or trim grasses to a low height within your defensible space. This is especially important as they begin to cure and dry.
- Remove plant parts damaged by snow, wind, frost or other agents.
- Timely pruning is critical. It not only reduces fuel volume but also maintains healthier plants with more succulent, vigorous growth.

Additional FireWise Publications

Cooperative Extension

The following publications are available from The Other Bookstore, Colorado State University Cooperative Extension, 115 General Services Bldg., Fort Collins, CO 80523-4061; (970) 491-6198; cerc1@ur.colostate.edu. Printed copies cost $1; they are available free on our Web site (see page 1):

- 6.302, *Creating Wildfire-Defensible Zones*
- 6.303, *Fire-Resistant Landscaping*
- 6.304, *Fire Safety, Evacuation and Home Defense*
- 6.306, *Grass Seed Mixes for the Reduction of Wildfire Hazard*
- 7.205, *Pruning Evergreens*
- 7.206, *Pruning Shrubs*
- 7.207, *Pruning Deciduous Trees*
- 7.402, *Protecting Trees During Construction*

Colorado State Forest Service

The following publication is available from the Colorado State Forest Service, Colorado State University, Fort Collins, CO 80523-5060; (970) 491-6303:

- *Home Fire Protection in the Wildland Urban Interface*, CSFS #142-399

Colorado State FOREST SERVICE

This fact sheet was produced in cooperation with the Colorado State Forest Service.

[1] *Wildfire Hazard Mitigation Coordinator, Colorado State Forest Service.*

FORESTRY

Creating Wildfire-Defensible Zones no. 6.302

by F.C. Dennis [1]

Quick Facts...

Wildfire will find the weakest links in the defense measures you have taken on your property.

The primary determinants of a home's ability to survive wildfire are its roofing material and the quality of the "defensible space" surrounding it.

Even small steps to protect your home and property will make them more able to withstand fire.

Consider these measures for all areas of your property, not just the immediate vicinity of the house.

Fire is capricious. It can find the weak link in your home's fire protection scheme and gain the upper hand because of a small, overlooked or seemingly inconsequential factor. While you may not be able to accomplish all measures below (and there are no guarantees), each will increase your home's, and possibly your family's, safety and survival during a wildfire.

Start with the easiest and least expensive actions. Begin your work closest to your house and move outward. Keep working on the more difficult items until you have completed your entire project.

Defensible Space

Two factors have emerged as the primary determinants of a home's ability to survive wildfire. These are the home's roofing material and the quality of the "defensible space" surrounding it.

Use fire-resistive materials (Class C or better rating), not wood or shake shingles, to roof homes in or near forests and grasslands. When your roof needs significant repairs or replacement, do so with a fire-resistant roofing material. Check with your county building department. Some counties now restrict wood roofs or require specific classifications of roofing material.

Defensible space is an area around a structure where fuels and vegetation are treated, cleared or reduced to slow the spread of wildfire towards the structure. It also reduces the chance of a structure fire moving from the building to the surrounding forest. Defensible space provides *room for firefighters to do their jobs.* Your house is more likely to withstand a wildfire if grasses, brush, trees and other common forest fuels are managed to reduce a fire's intensity.

The measure of fuel hazard refers to its continuity, both horizontal (across the ground) and vertical (from the ground up into the vegetation crown). Fuels with a high degree of both vertical and horizontal continuity are the most hazardous, particularly when they occur on slopes. Heavier fuels (brush and trees) are more hazardous (i.e. produce a more intense fire) than light fuels such as grass.

Mitigation of wildfire hazards focuses on breaking up the continuity of horizontal and vertical fuels. Additional distance between fuels is required on slopes.

Creating an effective defensible space involves developing a series of management zones in which different treatment techniques are used. See Figure 1 for a general view of the relationships among these management zones. Develop defensible space around each building on your property. Include detached garages, storage buildings, barns and other structures in your plan.

The actual design and development of your defensible space depends on several factors: size and shape of buildings, materials used in their construction, the slope of the ground on which the structures are built, surrounding topography,

Colorado State University Cooperative Extension

Putting Knowledge to Work

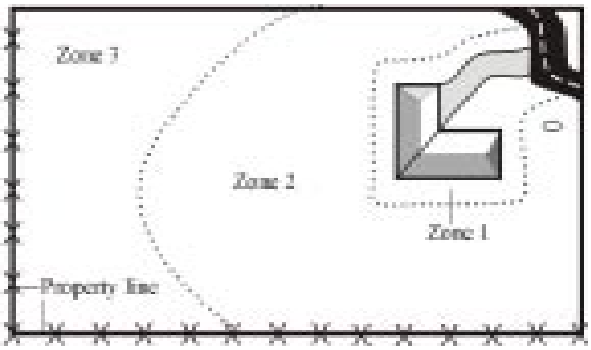


Figure 1: Forested property showing the three fire-defensible zones around a home or other structure.

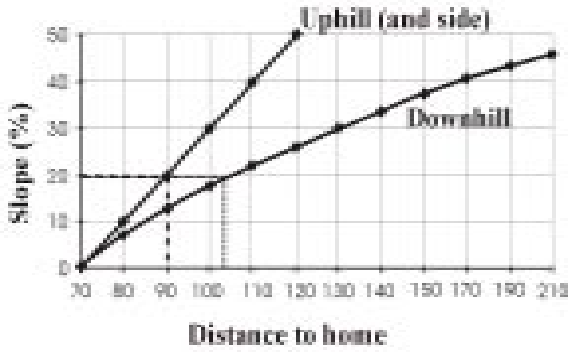


Figure 2: This chart indicates the *minimum recommended* dimensions for defensible space from the home to the outer edge of Zone 2. For example, if your home is situated on a 20 percent slope, the minimum defensible space dimensions would be 90 feet uphill and to the sides of the home and 104 feet downhill from the home.

and sizes and types of vegetation on your property. These factors all affect your design. You may want to request additional guidance from your local Colorado State Forest Service (CSFS) forester or fire department. (See the Special Recommendations section of this fact sheet for shrubs, lodgepole pine, Engelmann spruce, and aspen.)

Defensible Space Management Zones

Zone 1 is the area of maximum modification and treatment. It consists of an area of 15 feet around the structure in which all flammable vegetation is removed. This 15 feet is measured from the outside edge of the home's eaves and any attached structures, such as decks.

Zone 2 is an area of fuel reduction. It is a transitional area between Zones 1 and 3. The size of Zone 2 depends on the slope of the ground where the structure is built. Typically, the defensible space should extend *at least* 75 to 125 feet from the structure. See Figure 2 for the appropriate distance for your home's defensible space. Within this zone, the continuity and arrangement of vegetation is modified. Remove stressed, diseased, dead or dying trees and shrubs. Thin and prune the remaining larger trees and shrubs. Be sure to extend thinning along either side of your driveway all the way to your main access road. These actions help eliminate the continuous fuel surrounding a structure while enhancing homesite safety and the aesthetics of the property.

Zone 3 is an area of traditional forest management and is of no particular size. It extends from the edge of your defensible space to your property boundaries.

Prescriptions

Zone 1

The size of Zone 1 is 15 feet, measured from the edges of the structure. Within this zone, several specific treatments are recommended.

Plant nothing within 3 to 5 feet of the structure, particularly if the building is sided with wood, logs or other flammable materials. Decorative rock, for example, creates an attractive, easily maintained, nonflammable ground cover.

If the house has noncombustible siding, widely spaced foundation plantings of low growing shrubs or other "fire wise" plants are acceptable. Do not plant directly beneath windows or next to foundation vents. Be sure there are no areas of continuous grass adjacent to plantings in this area.

Frequently prune and maintain plants in this zone to ensure vigorous growth and a low growth habit. Remove dead branches, stems and leaves.

Do not store firewood or other combustible materials in this area. Enclose or screen decks with metal screening. Extend the gravel coverage under the decks. Do not use areas under decks for storage.

Ideally, remove all trees from Zone 1 to reduce fire hazards. If you do keep a tree, consider it part of the structure and extend the distance of the entire defensible space accordingly. Isolate the tree from any other surrounding trees. Prune it to at least 10 feet above the ground. Remove any branches that interfere with the roof or are within 10 feet of the chimney. Remove all "ladder fuels" from beneath the tree. Ladder fuels are vegetation with vertical continuity that allows fire to burn from ground level up into the branches and crowns of trees. Ladder fuels are potentially very hazardous but are easy to mitigate. No ladder fuels can be allowed under tree canopies. In all other areas, prune all branches of shrubs or trees up to a height of 10 feet above ground (or 1/2 the height, whichever is the least).

Zone 2

Zone 2 is an area of fuel reduction designed to reduce the intensity of any fire approaching your home. Follow these recommended management steps.

Thin trees and large shrubs so there is at least 10 feet between crowns. Crown separation is measured from the furthest branch of one tree to the nearest branch on the next tree (Figure 3). On steep slopes, allow more space between tree crowns. (See Figure 4 for *minimum recommended* spacing for trees on steep slopes.) Remove all ladder fuels from under these remaining trees. Carefully prune trees to a height of at least 10 feet.

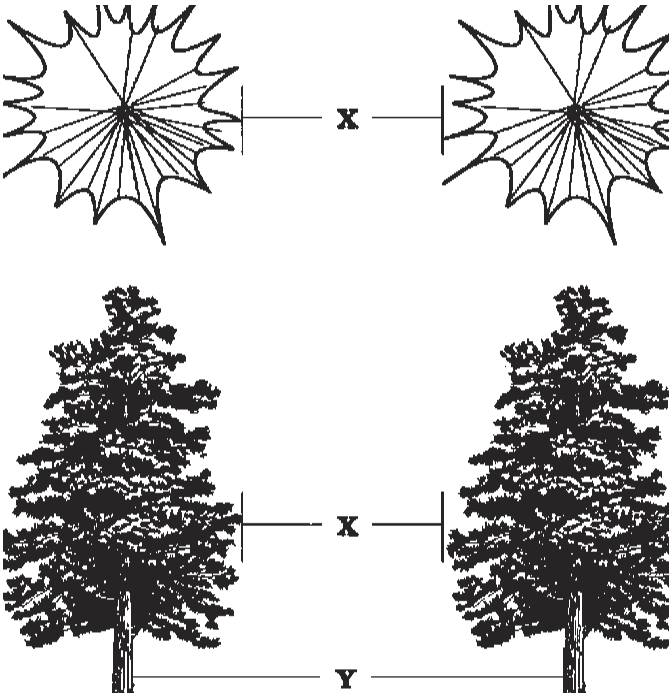


Figure 3: X = crown spacing; Y = stem spacing. Do not measure between stems for crown — measure between the edges of tree crowns.

Small clumps of 2 to 3 trees may be occasionally left in Zone 2. Leave more space between the crowns of these clumps and surrounding trees.

Because Zone 2 forms an aesthetic buffer and provides a transition between zones, it is necessary to blend the requirements for Zones 1 and 3. Thin the portions of Zone 3 adjacent to Zone 2 more heavily than the outer portions.

Isolated shrubs may remain, provided they are not under tree crowns. Prune and maintain these plants periodically to maintain vigorous growth. Remove dead stems from trees and shrubs annually. Where shrubs are the primary fuel in Zone 2, refer to the Special Recommendations section of this fact sheet.

Limit the number of dead trees (snags) retained in this area. Wildlife needs only one or two snags per acre. Be sure any snags left for wildlife cannot fall onto the house or block access roads or driveways.

Mow grasses (or remove them with a weed trimmer) as needed through the growing season to keep them low, a maximum of 6 to 8 inches. This is extremely critical in the fall when grasses dry out and cure or in the spring after the snow is gone but before the plants green up.

Stack firewood and woodpiles uphill or on the same elevation as the structure but at least 30 feet away. Clear and keep away flammable vegetation within 10 feet of these woodpiles. Do not stack wood against your house or on or under your deck, even in winter. Many homes have burned from a woodpile that ignited as the fire passed. Wildfires can burn at almost any time in Colorado.

Locate propane tanks at least 30 feet from any structures, preferably on the same elevation as the house. You don't want the LP container below your house — if it ignites, the fire would tend to burn uphill. On the other hand, if the tank is above your house and it develops a leak, LP gas will flow downhill into your home. Clear and keep away flammable vegetation within 10 feet of these tanks. Do not screen propane tanks with shrubs or vegetation.

Dispose of slash (limbs, branches and other woody debris) from your trees and shrubs through chipping or by piling and burning. Contact your local CSFS office or county sheriff's office for information about burning slash piles. If neither of these alternatives is possible, lop and scatter slash by cutting it into very small pieces and distributing it over the ground. Avoid heavy accumulations

% slope	Tree Crown Spacing	Brush and Shrub Clump Spacing
0 -10 %	10´	2 1/2 x shrub height
11 - 20%	15´	3 x shrub height
21 - 40%	20´	4 x shrub height
> 40%	30´	6 x shrub height

Figure 4: Minimum tree crown and shrub clump spacing.

Tree Diameter (in inches)	Average Stem Spacing Between Trees (in feet)
3	10
4	11
5	12
6	13
7	14
8	15
9	16
10	17
11	19
12	21
13	23
14	24
15	26
16	28
17	29
18	31
19	33
20	35
21	36
22	38
23	40
24	42

Figure 5: Minimum tree spacing for Zone 3.

of slash. Lay it close to the ground to speed decomposition. If desired, no more than two or three small, widely spaced brush piles may be left for wildlife purposes. Locate these towards the outer portions of your defensible space.

Zone 3

This zone is of no specified size. It extends from the edge of your defensible space to your property lines. A gradual transition into this zone from defensible space standards to other management objectives you may have is suggested. Typical management objectives for areas surrounding homesites or subdivisions are: provide optimum recreational opportunities; enhance aesthetics; maintain tree health and vigor; provide barriers for wind, noise, dust and visual intrusions; support limited production of firewood, fence posts and other forest commodities; or grow Christmas trees or trees for transplanting.

Specific requirements will be dictated by your objectives for your land and the kinds of trees present. See Figure 5 for the *minimum* suggested spacing between "leave" trees. Forest management in Zone 3 is an opportunity for you to increase the health and growth rate of the forest in this zone. Keep in mind that root competition for available moisture limits tree growth and ultimately the health of the forest.

A high canopy forest reduces the chance of a surface fire climbing into the tops of the trees and might be a priority for you if this zone slopes steeply. The healthiest forest is one that has multiple ages, sizes, and species of trees where adequate growing room is maintained over time. Remember to consider the hazards of ladder fuels. Multiple sizes and ages of trees might increase the fire hazard from Zone 3 into Zone 2, particularly on steep slopes.

A greater number of wildlife trees can remain in Zone 3. Make sure that dead trees pose no threat to power lines or fire access roads.

While pruning generally is not necessary in Zone 3, it may be a good idea from the standpoint of personal safety to prune trees along trails and fire access roads. Or, if you prefer the aesthetics of a well-manicured forest, you might prune the entire area. In any case, pruning helps reduce ladder fuels within the tree stand, thus enhancing wildfire safety.

Mowing is not necessary in Zone 3.

Any approved method of slash treatment is acceptable for this zone, including piling and burning, chipping or lop-and-scatter.

Special Recommendations

Tree spacing guidelines do not apply to *mature* stands of aspen trees where the recommendations for ladder fuels have been complied with. In areas of aspen regeneration and young trees, the spacing guidelines should be followed.

Brush and shrubs

Brush and shrubs are woody plants, smaller than trees, often formed by a number of vertical or semi-upright branches arising close to the ground. Brush is smaller than shrubs and can be either woody or herbaceous vegetation.

On nearly level ground, minimum spacing recommendations between clumps of brush and/or shrubs is 2 1/2 times the height of the vegetation. Maximum diameter of clumps should be 2 times the height of the vegetation. As with tree crown spacing, all measurements are made from the edges of vegetation crowns (Figure 3).

For example: For shrubs 6 feet high, spacing between shrub clumps should be 15 feet or more apart (measured from the edges of the crowns of vegetation clumps). The diameter of shrub clumps should not exceed 12 feet (measured from the edges of the crowns). Branches should be pruned to a height of 3 feet.

Grasses

Keep dead, dry or curing grasses mowed to less than 6 inches. Defensible space size where grass is the predominant fuel can be reduced (Figure 5) when applying this practice.

Windthrow

In Colorado, certain locations and tree species, including lodgepole pine and Engelmann spruce, are especially susceptible to damage and uprooting by high winds (windthrow). If you see evidence of this problem in or near your forest, or have these tree species, consider the following adjustments to the defensible space guidelines. It is highly recommended that you contact a professional forester to help design your defensible space.

Adjustments: If your trees or homesite are susceptible to windthrow and the trees have never been thinned, use a stem spacing of diameter plus five instead of the guides listed in the Zone 3 section. Over time (every 3 to 5 years) *gradually* remove additional trees. The time between cutting cycles allows trees to "firm up" by expanding their root systems. Continue this periodic thinning until the desired spacing is reached.

Also consider leaving small clumps of trees and creating small openings on their lee side (opposite of the predominant wind direction). Again, a professional forester can help you design the best situation for your specific homesite and tree species. Remember, with species such as lodgepole pine and Engelmann spruce, the likelihood of a wildfire running through the tree tops or crowns (crowning) is closely related to the overabundance of fuels on the forest floor. Be sure to remove downed logs, branches and *excess* brush and needle buildup.

Maintaining Your Defensible Space

Your home is located in a forest that is dynamic, always changing. Trees and shrubs continue to grow, plants die or are damaged, new plants begin to grow, and plants drop their leaves and needles. Like other parts of your home, defensible space requires maintenance. Use the following checklist each year to determine if additional work or maintenance is necessary.

% slope	D-space size (uphill, downhill, sidehill)
0 - 20 %	30'
21 - 40%	50'
> 40%	70'

Figure 6: Minimum defensible space size for grass fuels.

Defensible Space and FireWise Annual Checklist

- □ Trees and shrubs are properly thinned and pruned within the defensible space. Slash from the thinning is disposed of.
- □ Roof and gutters are clear of debris.
- □ Branches overhanging the roof and chimney are removed.
- □ Chimney screens are in place and in good condition.
- □ Grass and weeds are mowed to a low height.
- □ An outdoor water supply is available, complete with a hose and nozzle that can reach all parts of the house.
- □ Fire extinguishers are checked and in working condition.
- □ The driveway is wide enough. The clearance of trees and branches is adequate for fire and emergency equipment. (Check with your local fire department.)
- □ Road signs and your name and house number are posted and easily visible.
- □ There is an easily accessible tool storage area with rakes, hoes, axes and shovels for use in case of fire.
- □ You have practiced family fire drills and your fire evacuation plan.
- □ Your escape routes, meeting points and other details are known and understood by all family members.
- □ Attic, roof, eaves and foundation vents are screened and in good condition.

Stilt foundations and decks are enclosed, screened or walled up.

- ☐ Trash and debris accumulations are removed from the defensible space.
- ☐ A checklist for fire safety needs inside the home also has been completed. This is available from your local fire department.

References

Colorado State Forest Service, Colorado State University, Fort Collins, CO 80523-5060; (970) 491-6303:

- *FireWise Construction — Design and Materials*
- Home Fire Protection in the Wildland Urban Interface
- Wildfire Protection in the Wildland Urban Interface
- *Landowner Guide to Thinning*

Colorado State University Cooperative Extension, 115 General Services Bldg., Fort Collins, CO 80523-4061; (970) 491-6198; E-mail: cerc1@ur.colostate.edu:

- 6.303, *Fire-Resistant Landscaping*
- 6.304, *Forest Home Fire Safety*
- 6.305, *FireWise Plant Materials*
- 6.306, *Grass Seed Mixes to Reduce Wildfire Hazard*
- 7.205, *Pruning Evergreens*
- 7.206, *Pruning Shrubs*
- 7.207, *Pruning Deciduous Trees*

FIREWISE is a multi-agency program that encourages the development of defensible space and the prevention of catastrophic wildfire.

This fact sheet was produced in cooperation with the Colorado State Forest Service.

[1]Wildfire Hazard Mitigation Coordinator, Colorado State Forest Service.

Fuelbreak Guidelines for Forested Subdivisions & Communities

By

Frank C. Dennis

Colorado State Forest Service

Knowledge to Go Places

This publication was developed for use by foresters, planners, developers, homeowners' associations and others. Implementation of these measures cannot *guarantee* safety from all wildfires, but will greatly increase the probability of containing them at more manageable levels.

Inadequate fire planning can result in loss of life or property and costly suppression activities.

Colorado's forested lands are experiencing severe impacts from continuing population increases and peoples' desire to escape urban pressures. Subdivisions and developments are opening new areas for homesite construction at an alarming rate, especially along the Front Range and around recreational areas such as Dillon, Vail, and Steamboat Springs.

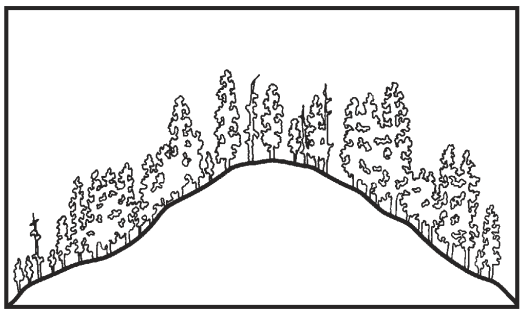
But with development inevitably comes a higher risk of wildfire as well as an ever-increasing potential for loss of life and property. Methods of fire suppression, pre-suppression needs, and homeowner and fire crew safety must all be considered in the planning and review of new developments as well as for the "retrofitting" of existing, older subdivisions.

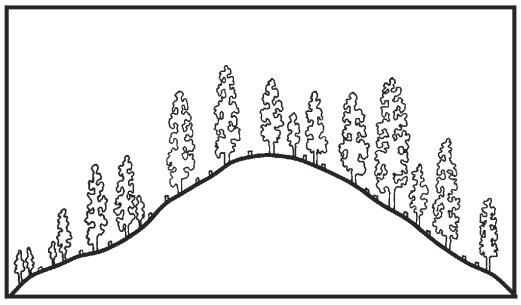
Fuelbreaks should be considered in fire management planning for subdivisions and developments; however, the following are guidelines **only**. They should be customized to local areas by professional foresters experienced in Rocky Mountain wildfire behavior and suppression tactics.

Fuelbreak vs Firebreak

Although the term fuelbreak is widely used in Colorado, it is often confused with firebreak. The two are entirely separate, and aesthetically different, forms of forest fuel modification and treatment.

• A firebreak is strip of land, 20 to 30 feet wide (or more), in which all vegetation is removed down to bare, mineral soil each year prior to fire season.





Above, cross section of mixed conifer stand before fuelbreak modification. Below, after modification.

• A fuelbreak (or shaded fuelbreak) is an easily accessible strip of land of varying width (depending on fuel and terrain), in which fuel density is reduced, thus improving fire control opportunities. The stand is thinned, and remaining trees are pruned to remove ladder fuels. Brush, heavy ground fuels, snags, and dead trees are disposed of and an open, park-like appearance is established.

The following is a discussion of the uses, limitations, and specifications of fuelbreaks in wildfire control and fuels management.

Fuelbreak Limitations

Fuelbreaks provide quick access for wildfire suppression. Control activities can be conducted more safely due to low fuel volumes. Strategically located, they break up large, continuous tracts of dense timber, thus limiting uncontrolled spread of wildfire.

Fuelbreaks can aid firefighters greatly by slowing fire spread under normal burning conditions. However, under extreme conditions, even the best fuelbreaks stand little chance of arresting a large

Before and after photos of a forest stand thinned to reduce fuel loads.

fire, regardless of firefighting efforts. Such fires, in a phenomenon called "spotting," can drop firebrands 1/8-mile or more ahead of the main fire, causing very rapid fire spread. These types of large fires may continue until there is a major change in weather conditions, topography, or fuel type.

It is critical to understand: A fuelbreak is the line of defense. The area (including any homes and developments) between it and the fire may remain vulnerable.

In spite of these somewhat gloomy limitations, fuelbreaks have proven themselves effective in Colorado. During the 1980 Crystal Lakes Subdivision Fire near Fort Collins, crown fires were stopped in areas with fuelbreak thinnings, while other areas of dense lodgepole pine burned completely. A fire at O'Fallon Park in Jefferson County was successfully stopped and controlled at a fuelbreak. The Buffalo Creek Fire in Jefferson County (1996) and the High Meadow Fire in Park and Jefferson Counties (2000) slowed dramatically wherever intense forest thinnings had been completed. During the 2002 Hayman Fire, Denver Water's entire complex of offices, shops and caretakers' homes at Cheesman Reservoir were saved by a fuelbreak with no firefighting intervention by a fuelbreak.

Burned area near Cheesman Reservoir as a result of the Hayman Fire. Note the unburned green trees in the middle right of the photo, a treated fuelbreak.

The Need For A Fuelbreak

Several factors determine the need for fuelbreaks in forested subdivisions, including: (1) potential problem indicators; (2) wildfire hazard areas; (3) slope; (4) topography; (5) crowning potential; and (6) ignition sources.

Potential Problem Indicator

The table below explains potential problem indicators for various hazards and characteristics common to Colorado's forest types. All major forest types, except aspen, indicate a high potential for wildfire hazard.

Fuel Type	Characteristics			Hazards			
	Aesthetics	Wildlife	Soil	**Wildfire**	Avalanche	Flood	Climate
Aspen	2	3	3	**2**	4	3	2
Douglas-fir	2	2	3	**5**	2	2	3
Greasewood-Saltbrush	4	2	2	**2**	1	3	3
Limber-Bristlecone Pine	3	2	4	**3**	4	2	5
Lodgepole Pine	2	2	3	**5**	4	2	4
Meadow	5	4	4	**2**	3	4	3
Mixed Conifer	2	1	1	**5**	3	1	3
Mountain Grassland	5	3	4	**3**	3	2	4
Mountain Shrub	3	5	4	**4**	2	2	3
Piñon-Juniper	2	3	4	**4**	2	3	2
Ponderosa Pine	2	3	1	**5**	2	2	3
Sagebrush	4	4	3	**3**	3	2	3
Spruce-Fir	2	3	3	**4**	5	**3**	4

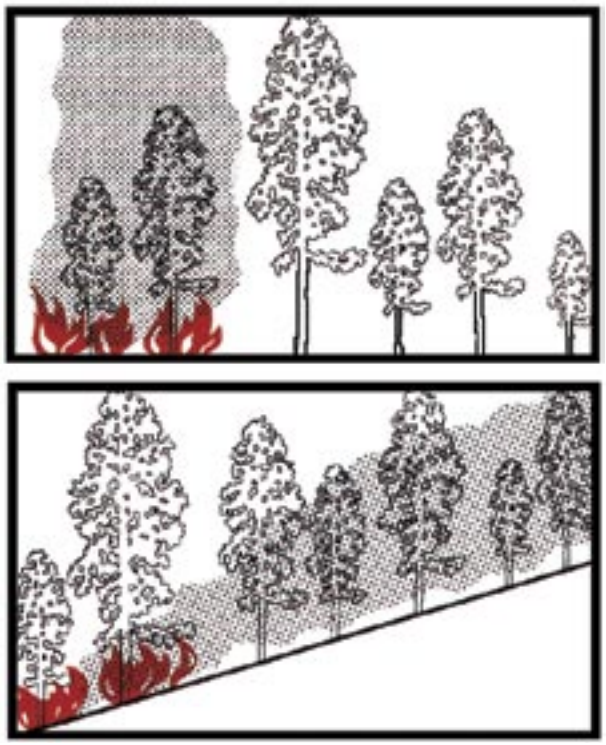
Legend: 5 – Problem may be crucial; 4 – Problem very likely;
3 – Exercise caution; 2 – Problem usually limited;
1 – No rating possible

Wildfire Hazard Maps

The Colorado State Forest Service (CSFS), numerous counties and some National Forests have completed wildfire hazard mapping for many areas within Colorado, particularly along the Front Range. These maps typically consider areas with 30 percent or greater slope; hazardous fuel types; and hazardous topographic features such as fire chimneys. Wildfire Hazard Ratings may be depicted in several ways. Whatever system is used, areas rated moderate or higher should be considered for fuel modification work.

Slope

Rate of fire spread increases as the slope of the land increases. Fuels are preheated by the rising smoke column or they may even come into contact with the flames themselves.



Fire effects, flat vs steep terrain. Note preheating of fuels on steep ground from passage of smoke column.

At 30 percent slope, rate of fire spread doubles compared to rates at level ground, drastically reducing firefighting effectiveness. **Areas near 30 percent or greater slopes are critical and must be reviewed carefully.**

Topography

Certain topographic features influence fire spread and should be evaluated. Included are fire chimneys, saddles, and V-shaped canyons. They are usually recognized by reviewing standard U.S.G.S. quad maps.

• Chimneys are densely vegetated drainages on slopes greater than 30 percent. Wind, as well as air pre-heated by a fire, tends to funnel up these drainages, rapidly spreading fire upslope.

• Saddles are low points along a main ridge or between two high points. Like chimneys, they also funnel winds to create a natural fire path during a fire's uphill run. Saddles act as corridors to spread fire into adjacent valleys or drainages.

Chimney.

Saddle.

• Narrow, V-shaped valleys or canyons can ignite easily due to heat radiating from one side to the other. For example, a fire burning on one side of a narrow valley dries and preheats fuels on the opposite side until the fire "flashes over." The natural effect of slope on fire then takes over and fire spreads rapidly up drainage and uphill along both sides of the valley.

Flashover in V-shaped valley.

Crowning Potential

An on-site visit is required to accurately assess crowning potential. A key, below, helps determine this rating. Fuel modification is usually unnecessary if an area has a rating of 3 or less.

Crowning Potential Key

	Rating
A. Foliage present, trees living or dead — B	
B. Foliage living — C	
C. Leaves deciduous or, if evergreen, usually soft, pliant, and moist; never oily, waxy, or resinous.	0
CC. Leaves evergreen, not as above — D	
D. Foliage resinous, waxy, or oily — E	
E. Foliage dense — F	
F. Ladder fuels plentiful — G	
G. Crown closure > 75 percent	9
GG. Crown closure < 75 percent	7
FF. Ladder fuels sparse or absent — H	
H. Crown closure > 75 percent	7
HH. Crown closure < 75 percent	5
EE. Foliage open — I	
I. Ladder fuel plentiful	4
II. Ladder fuel sparse or absent	2
DD. Foliage not resinous, waxy, or oily — J	
J. Foliage dense — K	
K. Ladder fuels plentiful — L	
L. Crown closure > 75 percent	7
LL. Crown closure < 75 percent	4
KK. Ladder fuels sparse or absent — M	
M. Crown closure > 75 percent	5
MM. Crown closure < 75 percent	3
JJ. Foliage open — N	
N. Ladder fuels plentiful	3
NN. Ladder fuels sparse or absent	1
BB. Foliage dead	0

The majority of dead trees within the fuelbreak should be removed. Occasionally, large, dead trees (14 inches or larger in diameter at 4 1/2 feet above ground level) may be retained as wildlife trees. If retained, all ladder fuels must be cleared from around the tree's trunk.

Ignition Sources

Possible ignition sources, which may threaten planned or existing developments, must be investigated thoroughly. Included are other developments and homes, major roads, recreation sites, railroads, and other possible sources. These might be distant from the proposed development, yet still able to channel fire into the area due to slope, continuous fuels, or other topographic features.

Fuelbreak Locations

In fire suppression, an effective fire line is connected, or "anchored," to natural or artificial fire barriers. Such anchor points might be rivers, creeks, large rock outcrops, wet meadows, or a less flammable timber type such as aspen. Similarly, properly designed and constructed fuelbreaks take advantage of these same barriers to eliminate "fuel bridges." (Fire often escapes control because of fuel bridges that carry the fire across control lines.)

Since fuelbreaks should normally provide quick, safer access to defensive positions, they are necessarily linked with road systems. Connected with county-specified roads within subdivisions, they provide good access and defensive positions for firefighting equipment and support vehicles. Cut-and fill slopes of roads are an integral part of a fuelbreak as they add to the effective width of modified fuels.

Fuelbreaks without an associated road system, such as those located along strategic ridge lines, are still useful in fire suppression. Here, they are often strengthened and held using aerial retardant drops until fire crews can walk in or be ferried in by helicopter.

Preferably, fuelbreaks are located along ridge tops to help arrest fires at the end of their runs. However, due to homesite locations and resource values, they can also be effective when established at the base of slopes. Mid-slope fuelbreaks are least desirable, but under certain circumstances and with modifications, these too, may be valuable.

Fuelbreaks are located so that the area under management is broken into small, manageable units. Thus, when a wildfire reaches modified fuels, defensive action is more easily taken, helping to keep the fire small. For example, a plan for a subdivision might recommend that fuelbreaks break up continuous forest fuels into units of 10 acres or less. This is an excellent plan, especially if defensible space thinnings are completed around homes and structures, and thinning for forest management and forest health are combined with the fuelbreak.

When located along ridge tops, continuous length as well as width are critical elements. Extensive long-range planning is essential in positioning these types of fuelbreaks.

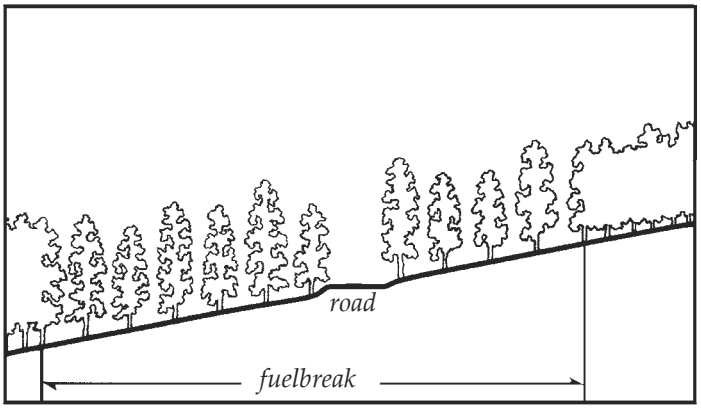
Aesthetics

Improperly planned fuelbreaks can adversely impact an area's aesthetic qualities. Careful construction is necessary when combining mid-slope fuelbreaks with roads involving excessive cut-and-fill.

These photos, far- and near- views of the same site, illustrate that forest can be thinned without impacting aesthetics.

Care must also be taken in areas that are not thinned throughout for fuel hazard reduction. In such cases the fuelbreak visually sticks out like a "sore thumb" due to contrasting thinned and unthinned portions of the forest. (Especially noticeable are those portions of the fuelbreak above road cuts).

These guidelines are designed to minimize aesthetic impacts. However, some situations may require extensive thinning and, thus, result in a major visual change to an area. Additional thinning beyond the fuelbreak may be necessary to create an irregular edge and to "feather," or blend, the fuelbreak thinning into the unthinned portions of the forest. Any thinning beyond the fuelbreak improves its effectiveness and is highly recommended.



Cross-section of a typical fuelbreak built in conjunction with a road.

Constructing the Fuelbreak

Fuelbreak Width and Slope Adjustments

Note: Since road systems are so important to fuelbreak construction, the following measurements are from the toe of the fill for downslope distances, and above the edge of the cut for uphill distances.

The minimum recommended fuelbreak width is approximately 300 feet for level ground. Since fire activity intensifies as slope increases, the overall fuelbreak width must also increase. However, to minimize aesthetic impacts and to maximize fire crew safety, the majority of the increases should be made at the bottom of the fuelbreak, below the road cut.

Widths are also increased when severe topographic conditions are encountered. Guidelines for fuelbreak widths on slopes are given below:

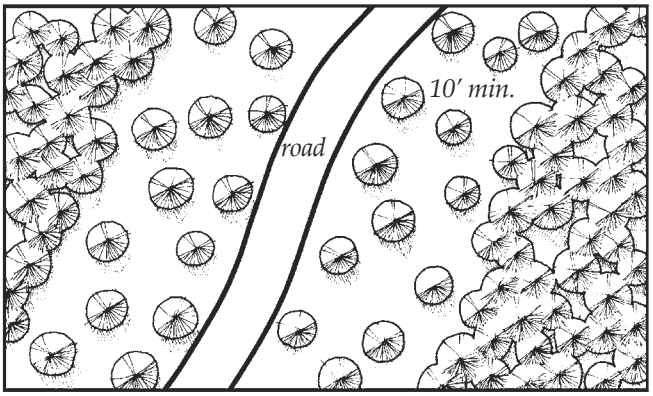
Fuelbreak Width/Slope

Percent Slope (%)	Minimum Uphill Distance (ft)	Minimum Downhill Distance (ft)	Total Width of Modified fuels (ft)*
0	150	150	300
10	140	165	303
20	130	180	310
30	120	195	315
40	110	210	320
50	100	225	325
60	100	240	340

*As slope increases, total distance for cut-and-fill for road construction rapidly increases, improving fuelbreak effective width.

Stand Densities

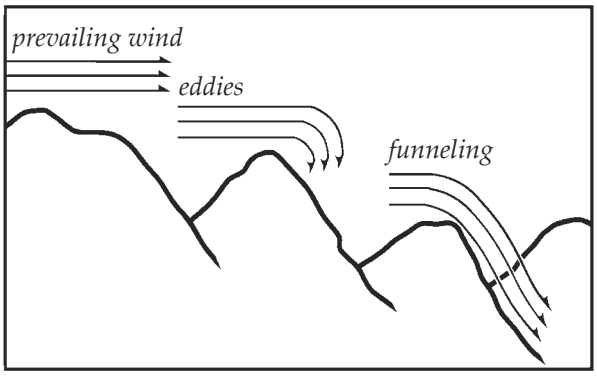
Crown separation is a more critical factor for fuelbreaks than a fixed tree density level. A *minimum* 10-foot spacing between the edges of tree crowns is recommended on level ground. As slope increases, crown spacing should also increase. However, small, isolated groups of trees may be retained for visual diversity. Increase crown spacing around any groups of trees left for aesthetic reasons and to reduce fire intensities and torching potential.



Plan view of fuelbreak showing minimum distance between tree crowns.

In technical terms, a fuelbreak thinning is classified as a heavy "sanitation and improvement cut, from below." Within fuelbreaks, trees that are suppressed, diseased, deformed, damaged, or of low vigor are removed along with all ladder fuels. Remaining trees are the largest, healthiest, most wind-firm trees from the dominant and co-dominant species of the stand.

Because such a thinning is quite heavy for an initial entry into a stand, prevailing winds, eddy effects, and wind funneling must be carefully evaluated to minimize the possibility of windthrow. It may be necessary to develop the fuelbreak over several years to allow the timber stand to "firm-up" — this especially applies to lodgepole pine and Engelmann spruce stands.



Topography affects wind behavior – an important consideration during fuelbreak construction.

Area-wide forest thinnings are recommended for any subdivisions. Such thinning is not as severe as a fuelbreak thinning, but generally should be completed to fuelbreak specifications along the roads (as outlined on page 6.) In addition, "defensible space thinnings" are highly recommended around all structures (see CSU Coop. Extension Fact sheet 6.302, *Creating Wildfire-Defensible Zones*).

Debris Removal

Limbs and branches left from thinning (slash) can add significant volumes of fuel to the forest floor, especially in lodgepole pine, mixed-conifer, or spruce/fir timber types. These materials can accumulate and serve as ladder fuels, or can become "jackpots," increasing the difficulty of defending the fuelbreak during a wildfire. **Slash decomposes very slowly in Colorado and proper disposal is essential.** Proper treatment reduces fire hazard, improves access for humans and livestock, encourages establishment of grasses and other vegetation, and improves aesthetics.

Three treatment methods are commonly used. These are lopping-and-scattering, piling and burning, and chipping. Mulching of small trees and slash using equipment similar to Hydro-axes or Timbcos equipped with mulching heads are becoming a popular method of treatment. Size, amount, and location of slash dictates the method used, in addition to cost and the final desired appearance. The method chosen will also depend on how soon an effective fuelbreak is needed prior to construction in new developments.

Lop and scatter: slash should be no deeper than 12'' above ground surface.

Chipping is the most desirable, but also the most expensive method of slash disposal.

Piled slash can be burned but only during certain conditions, such as after a snowfall.

Fuelbreak Maintenance

Following initial thinning, trees continue to grow (usually at a faster rate). The increased light on the forest floor encourages heavy grass and brush growth where, in many cases, where little grew before. The site disturbance and exposed mineral soil created during fuelbreak development is a perfect seed bed for new trees that, in turn, create new ladder fuels. Thus, in the absence of maintenance, fuelbreak effectiveness will decrease over time.

Fuelbreak maintenance is essential. Ingrowth, shown above, will minimize the effectiveness of this fuelbreak within a few years.

Fuelbreak maintenance problems are most often the result of time and neglect. Misplaced records, lack of follow-up and funding, and apathy caused by a lack of fire events are some of the major obstacles. In addition, the responsibility for fuelbreak maintenance projects is often unclear. For example, control of a fuelbreak completed by a developer passes to a homeowner's association, usually with limited funds and authority to maintain fuelbreaks.

If fuelbreak maintenance is not planned and completed as scheduled, consider carefully whether the fuelbreak should be constructed. An un-maintained fuelbreak may lead to a false sense of security among residents and fire suppression personnel.

Conclusion

An image of well-designed communities for Colorado includes:

• Forested subdivisions where the total forest cover is well-managed through carefully planned, designed, and maintained thinnings. This contributes to reduced wildfire hazards and a much healthier forest — one that is more resistant to insects and disease.

• A system of roads and driveways with their associated fuelbreaks that break up the continuity of the forest cover and fuels. These help keep fires small, while also providing safer locations from which to mount fire suppression activities. In addition to allowing fire personnel in, they will allow residents to evacuate if necessary.

• Individual homes that all have defensible space around them, making them much easier to defend and protect from wildfire, while also protecting the surrounding forest from structure fires.

Creation of such communities is entirely feasible if recognition of the fire risks, a spirit of cooperation, an attitude of shared responsibility, and the political will exists.

Colorado's mountains comprise diverse slopes, fuel types, aspects, and topographic features. This variety makes it impossible to develop general fuelbreak prescriptions for all locations. ***The previous recommendations are guidelines only.*** *A professional forester with fire suppression expertise should be consulted to "customize" fuelbreaks for particular areas.*