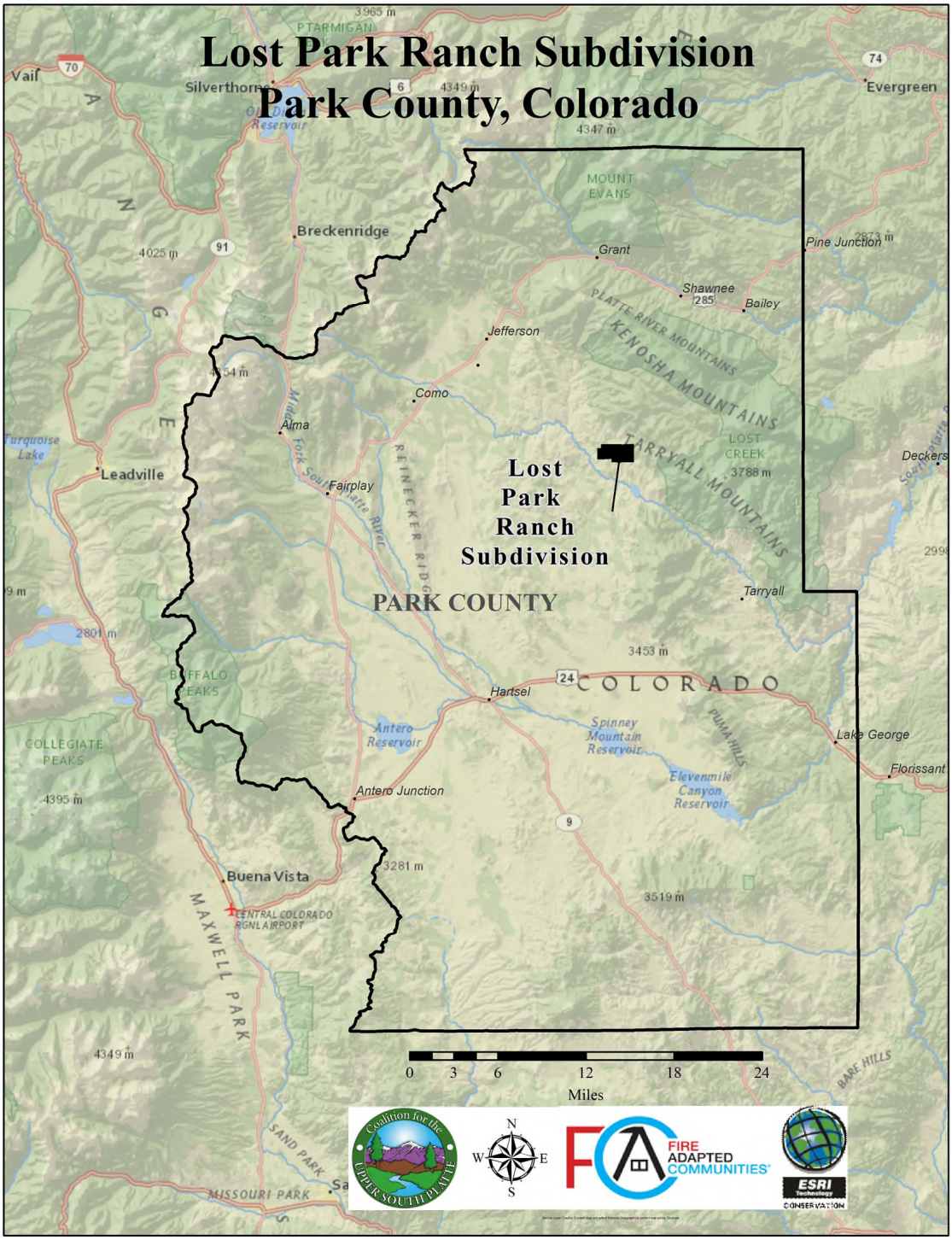
Lost Park Ranch Owners Association
Community Wildfire Protection Plan 2015



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Acronyms

BLM	Bureau of Land Management
CUSP	Coalition for the Upper South Platte
CSFS	Colorado State Forest Service
CWPC	Community Wildfire Protection Committee
CWPP	Community Wildfire Protection Plan
EMS	Emergency Medical Services
GIS	Geographic Information Systems
HFRA or The Act	Healthy Forests Restoration Act
HFRA	Healthy Forests Restoration Act
HIZ	Home Ignition Zone
JCFPD	Jefferson-Como Fire Protection District
MPB	Mountain Pine Beetle
NIST	National Institute of Science and Technology
USFS	United States Forest Service
WUI	Wildland-urban Interface

Document Revision History

Name	Version	Date
LPROA Final Approved by LPROA Board	LPROA Board Final	April 3, 2015

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1.0 PURPOSE AND CONCURRENCES

1.1 PURPOSE

Congressional enactment of the Healthy Forests Restoration Act (HFRA) in 2003 gave unprecedented incentive for community-based forest planning. This landmark legislation includes the first meaningful statutory incentives for the US Forest Service (USFS) and the Bureau of Land Management (BLM) to consider the priorities of local communities as they develop and implement forest management and hazardous fuel reduction projects. In order for a community to take full advantage of this opportunity, it must first prepare a Community Wildfire Protection Plan (CWPP). Local wildfire protection plans can take a variety of forms, based on the needs of the people involved in their development. A CWPP also may address issues such as wildfire response, hazard mitigation, community preparedness and structure protection. The process of developing a CWPP can help a community clarify and refine its priorities for protection of life, property and infrastructure in its wildland–urban interface. This CWPP for the Lost Park Ranch subdivision of Park County is intended to accomplish all of these ends.

1.2 CONCURRENCES

Each of the following entities concurs in the adoption of this CWPP:

James A. Hoffmeyer — Date: April 5, 2015
Jim Hoffmeyer, LPROA Firewise Committee

Clifford R. Pugh — Date: 4-6-2015
Cliff Pugh, LPROA President

Date: 4-7-2015
Jonathan Bruno, Coalition for the Upper South Platte

Date: 4-9-2015
Barry Wilson, Jefferson-Como Fire Protection District Chief

Date: 4-6-2015
Larry Long, Colorado State Forest Service District Forester

Date: 6-18-2015
The Park County Board of County Commissioners concurred on this Lost Park Ranch CWPP

2.0 INTRODUCTION

For most of the twentieth century, the predominant theme for managing the nation's forests was conservation. Accordingly, forest fires were actively suppressed to protect both old and young trees. Consequently, the present forests, including those in Lost Park Ranch, are quite different from those existing in the early nineteenth century, before settlement, when occasional fires played an important role in maintaining healthy forests.

As fires have been suppressed, forest fuel levels have increased so that fires ignite more easily and burn with greater intensity. Due to prolonged drought and overcrowded forest conditions, the trees are more susceptible to insects and disease. In addition, the rapid expansion of residential housing and other development into the wildlands has greatly increased the likelihood and the difficulty of managing wildfires so that some have the potential to reach catastrophic proportions.

Fire managers can no longer focus only on perimeter control and putting fires out. They must also deal with evacuation and safety of residents, protection of homes, higher fire intensities and heavy media interest. These factors require high levels of cooperation and coordination across jurisdictional and agency boundaries.

Wildfire poses a high risk of catastrophic consequences to the Lost Park Ranch subdivision and its increasing number of residents. Therefore, property owners have developed this Plan to provide a strategy for improving awareness and preparedness, acting cooperatively and efficiently in fuel mitigation projects, and understanding emergency response.

2.1 HEALTHY FORESTS RESTORATION ACT

In 2000, more that 7 million acres of forest and range land burned across the United States, making that year one of the worst wildfire seasons in American history. The fire season of 2002 was another reminder for citizens and governments about the severity of wildfire in America. Colorado's Hayman Fire occurred that year and involved hundreds of forestry officials and firefighters, caused nearly $40 million in damages, burned 138,000 acres and 133 homes, and forced the evacuation of 5,340 people. The Hayman fire occurred about 12 miles south east of Lost Park Ranch and spread east away from Lost Park Ranch.

The fire seasons of 2000 and 2002 led to comprehensive forest planning and the 2003 enactment of the Healthy Forests Restoration Act (HFRA or the Act) by the Federal government.[1] In the HFRA, Congress directed vulnerable communities to prepare Community Wildfire Protection Plans (CWPPs).

1 "The Healthy Forests Restoration Act," Society of American Foresters, http://wiki.safnet.org/index.php/Currentissues07.

2.2 REQUIREMENTS FOR COMMUNITY WILDFIRE PROTECTION PLANS

The HFRA encouraged the use of CWPPs to aid communities in planning how they would reduce the risk of wildfire. Such plans are to identify strategic sites and methods for fuel reduction projects across the landscape and across jurisdictional boundaries. The benefits of having a CWPP include funding priority under the National Fire Plan for projects identified in the CWPP and tax advantages for property owners who accomplish fuel reduction. In addition, the United States Forest Service (USFS) and the Bureau of Land Management (BLM) can expedite the implementation of fuel treatments identified in a CWPP through alternative environmental compliance options offered under the HFRA. The Act requires the following items of a CWPP:

1. Collaboration between private landowners, emergency services personnel and federal and state land managers.
2. Identification and prioritization of fuel reduction strategies and treatments, with recommendations for the future.
3. Recommendation of measures that homeowners and communities can take to reduce ignitability of structures.

The Colorado State Forest Service (CSFS) issued guidance on the development and management of CWPPs[2] and revised the guidance in November 2009.[3]

2.3 DESCRIPTION OF LOST PARK RANCH COMMUNITY

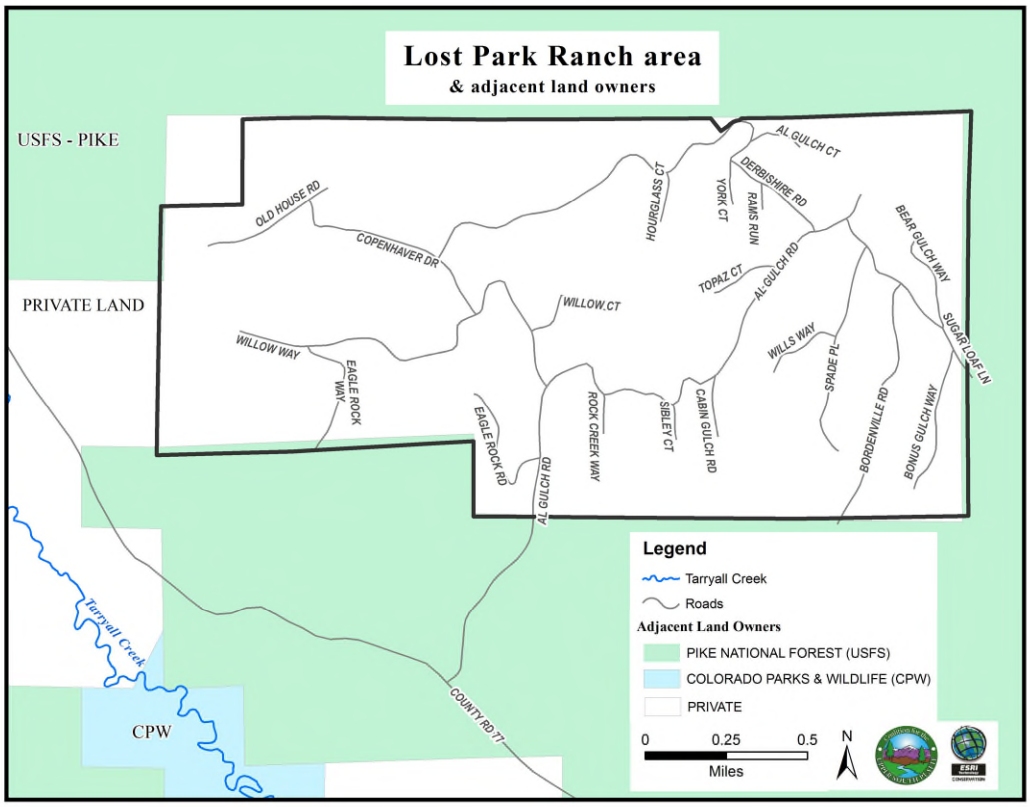
The Lost Park Ranch subdivision is situated in the northern part of Park County, Colorado. It encompasses approximately 1790 acres. There are 267 lots in the subdivision with roughly 51% of the lots having structures. The subdivision's population is estimated to be about 18 full time residents. These numbers continue to increase. As the population increases, so does the potential for wildfire to destroy homes and other highly valued assets in the community. Therefore, it is imperative that all landowners work cooperatively to reduce this risk. The Jefferson-Como Fire Protection District (JCFPD)[4] provides fire protection for the subdivision.

The Lost Park Ranch subdivision is outlined in the below subdivision base map. The subdivision is bordered on the West and South by private property and on the North and East by the Pike National Forest.

2 "Community Wildfire Protection Planning," Colorado State Forest Service, http://csfs.colostate.edu/pages/community-wf-protection-planning.html.

3 "Final revised CWPP Minimum Standards," Colorado State Forest Service, http://csfs.colostate.edu/

4 Jefferson-Como Fire Protection District, http://jcfpd.org/



2.4 ROLE OF THE CWPP COMMITTEE FOR LOST PARK RANCH

Property owners in Lost Park Ranch formed an ad hoc committee to develop this CWPP in the spring of 2014. The committee requested assistance from the Colorado State Forest Service, which asked the Coalition for the Upper South Platte (CUSP) to provide professional support to the Lost Park Ranch Owners Association Committee. All committee members own homes or property in Lost Park Ranch. Jonathan Bruno, Michelle Connelly, and Kat Herrera from CUSP and Dave Root from the Colorado State Forest Service supported the committee. The committee met several times to create this plan. Representatives of CSFS, JCFPD, Lost Park Ranch and Park County government that are familiar with the purpose of CWPPs also reviewed the plan.

The LPROA CWPP Committee enumerated the following reasons for developing this plan for Lost Park Ranch:

1. Providing learning opportunities regarding the importance and techniques of wildfire prevention to members of the community;
2. Integration of the efforts of the diverse stakeholders in wildfire prevention in the community;
3. Improving fire fighter accessibility in the event of wildland or structural fire;
4. Informing property owners of tax advantages of wildfire prevention efforts;
5. Enabling grant applications for funds to assist wildfire prevention efforts;

6. Increasing awareness of the relationships among fire prevention, forest health and water sheds;
7. Improving collaborative efforts within the subdivision;
8. Obtaining measurable reductions in wildfire fuel within the subdivision; and
9. Establishing collaborative efforts with property owners adjoining the subdivision to reduce the fuel for wildfires.

The CWPP committee intends that comments on the plan can be made at any time and that the plan will be updated from time to time to reflect the will of the community.

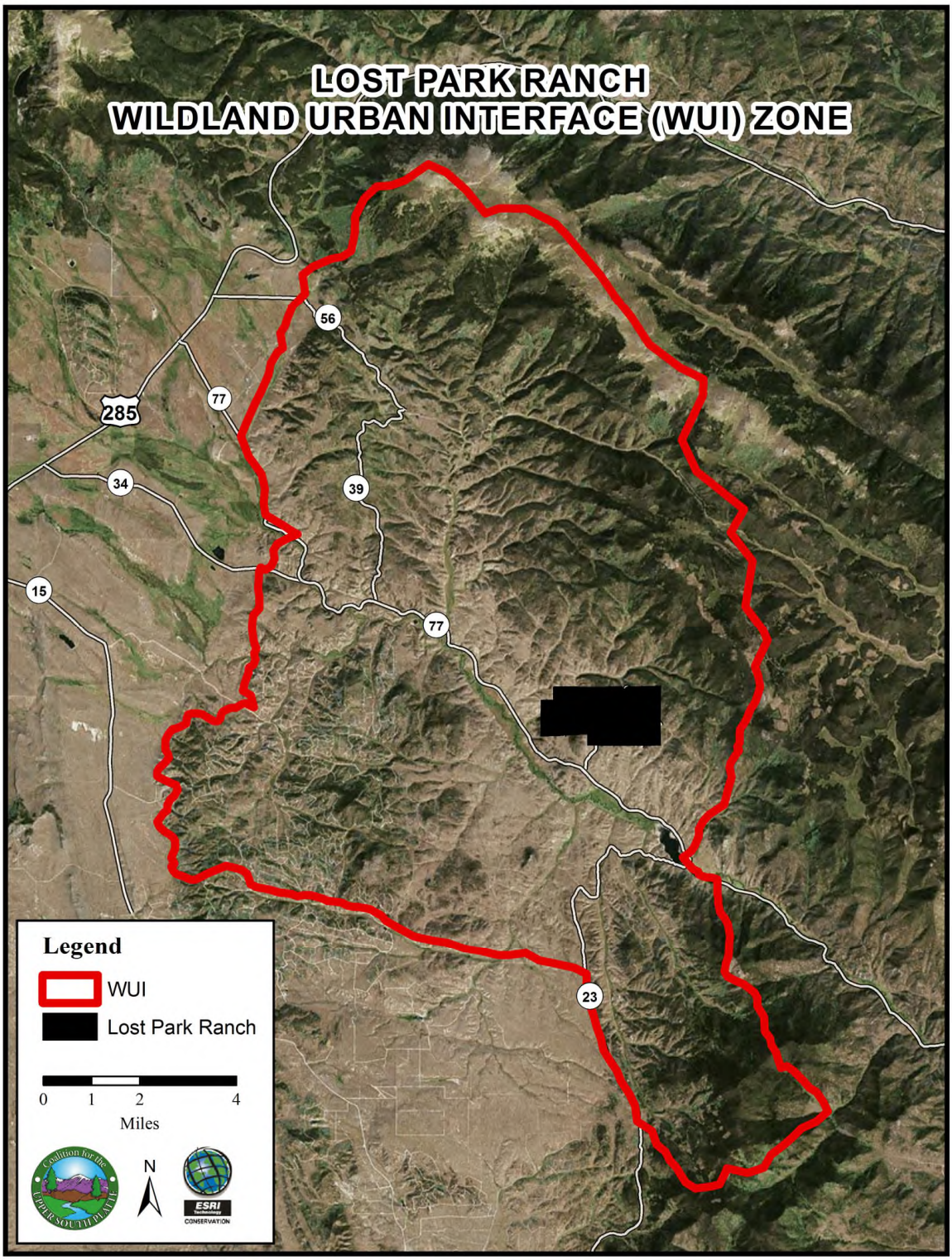
3.0 WILDLAND-URBAN INTERFACE (WUI)

The impact of a catastrophic wildland fire is far reaching. Not only is there the potential loss of structures, but wildfire also leaves behind emotional, economic and environmental devastation. Fire that leads to the loss of wild lands and homes (urban structures) is the subject of this Plan. A term that has gained wide acceptance in wildfire prevention circles, and that is used throughout this Plan, is the wildland-urban interface (WUI). It is the zone where structures and other human development meet and intermingle with vegetative fuels in undeveloped wildland.

3.1 LOST PARK RANCH WILDLAND URBAN INTERFACE BOUNDARY

The wildland urban interface (WUI) boundary is defined as the area where a wildfire would be a threat. The boundary was developed by considering fuels, topography and values at risk adjacent to the community. The boundary was drawn to reflect not only the areas where a fire might burn to the community, but to include the area where post fire erosion would adversely affect the communities prized fisheries. Erosion from the drainages would threaten water quality in the Tarryall River. The map below shows the WUI for Lost Park Ranch.[5]

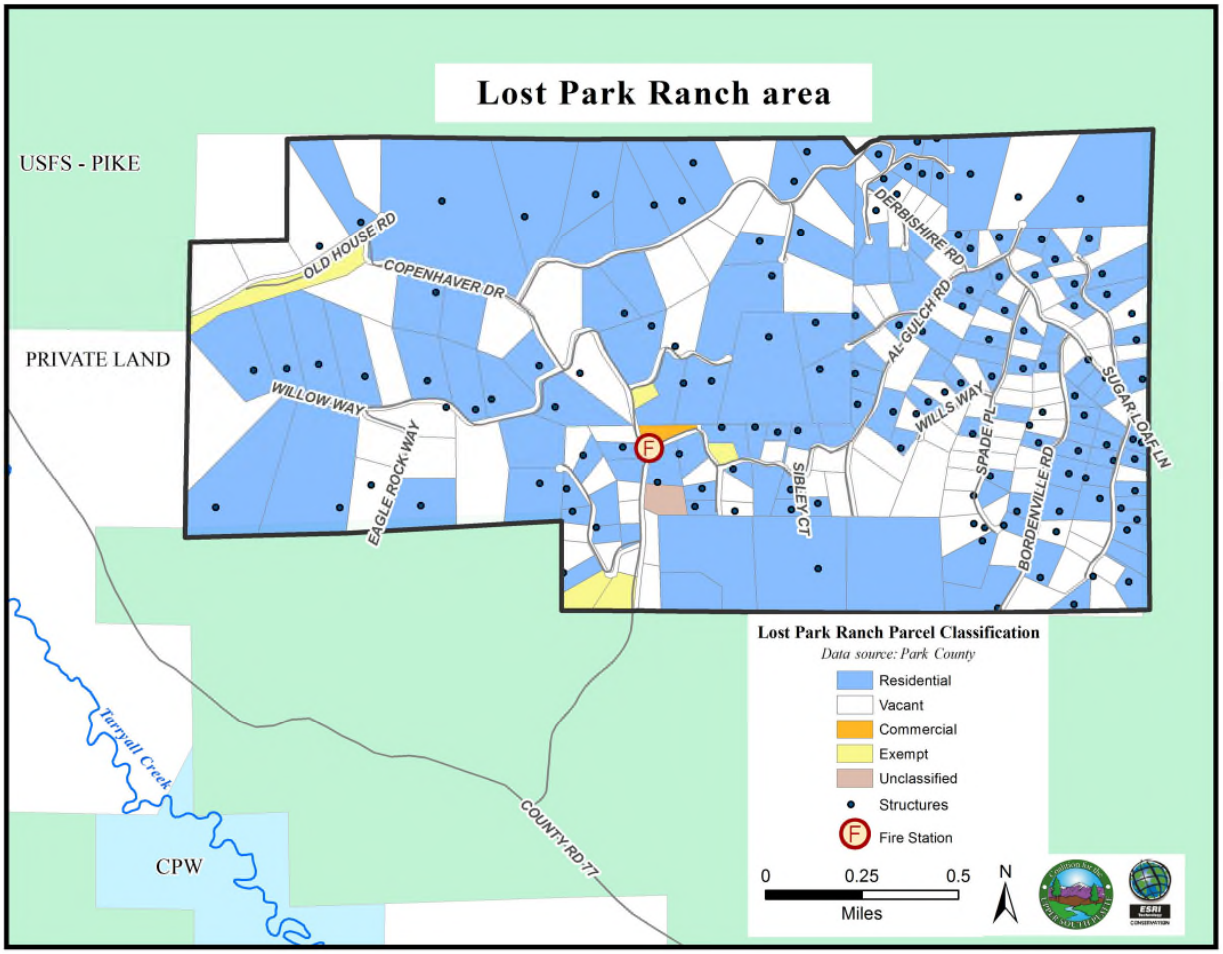
[5] The source of the information is "Colorado Risk Assessment Summary Report – Lost Park Ranch," July 18, 2013, Colorado State Forest Service.


LOST PARK RANCH
WILDLAND URBAN INTERFACE (WUI) ZONE
56
77
285
34
39
15
77
23
Legend
WUI
Lost Park Ranch
0 1 2 4
Miles
N
ESRI
CONSERVATION

3.2 STRUCTURES AT RISK

There are roughly 190 privately owned structures at risk in Lost Park Ranch. Their average replacement cost can range upwards from $150,000 per residence. Thus, the total real property value in the subdivision exceeds $28.5 million dollars.

The map below shows wide dispersion of properties with structures of various types within Lost Park Ranch (i.e., the WUI). The potential for wildfire movement in the Lost Park Ranch vicinity is high. Cross-boundary projects for fuel mitigation should be considered by all land owners to provide for the greatest potential benefits in Lost Park Ranch.



In the past, little information was available to homeowners and contractors regarding the wildfire threat to residences and other structures. As a result, construction materials and placement of structures often created a greater hazard than was necessary. Today there is improved understanding of the WUI and there are "firewise" construction techniques and materials to reduce the likelihood of loss of structures in the event of a wildfire. Actions described later in this CWPP address these opportunities.

3.3 OTHER VALUES AT RISK

Other values at risk, besides structures, include the forest, the watershed and wildlife.

Besides homes and community properties in Lost Park Ranch, other values may be critical to the community and could become casualties of a catastrophic wildfire. These include historic artifacts real estate values, community infrastructure, such as roads and utilities, economic impacts to residents and businesses, aesthetic values and a sense of community or "why we live here."

The following information is from the Colorado State Forest Service. [6]

The Values Impacted Rating (VIR) is an overall Fire Effects rating that combines the risk ratings for Wildland Urban Interface (WUI), Forest Assets, Riparian Assets, and Drinking Water Importance Areas into a single measure of values-at-risk. The individual ratings for each value layer were derived using a Response Function approach.

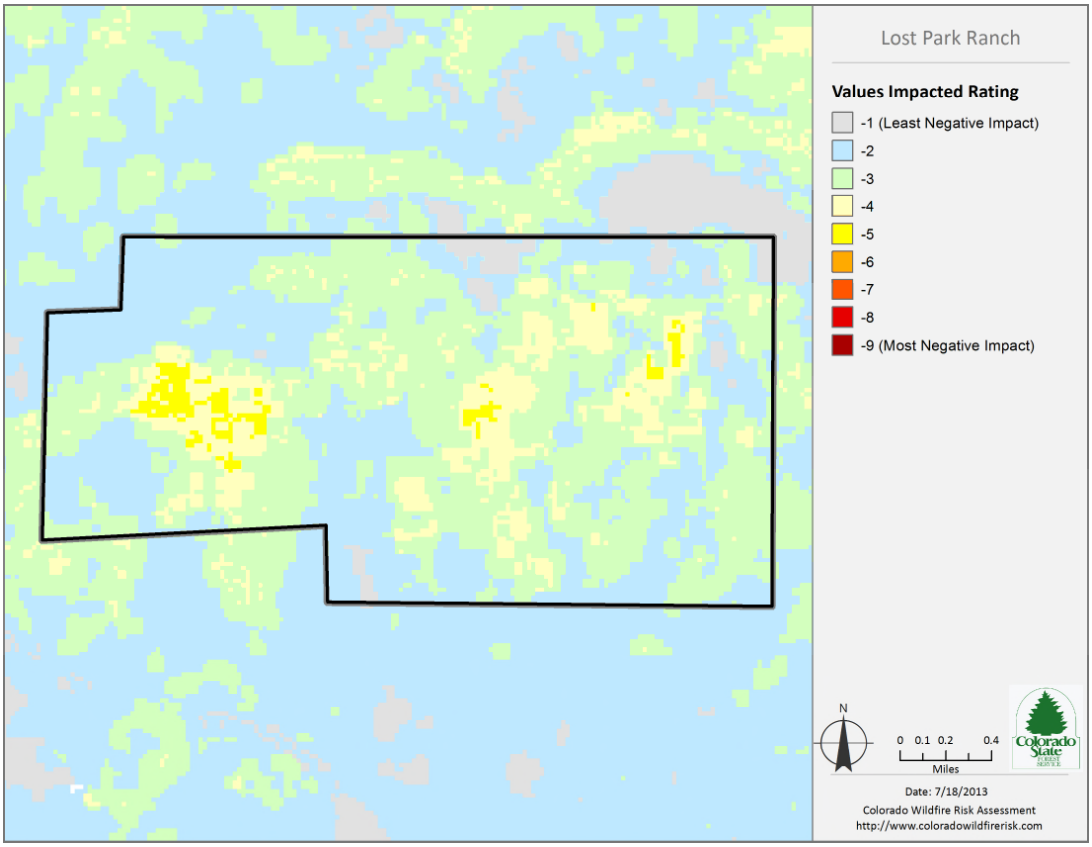
Response functions are a method of assigning a net change in the value to a resource or asset based on susceptibility to fire at different intensity levels. A resource or asset is any of the Fire Effects input layers, such as WUI, Forest Assets, etc. These net changes can be adverse (negative) or positive (beneficial).

Calculating the VIR at a given location requires spatially defined estimates of the intensity of fire integrated with the identified resource value. This interaction is quantified through the use of response functions that estimate expected impacts to resources or assets at the specified fire intensity levels. The measure of fire intensity level used in the Colorado assessment is flame length for a location. Response Function outputs were derived for each input data set and then combined to derive the Values Impacted Rating.

[6] "Colorado Wildfire Risk Assessment Summary Report – Lost Park Ranch," Colorado State Forest Service, July 18, 2013

VIR Class	Acres	Percent
-1 (Least Negative Impact)	44	2.5%
-2	649	36.6%
-3	802	45.3%
-4	238	13.4%
-5	39	2.2%
-6	0	0.0%
-7	0	0.0%
-8	0	0.0%
-9 (Most Negative Impact)	0	0.0%
Total	**1,773**	**100.0%**

The table above and the figure below clearly show the areas of Lost Park Ranch that have the greatest potential value impact from wildfires. It is interesting to note that 84.4% of Lost Park Ranch has a VIR of -3 or less.



3.4 HISTORIC BUILDINGS

There are no historic buildings within Lost Park Ranch.

3.5 FOREST

The Lost Park Ranch forest is old growth and contains six species of conifers, namely, ponderosa pine, limber pine, bristle-cone pine, Douglas-fir, Colorado blue spruce and Engelmann spruce. Scattered among the conifers are patches of aspen and grass ranging in size from dozens of square feet to dozens of acres.

Vacant property values in Lost Park Ranch range from $2000 to $20,000 per acre. If the average land value is $5,000 per acre for both developed and undeveloped lots and if that value were to be reduced in half by a wildfire, the potential loss of land value for the 1790 acres encompassed in the subdivision would total$4,432,500.

Lost Park Ranch enjoys unparalleled views of the Continental Divide and other mountains that surround South Park, all framed by the species-rich forests of the subdivision. The loss of esthetic and monetary value of Lost Park Ranch scenery in a destructive wildfire would be tragic.

3.6 WATERSHED

Lost Park Ranch is in the Tarryall Creek drainage, which combines downstream with the South Platte River drainage, the source of water for metropolitan Denver. The 2002 Hayman fire on the South Platte River drainage affected the cost of the metropolitan water supply for years. As a result of the damage to the watershed, $17,000,000 was applied to post-fire management techniques to restore and maintain water quality.

A severe wildfire in the Lost Park area would negatively impact water users near and far from the burn. Erosion and debris flows from a fire would degrade stream quality and fisheries in Tarryall Creek and the South Platte. The south Platte drainage supplies water to the large metropolitan areas along the Front Range and eastern plains of Colorado. These problems will persist for many years after the fire itself is controlled.

3.7 WILDLIFE

Lost Park Ranch is home to bear, mountain lion, bobcat, fox, coyote, elk, deer and uncounted smaller, four-legged animals. More than 75 bird species have been recorded in the subdivision and surrounding lands. While research has shown that wildfire can lead to increased diversity of wildlife, the temporary disruption of wildlife habitat caused by a wildfire would dismay many residents in Lost Park Ranch and diminish property values and the quality of life in this large, forested community.

When forest are restored to the more open structure typical of pre fire suppression forests, the abundance and variety of wildlife species increases. Managing forests to create a variety of habitats, for example

openings and aspen patches, increases the diverse habitat structure that supports many species of wildlife. Dense, overgrown forests are poor habitat for most wildlife species

4.0 WILDLAND FIRE, FUELS, AND RISK

Before human occupation, fire was a natural part of the Rocky Mountain environment. Frequent low intensity fires thinned the trees and maintained forest diversity removed dead or down fuels and recycled nutrients necessary for healthy forest growth. These naturally occurring fires also promoted a variety of other vegetation that provided food sources and habitats necessary for wildlife to thrive.

As people moved into the wildland, wildfire was seen as a destructive force to be avoided at all cost. The strict fire suppression activities of the last hundred years, which were meant to protect human life and communities, have interfered with the natural wildfire cycle allowing forest fuels to accumulate, reducing forest and vegetation diversity and limiting wildlife habitats. The potential costs of catastrophic wildfire, in terms of dollars, resources and aesthetics, have continued to rise as the density of the vegetation continued to increase.

4.1 TYPES OF WILDFIRES

Wildfires can be broadly categorized into two types based on the intensity of the fire and the damage caused to the environment. The most severe type is a crown fire, such as the Hayman Fire of 2002. As will be discussed later, the second type of fire is the ground fire.

4.1.1 CROWN FIRES

A crown fire burns in the canopy of the forest, jumping from treetop to treetop, killing most if not all of the trees in its path, and producing extreme heat. The frequent high winds in Lost Park Ranch increase the risk of crown fires. The heat produced in a crown fire is intense enough to damage the soil. Long after a crown fire is extinguished, precipitation runs off the impermeable soil causing flash flooding and environmental degradation far from the burn area. In addition, because of the intense heat and soil damage connected with a crown fire, vegetation re-growth is significantly delayed. As demonstrated in the Park County CWPP, 2007, the current forest condition in Lost Park Ranch is classified as a closed canopy with a high rating for crown fire risk.[7]

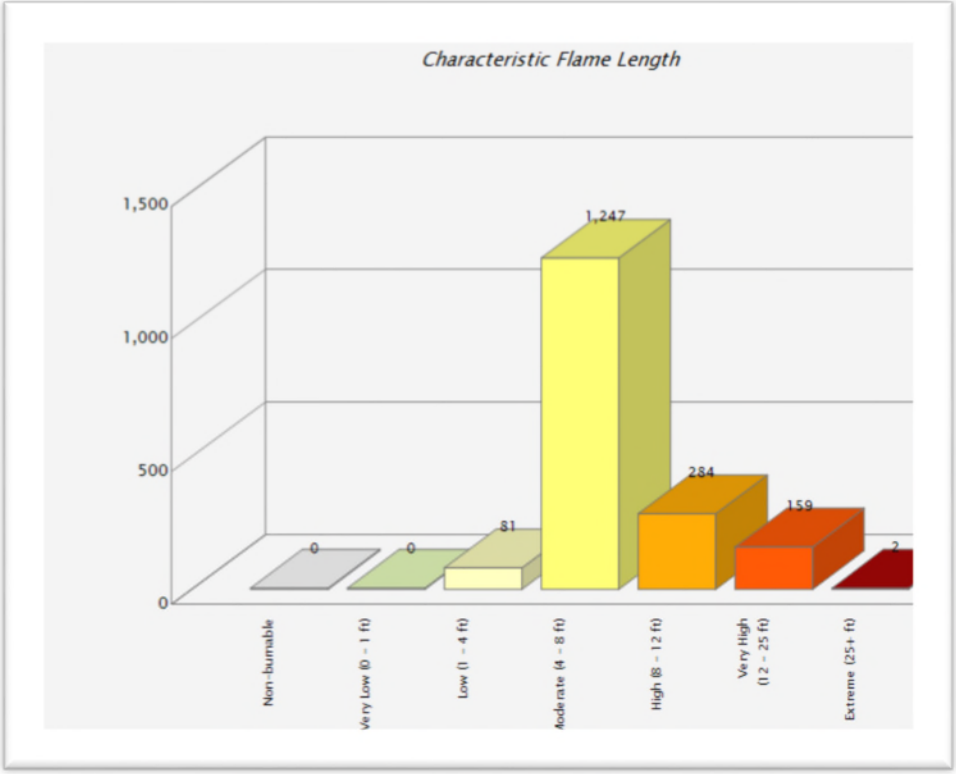
7 "Community Wildfire Protection Plan 2007: Park County, Colorado," p. A-15, http://csfs.colostate.edu/pages/documents/ParkcountyCWPP.pdf

Thinning and the effect on fire behavior is illustrated in this photo of the Black Forest Fire. On the right side of the road, the un-thinned forest burned as crown fire, but in the thinned forest left of the road, the fire became a ground fire. Note the rapid recovery of the thinned forest when the photo was taken on August 2, 2013.

The Colorado Wildfire Risk Assessment Portal (CO-WRAP) is a GIS based program that predicts fire behavior, and provides useful information to judge the potential risk to the community. CO-WRAP uses the average weather to model its fire behavior outputs, and thus does not predict the worst case scenario.

Under the average conditions used by CO-WRAP, the program predicts high rates of fire spread in the community with fire spreading between approximately 800 to 2,640 feet per hour.

Flame length is another indicator of fire severity and the amount of heat produced by a fire. Hand crews working directly adjacent to flames can tolerate flame length of four feet or less without injury from the heat. When flames lengths exceed four feet, crews must pull back from the flame front and attack the fire indirectly. CO-WRAP predicts flame lengths in excess of 12 feet in Lost Park Ranch. This indicates that firefighters would not be able to work within most of the community while the flaming front passes through.



Forest vegetation in Lost Park Ranch varies, usually depending on aspect. South and east facing slopes tend to be a mixed conifer dominated by ponderosa pine with smaller amounts of Douglas-fir spruce, limber pine, and aspen. The forest structure can be best described as a patchy overstory of conifers with small openings containing some aspen. The forest canopy is closed in most areas, and a crown fire will move rapidly through the community during moderate to high winds. It appears that aspen once constituted a larger proportion of the forest stand, but after a century of fire suppression, shade tolerant conifers are replacing the aspen.

Most of the forest stands have dense spruce, some ponderosa, and bristle-cone pine and have Douglas-fir regeneration in the understory. The dense regeneration is a ladder fuel that would allow a fire in the ground to reach the forest canopy. The forest floor is littered with large amounts of down wood, mostly dead aspen and spruce. While some isolated down wood is ecologically beneficial, the large concentrations present a source of fuel for a fire.

4.1.2 GROUND FIRES

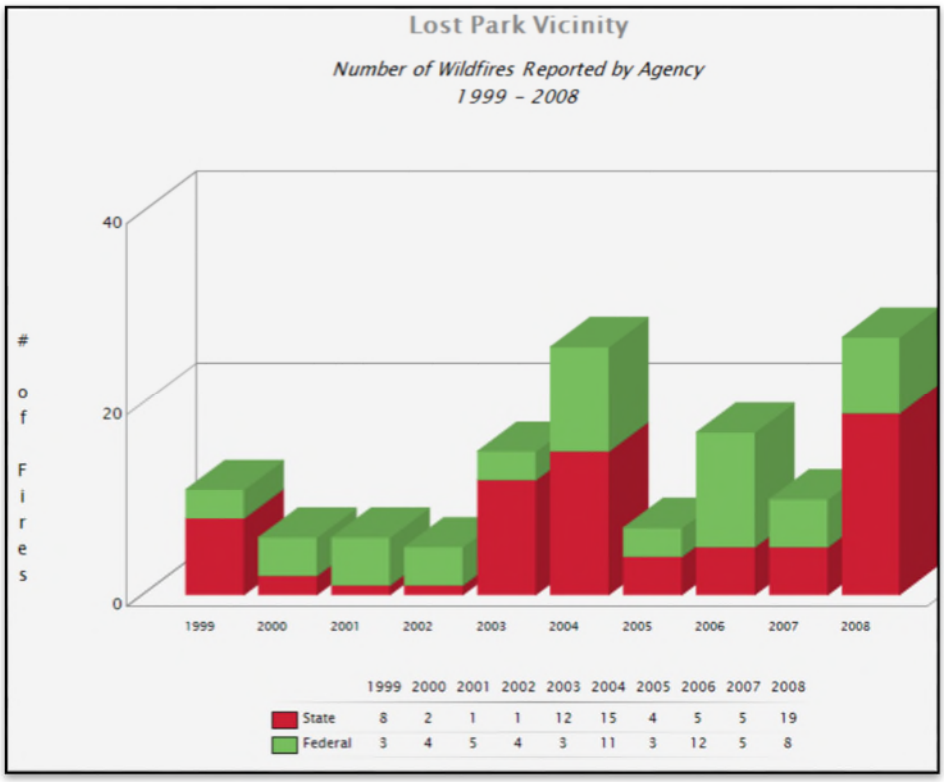
A less severe type of fire is the so-called ground fire. This type of fire is typical of open ponderosa pine forests and open grasslands. In forests that are not overgrown, wildfires burn more slowly and often stay closer to the ground, clearing away excess fuel such as needles, fallen branches and small seedlings. Such a fire revitalizes the forest without destroying the healthy trees. The heat produced is less intense, does not damage the soil and rarely penetrates the thick bark of the ponderosa trees. Due to the release

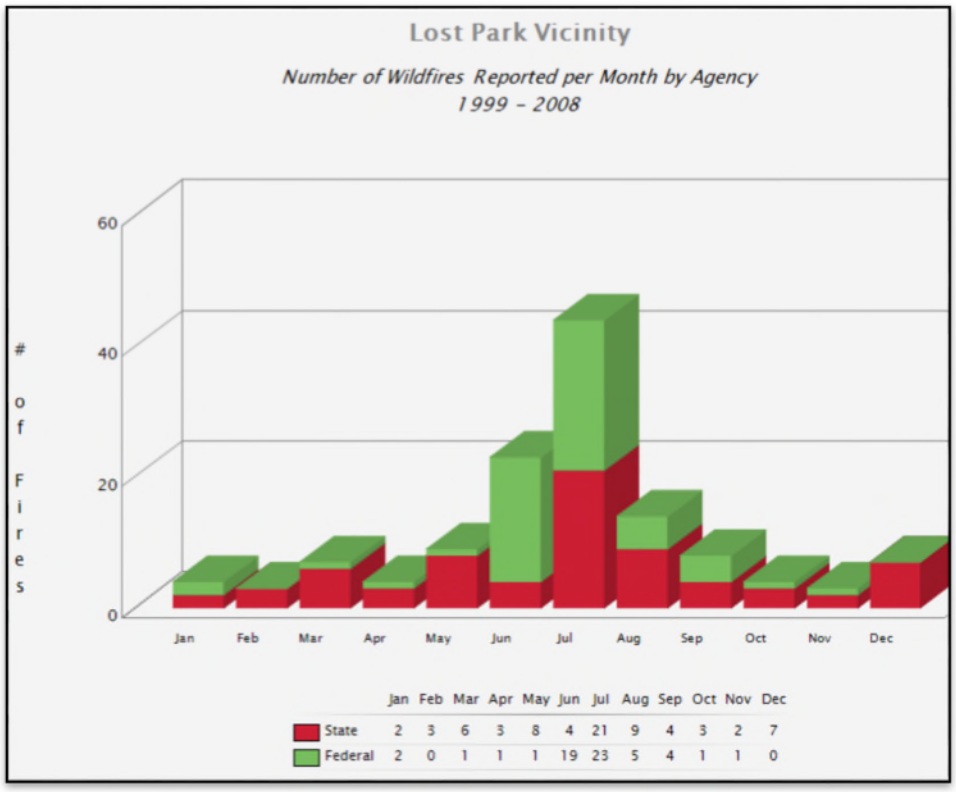
of nutrients attendant to such a fire, new herbaceous plants re-sprout quickly after the fire cools. Prescribed fires mimic this type of fire.

Large areas of Lost Park Ranch are grass and sage scrublands. It should be noted that fires in these areas can still threaten structures, and the landowners in grass and sage areas should heed the mitigation prescriptions in Section 6.2.

4.2 FIRE HISTORY

Over the years there have been numerous small fires in the vicinity that have been quickly extinguished and forgotten. There are numerous fire scars on the Tarryall Mountains that bear witness to fire activity over past decades. The Hayman Fire of 2002 will forever remain in people's memories.





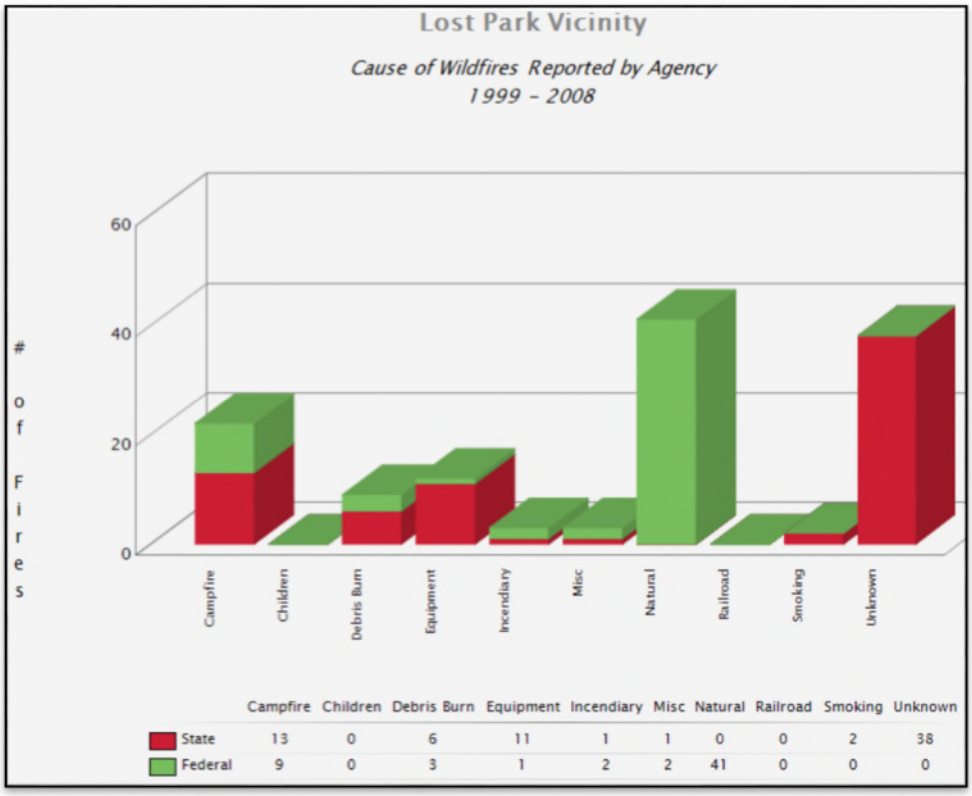
The Colorado Wildfire Risk Assessment Portal (CO-WRAP) is a GIS base program that allows the user to define an area and access much wildfire information and analysis. The information presented here is taken within a two mile radius of Lost Park Ranch on private and public land

The number of fires reported per year varies. More fires ignite in dry years than in moist years. More fires tend to be reported on Federal lands that on Private or state lands. However, 98% of the acres burned are on Federal land. Data indicates that most fires burn during the summer months, but that fires are reported during every month of the year.

A significant number of wildfires are reported in the month of December, proving that fire season is entire year.

On state and private lands surrounding Lost Park Ranch, the cause of most fires was not determined. Campfires are the largest cause of know fire starts followed by equipment and debris burning.

Lightning was the cause of most fires of Federal lands. Campfires, debris burning and equipment were also common causes of wildfires.



	Campfire	Children	Debris Burn	Equipment	Incendiary	Misc	Natural	Railroad	Smoking	Unknown
State	13	0	6	11	1	1	0	0	2	38
Federal	9	0	3	1	2	2	41	0	0	0

4.3 FACTORS AFFECTING FIRE BEHAVIOR

In order to understand the wildfire hazard in Lost Park Ranch, it is necessary to understand the factors that influence how fires burn. The three primary factors that determine fire behavior are weather, fuel and topography as will be discussed in the following sections.

4.3.1 WEATHER

Weather is the "wild card" of fire behavior and cannot be predicted. While lightning or human activity may ignite a fire, high temperatures, low humidity and strong winds increase its intensity. Dry conditions any time of year can increase the frequency and intensity of wildfires; however, such fires are usually less severe in cold seasons.

4.3.2 FUEL

The two types of fuel in a wildland-urban interface are vegetative and structural. The fuel available to a fire influences how much heat is produced and, hence, the severity of a wildfire. Vegetative fuels consist of living and dead trees, brush and grasses.[8]

[8] Information in this section is from "Colorado Wildfire Risk Assessment Report – Lost Park Ranch," CSFS July 18, 2013.

Fire behavior fuel models as they are technically referred to, contain rate of spread, flame length, fireline intensity and other fire behavior metrics. As the name might suggest, surface fuels account only for surface fire potential. Canopy fire potential is computed through a separate but linked process. The Colorado WRA accounts for both surface and canopy fire potential in the fire behavior outputs. However, only surface fuels are shown in this report.

Surface fuels typically are categorized into one of four primary fuel types based on the primary carrier of the surface fire: 1) grass, 2) shrub/brush, 3) timber litter, and 4) slash.

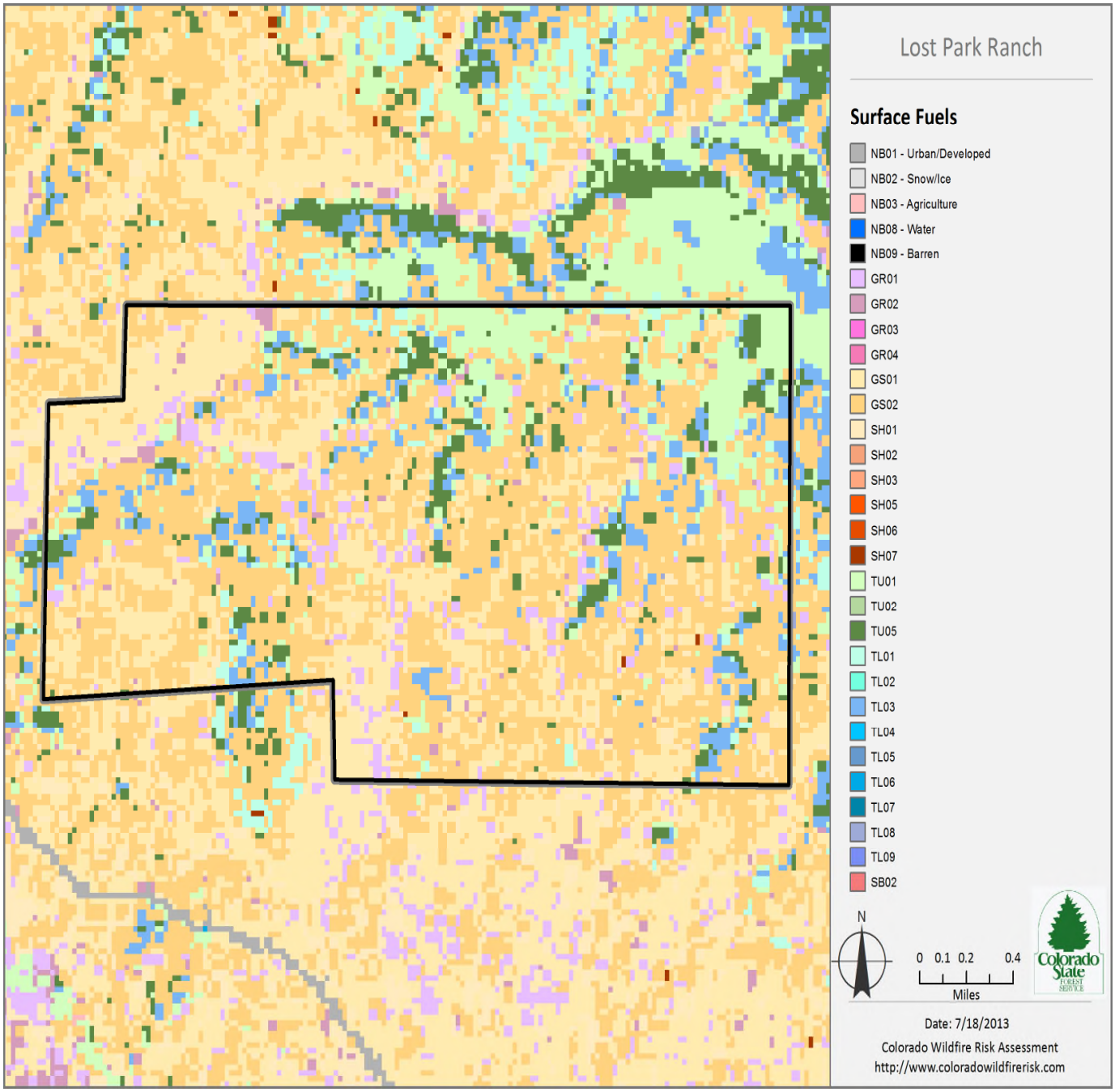
While the focus of wildfire management is usually on forested areas, some portions of the Lost Park Ranch subdivision have more grassland and brush than trees. Typically, grass fires ignite more easily and move faster than forest fires. However, the fire intensity decreases shortly after the flame front has passed. Grass fires can be extremely hazardous to life and property.

The diameter of fuel affects fire behavior. Small diameter fuels such as small branches ignite more easily than large diameter fuels such as large logs. Smaller diameter fuels act as kindling, spreading a fire to larger size fuels. Fires burning in organic material on the forest floor usually move slowly and create relatively low heat.

The unnaturally dense forest conditions that cause the potential for catastrophic wildfire in Lost Park Ranch also create the potential for cyclical outbreaks of insects and disease because trees weakened by overcrowding and competition for water and sunlight are more susceptible to invasion.

Structural fuels include houses, outdoor equipment, lawn furniture, ancillary buildings, fences and firewood. In the WUI, structures can contribute to the quantity of fuel available to a fire. Not only can a wildfire move into a structure from a forest or grassland, a structure fire can move outward into a grassland or forest and become a wildfire.

The map and the table below following the table illustrate the percentages for each type of fuel in LPR.


Lost Park Ranch
Surface Fuels
NB01 - Urban/Developed
NB02 - Snow/Ice
NB03 - Agriculture
NB08 - Water
NB09 - Barren
GR01
GR02
GR03
GR04
GS01
GS02
SH01
SH02
SH03
SH05
SH06
SH07
TU01
TU02
TU05
TL01
TL02
TL03
TL04
TL05
TL06
TL07
TL08
TL09
SB02
N
0 0.1 0.2 0.4
Miles
Colorado State Forest Service
Date: 7/18/2013
Colorado Wildfire Risk Assessment
http://www.coloradowildfirerisk.com

Surface Fuels	Description	FBPS Fuel Model Set	Acres	Percent
GR 1	Short, Sparse Dry Climate Grass (Dynamic)	2005	78	4.4%
GR 2	Low Load, Dry Climate Grass (Dynamic)	2005	19	1.1%
GR 3	Low Load, Very Coarse, Humid Climate Grass (Dynamic)	2005	0	0.0%
GR 4	Moderate Load, Dry Climate Grass (Dynamic)	2005	0	0.0%
GS 1	Low Load, Dry Climate Grass-Shrub (Dynamic)	2005	404	22.8%
GS 2	Moderate Load, Dry Climate Grass-Shrub (Dynamic)	2005	847	47.8%
SH 1	Moderate Load, Humid Climate Grass-Shrub (Dynamic)	2005	45	2.6%
SH 2	Moderate Load, Dry Climate Shrub	2005	0	0.0%
SH 3	Moderate Load, Humid Climate Timber-Shrub	2005	0	0.0%
SH 5	High Load, Humid Climate Grass-Shrub	2005	0	0.0%
SH 7	Very High Load, Dry Climate Shrub	2005	1	0.0%
TU 1	Light Load, Dry Climate Timber-Grass-Shrub	2005	154	8.7%
TU 2	Moderate Load, Humid Climate Timber-Shrub	2005	0	0.0%
TU 5	High Load, Conifer Litter	2005	88	5.0%
TL 1	Low Load, Compact Conifer Litter	2005	34	1.9%
TL 2	Low Load, Broadleaf Litter	2005	0	0.0%
TL 3	Moderate Load, Conifer Litter	2005	102	5.7%
TL 4	Small Downed Logs	2005	0	0.0%
TL 5	High Load, Conifer Litter	2005	0	0.0%
TL 6	Moderate Load, Broadleaf Litter	2005	0	0.0%
TL 7	Large Downed Logs, Heavy Load Forest Litter	2005	0	0.0%
TL 8	Long-needle Litter	2005	1	0.1%
TL 9	Very High Load, Broadleaf Litter	2005	0	0.0%
SB 2	Moderate Load, Activity Fuel	2005	0	0.0%
NB 1	Urban/Developed	2005	0	0.0%
NB 2	Snow/Ice	2005	0	0.0%
NB 3	Agricultural	2005	0	0.0%
NB 8	Open Water	2005	0	0.0%
NB 9	Bare Ground	2005	0	0.0%
	Total		**1,773**	**100.0%**

4.3.3 TOPOGRAPHY

Topography is a term that describes the lay of the land. The influence of topography on wildfire is simply that heat rises. On a slope, heat rises above a fire, pre-heating and drying the fuel above. The drier upslope fuels ignite easier and burn more quickly than downslope fuels. The steeper the slope, the more pronounced is this effect. During the day, warming air rises and pushes wildfires upslope. Fires may move four times faster up slopes than on flat ground.

4.3.4 ASPECT

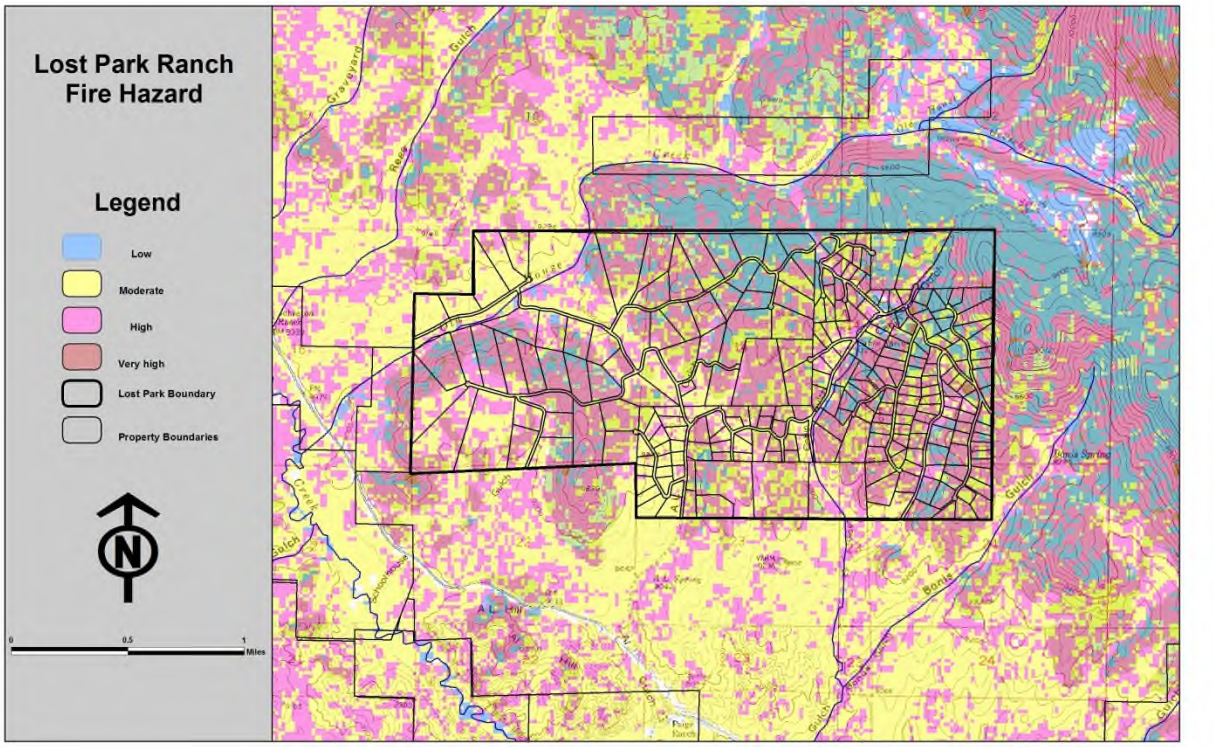
Solar heating also plays a part in the intensity of wildfire, and solar heating is a function of the aspect, a term that refers to the primary direction that a slope faces. At this high elevation, slopes in Lost Park Ranch that face south and west are pre-heated and dried by strong sunlight which makes these areas more vulnerable to rapidly igniting fuels.

4.4 INTEGRATED RISK ASSESSMENT

Fire hazard for Lost Park was determined by a combination of CO-WRAP outputs and on the ground analysis. CO-WRAP wildfire threat data was used as the basis for the analysis and this data was adjusted by the Colorado State Forest Service based on direct observations and aerial photo analysis of Lost Park Ranch. The final hazard map shown below.[9]

To aid in the use of Wildfire Threat for planning activities, the output values are categorized into four (4) classes. These are given general descriptions from Lowest to Highest Threat.

[9] The wildfire risk map is from "Colorado Wildfire Risk Assessment Report – Lost Park Ranch," CSFS, July 18, 2013.



The map produced here is a general depiction of the wildfire threat, and is not a lot by lot analysis. Within the larger areas of a hazard category there may be isolated areas of lower or higher threats. As noted earlier the structures themselves have a significant influence on the fire hazard for any particular property. The CSFS does not enter any property without a specific request of the property owner, and a detailed assessment of individual structures was not part of this assessment.

5.0 WILDFIRE SUPPRESSION CAPABILITIES

Although the principal reason for this CWPP is to expand the knowledge and awareness of wildfire prevention in Lost Park Ranch, it is useful in this context for residents to be informed of the planning and preparations for suppression of wildfires within the subdivision. In addition, early suppression of fires, either vegetative or structural, is a primary means of preventing the spread of wildfires.

5.1 JEFFERSON-COMO FIRE PROTECTION DISTRICT (JCFPD) OVERVIEW

The JCFPD encompasses 525 square miles within Park County. The Lost Park Ranch subdivision is a small portion of the district. In recent times, 83% of calls generated within the district were requests for Emergency Medical Services (EMS). The other calls were associated with smoke investigations, wildland fires and structure fires. In 2014, JCFPD ran 227 emergency calls. Lost Park Ranch accounted for less than 5% of them.

The following list characterizes some of JCFPD's preparations for fire emergencies in Lost Park Ranch:

1. Access to properties with locked gates or difficult access would depend on the property itself. If the property were deemed savable at the time of the fire, then firefighters would use every tool they have to gain access. For example, all JCFPD trucks carry bolt cutters for locked gates. If fire-fighting equipment could not get onto a savable property for other reasons, and if it were deemed safe to do so, firefighters would carry what they could to fight the fire on foot. In assessing whether a property is savable, fire fighters would consider the flammability of the structure, the degree to which the surrounding vegetation had been cleared and the risk attendant in that specific fire to the lives of the fire fighters.

2. JCFPD has one fire station within the Lost Park Ranch subdivision that houses a 1000 gal fire truck. The JCFPD does not staff this location.

3. The JCFPD stations two people at Station 5 at the intersection of County Road 15 (Elkhorn Road) and Albino Road (about three miles from the west-most entrance to the Stagestop subdivision) from 7am to 5 pm, seven days a week. Those individuals remain on call for the remainder of the 24-hour shift and respond from their residences during the evening. JCFPD has a number of trained volunteers living in Lost Park Ranch, Stagestop and neighboring communities that respond to all calls.

4. The firefighters in the JCFPD are trained in the initiation of owner-provided fire suppression systems, such as foaming systems.

The JCFPD posts the current fire danger in the district on a sign adjacent to Station 5. The posting is based on temperature and moisture conditions provided by the National Weather Service. As conditions change, the JCFPD changes the fire danger posting. In addition to these fire danger postings, outdoor burn bans are issued countywide by the Sheriff's office.

5.2 EMERGENCY PLANNING AND RESPONSE

In any wildland fire event, the JCFPD is the first responder to a fire in Lost Park Ranch. The Park County Sheriff would control egress and ingress in and around Lost Park Ranch in the event of a structure or wildfire, based on an ad hoc assessment of fire location, weather conditions and fuel conditions. There is no preset routing for emergency ingress and egress. The Sheriff's office would also advise Lost Park Ranch residents of any major incident through a reverse 911 call.

Reverse 911 is automatically routed to land line telephones listed in the phone book, but property owners who rely solely on cellular phones, have unlisted numbers or wish notification to a mobile device do not receive reverse 911 calls unless the unlisted number, cell phone or mobile devise has been registered. Registration is through the Park County website at:

http://parkco.us/civicalerts.aspx?aid=144

6.0 PREVENTION AND MITIGATION OF CATASTROPHIC WILDFIRES

6.1 PERSONAL RESPONSIBILITY

In the words of Smoky Bear, "only you can prevent wildfires." In the context of this CWPP, those words mean that the reduction of the fire risk to structures and vegetation on private property is the owner's responsibility. That responsibility includes creating defensible space within the first 100 to 200 feet surrounding any structure. It has been demonstrated repeatedly that the greatest fire threat to a structure occurs within that area.[10] Forest restoration thinning to the boundaries of a property further protects from wildfires, insects and disease.

Property owners understand and accept their responsibilities to varying degrees. The foremost examples of poor acceptance are the absence of survivable space surrounding some structures in the community and the lack of easy access for fire fighters on some developed lots. Other examples are poor outdoor burning practices and ignoring burn bans issued by the Sheriff's office. This plan is to increase the understanding of personal responsibility and to increase the knowledge of the assistance available.

It is a common misconception that the absence of a structure means the absence of wildfire risk. Owners of vacant property should be aware that it is more likely for a wildfire to increase in intensity as it moves through a parcel with untreated fuels causing more severe damage to vegetation and soil and posing a greater threat to adjacent properties. Under "natural" circumstances, historical fires would have maintained healthy forest conditions. The absence of natural fire cycles for the last century has led to abnormal fuel accumulation and created unhealthy forest conditions that must be addressed by other methods. Owners of vacant property risk substantial loss of property values to a catastrophic fire or insect infestations.

10 "Reducing the Wildland Fire Threat to Homes: Where and How Much?" Jack D. Cohen, USFS, General Technical Report, PSW-GTR-173, 1999. http://www.treesearch.fs.fed.us/pubs/5603.

Part of a mountain property owner's responsibility is to stay informed about fire prevention and mitigation measures for property and structures in the wildland-urban interface. These measures have evolved over the years based on advancements in science and on lessons learned in past fires.

In addition, there is a Colorado tax deduction of one half an owner's expenses, up to a maximum of $2,500, for property owners who accomplish fuels reduction.[11]

According to the latest thinking of the Fire Sciences Laboratory of the USFS,[12] most homes that burn during a wildfire ignite while they are still some distance from intense flames. Although low intensity ground fires in grasses and other low-lying vegetation close to homes ignite some homes, others ignite when the wildfire is more than a mile away because of the propensity for the fire to generate airborne embers.

When a tree ignites, flames can race up the trunk at up to 75 miles an hour. Burning material is literally stripped away and hurled into the air where winds can carry it far downwind. Multiplying this process by dozens or even hundreds of trees can produce a blizzard of firebrands that literally fill the air. These embers can pile up on top or under a deck, in corners or indentations outside a house, even on exterior windowsills, like drifts of snow. They also can settle on roofs, accumulate there and burn through a flammable roof or drop down onto a flammable deck. When enough embers accumulate, the house catches fire.

Whether a house ignites during a wildfire depends on its design, the materials used in its exterior construction, including its roof, and the amount of heat to which it is subjected. The materials of construction and the nearby fuels, such as wooden decks, stored firewood, dry grass and trees, determine whether embers will ignite a house during a wildfire. By the time a fire threatens, it's too late to do much about these factors. They should be addressed before a fire season begins. Protective measures might include renovations to the house itself, such as replacing a flammable roof with a fire resistant one. The Fire Science Lab summarized the primary lessons learned from the 2010 Fourmile Canyon Fire in Boulder, Colorado, as follows:

1. Eliminate all flammable materials (potential fuels) within 10 feet of the house.
2. Consider any wood roof to be flammable; wet the whole roof frequently when flying embers are threatened.
3. Remove flammable materials from decks or boardwalks – if it's connected to the house, consider it part of the house.
4. Remove dead leaves and pine needles from gutters and the roof.
5. Staple metal window screening over any openings or gaps including low decks, walkways and crawl spaces.

11 "Wildfire Mitigation Measures Subtraction," CSFS, http://csfs.colostate.edu/pages/community-wf-protection-planning.html.

12 USFS Missoula Fire Sciences Laboratory, http://www.firelab.org/.

6. If possible, place sprinklers to wet the area around the house, especially within 60 feet of the house.
7. Reduce or eliminate surface fuels, including cutting the grasses, starting at the house to within 100 feet of the house, and pruning lower limbs of trees to at least 8 feet above the ground.

While wildfire mitigation is primarily the responsibility of the property owner, it is also a community endeavor. Mitigation is most effective when communities act together. A thorough analysis of the effectiveness of mitigation in Black Forest by the Pikes Peak Wildfire Prevention Partners found that community wide mitigation was by far the most effective.[13]

The report found that individual mitigation on small lots, though effective in many cases, was often overwhelmed by the untreated fuels adjoining them, In communities where mitigation was done on a landscape level the fire did minimal damage. The report cited Cathedral Pines as a successful example of community fire mitigation. Although the fire burned through two thirds of the community only one structure, located adjacent to unmitigated fuel outside the community, was burned. Not only did the homes survive, but fire damage to the forest was minimal and the forest recovered quickly.

6.2 DEFENSIBLE SPACE AND THE HOME IGNITION ZONE (HIZ):

Modification of vegetation surrounding a structure to reduce fire intensity is called defensible space. The term "home ignition zone" (HIZ) is defined as a structure and the surrounding vegetation. A structure's vulnerability to wildfire depends on the surrounding vegetation, including landscaping, and the structure itself.

6.2.1 DEFENSIBLE SPACE VS. FUEL BREAKS

In a broad sense there are two generalized categories of mitigation. First is defensible space thinning around structures to increase the chance that the structure will survive a wildfire. Second, is fuel break thinning away from structures to reduce severe fire behavior and give firefighters a safer place to work and possibly halt an approaching wildfire.

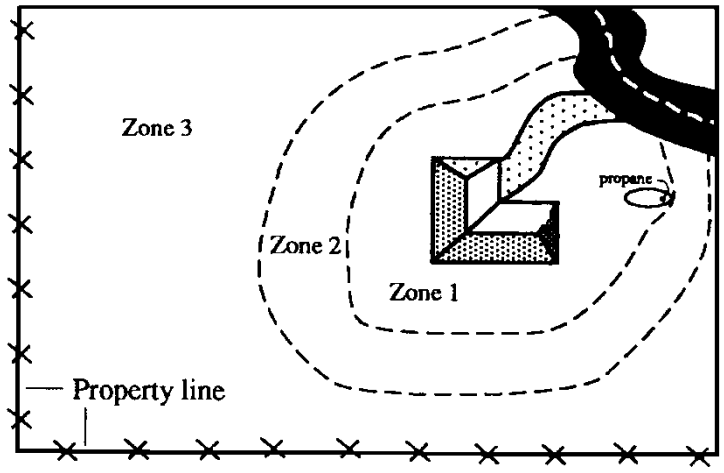


Fig. 6.1 Defensible space zones

Both approaches require thinning of the canopy and removal of ladder fuels. The approach will vary depending of the forest conditions existing on the area in question.

[13] Pikes Peak Wildfire Prevention Partners in Cooperation with the Black Forest Fire and Rescue Department and Falcon Fire Department. 2014. *Black Forest Fire Assessment Team Report to the Governor of Colorado*. Published at www.ppwpp.org

6.2.2 PROTECTING HOMES WITH DEFENSIBLE SPACE

Thinning around homes is different than thinning for fuel breaks. Thinning in the HIZ is designed to protect structures from the heat of wildfires. Defensible space includes both thinning around structures to reduce the heat from burning vegetation and reducing flammability of the structures to protect them from wind borne embers, radiation and convective heat. Further information about increasing the survivability of structures is found on the CSFS website at:

http://csfs.colostate.edu/pages/pub-csfs2.html#wildfire .

Defensible space is defined as an area around a structure where existing vegetation is modified to slow the rate and intensity of an advancing wildfire. This includes selective removal of trees around structures in three concentric management zones. On slopes, increase the width of each zone on the downhill side. Fuels are reduced according to prescriptions for each zone.

6.2.2.1 ZONE ONE

This is the closest zone to a structure, and extends 15-30 feet from the outer most edge of a structure including any decks. The management goal is to reduce or eliminate most large trees or shrubs within this zone so that they convective heat will not ignite the structure. A few tall trees may be left in zone one if the lowest branches are pruned so that they are well above a fire resistant roof. It is best to limit this to one or two trees near a structure. Treat such trees as part of the structure and create 15-30 feet of space outside the tree.

Owners of homes in grass and sage shrublands should take steps to protect their structures from wildfires. While grass fires do not produce the intense heat of crown fires, grass fires can move rapidly with the wind and can destroy structures quickly. Measures taken in zone one are particularly important when reducing structural vulnerability to grass fires.

Maintaining a five foot zone of noncombustible mulch around foundations and beneath decks is particularly important. Removal of flammable shrubs around the foundation and under decks is important as well. In the remainder of zone one, landowners should maintain gaps between clumps of sage and other native shrubs. Clumps of native shrubs should be small, a maximum of three feet in diameter. A good rule of thumb is that native shrubs should be separated by two and one half times the height of the adjoining shrub.

Mowing native grasses in this area to a height of less than six inches is important. Periodic raking and removal of dead leaves and woody debris is also recommended.

6.2.2.2 ZONE TWO

The width of zone two depends on the slope around the house. If the average slope angle is less than 5%, zone two extends out 70 feet from zone one (100 feet total distance around the house). As slopes increase, increase the width of zone two on the downhill side of the house, and increase the spacing between tree crowns.

The main fuels reduction guideline for zone two is to thin the trees to an average spacing of 10-feet crown separation. Clumps of two or three trees may be retained in this zone if the space between the clump and the adjoining trees is at least 30 feet. All ladder fuels under trees should be removed. The branches of large trees should be pruned to a height of 8 feet above ground, but small trees should have at least two-thirds of the green needles remaining.

Firefighters must be able to escape quickly if conditions suddenly deteriorate. Zone two should extend along both sides of driveways for a width of 30 feet from each edge of the drive. This is important to allow safe access and egress for emergency vehicles. Adequate clearance should be maintained to allow access to large structural fire trucks. Twelve feet of horizontal clearance and 13 feet of vertical clearance should be maintained. At the end of driveways, adequate room for a large fire engine to turn around should be maintained.

In grass and sage shrublands, large clumps of continuous shrubs should be separated; again two and a half times the height of adjoining shrubs is a good rule of thumb.

6.2.2.3 ZONE THREE:

The guideline for zone three is to thin the forest primarily to improve forest health. Spacing is less critical in this area but some spaces should be made in the canopy. A useful rule of thumb is that a tree should receive sunlight from all four sides.

6.2.3 HOME CONSTRUCTION AND SURVIVABILITY:

The construction materials, location and even the shape of a structure influence its vulnerability to wildfire.[14] It is not the intent of this CWPP to suggest extensive alterations to homes that already exist in the community. Understanding how home construction affects the vulnerability of the structure to a wildfire helps residents plan defensible space projects to compensate for construction differences. When remodeling or home improvement projects are done plans can be made to reduce the ignitability of the buildings.

Decks and roofs are the most vulnerable parts of a structure. If either burns, the home will be lost. They are most likely to catch windblown firebrands, and air currents are more likely to form eddies that trap heat and in the irregular surfaces found in roofs and decks.

Fire restive roofs are extremely important. *Wood shake roofs have been the cause of many home losses due to firebrands.* Roof material with a class A rating indicates the best resistance to fire. Many roofing materials are available to homeowners but they vary in cost, weight and longevity. Homeowners should consult with a reputable building contractor to determine which roofing material will best suit their needs.

[14] Bueche, David, Tim Foley, Peter Slack, (2012): *Firewise Construction: Site Design and Building Materials.* Colorado State Forest Service. http://csfs.colostate.edu/pages/forests-restoration.html

Even the most fire resistant roofs require maintenance. The most important item is to keep the roof—and gutters--free of debris. Combustible debris on a roof such as leaves and pine needles may ignite from firebrands and start the home on fire even with a class A roof. Combustible litter is most likely to accumulate in areas where one shape meets another such as gables and dormer windows. Gutters will also accumulate debris. These same areas are most likely to accumulate firebrands because of eddies in wind currents during a wildfire. Combustible debris should be removed anytime it accumulates. Gutters should be metal since plastic gutters may burn.

The eves (the extension of the roof over the outside wall) are also vulnerable areas. Open eves, with the roof joists exposed, are particularly vulnerable because the irregular surfaces can trap hot gasses and fire brands. Enclosure of exposed eves (called a soffit) helps prevent this. It is best to construct soffits so that the lower edge of the soffit meets the wall at a 90^{o} angle. This reduces the amount of heated air and fire brands that might be trapped.

Vents, in roofs and foundations, are also areas of vulnerability, but are necessary to ventilate attics and crawl spaces to prevent moisture accumulation. During a wildfire, heated gasses and firebrands can enter attics or crawl spaces through vents. All vents should be screened with metal screening with openings of 1/8 inch or less. Soffit vents should be located as close to the edge of the eve as possible. Vegetation around foundation vents can create unintended vulnerability, particularly on the downhill side. Landscaping with stone or rock around crawlspace vents is recommended.

In addition to the roof, decks are extremely vulnerable to fire. The deck surface is exposed to fire brands and fire brands can collect underneath decks. Possibly the worst mistake any homeowner can make is to store any combustible material beneath a deck. Countless homes have been lost because of firewood, scrap lumber, even gasoline stored under a deck. Even motorized equipment, when left under a deck, with gas in the tank has caused home losses during fires.

Ideally the underside of decks should be enclosed with a non-combustible material. If that is not possible, covering the area under a deck with stone, concrete or rock mulch will make the deck safer. When decks are rebuilt use fire resistant materials.

Carefully consider the landscaping in the vicinity of decks as well. Avoid planting flammable shrubs, such as junipers, anywhere near decks or foundations. Potted plants or planters on decks may also increase the hazard. Even furniture with cushions or wooden frames may ignite from firebrands. The area of defensible space should be increased near decks, especially on the downhill side.

Fire resistance of windows and doors should be considered. If window glass breaks, firebrands will enter the house. The most fire resistant glass is low emissivity, tempered glass which withstands the heat of a fire for the longest period. Double pane windows last longer than single pane when exposed to the heat of a fire.

Window frames are also important. Metal frames offer the best protection. Vinyl frames usually do not burn but can melt when exposed to heat. Wooden frames will burn. Metal screening with on the outside of windows offers additional protection, but most windows are sold with nylon screening that will melt.

Solid metal shutters offer the best protection, assuming the homeowner has the opportunity to close them before evacuating.

Wooden doors are obviously able to burn during a fire. The thicker the door the more resistant it will be. Metal doors are far superior, and glass in doors is subject to the same vulnerabilities as window glass. Well maintained weather stripping in outside doors will help prevent fire brands from entering a home.

6.2.4 SLASH DISPOSAL

A problem encountered by property owners in creating survivable space or otherwise thinning their forests is disposal of the slash, i.e., the debris created by the felling or the trimming of trees and brush. The term also includes dead and down trees. Chipping, lop and scatter, and mastication (shredding) are common methods of treating slash that return the nutrients of the wood to the forest floor. Pile burning is another method of slash disposal, although it is not recommended. Burning piles of slash may be done in Lost Park Ranch only if the owner secures and abides by a proper burn permit. However, done incorrectly, these fires run the risk of starting a wildfire within the community and may cause long-term damage to the soil. The JCFPD has provided guidance on burn permits.[15] Further information is included in Appendix 3.

In previous years, residents of the JCFPD have had an alternative for slash disposal, i.e. to transport it to a burn pit located on land owned by Indian Mountain on Elkhorn Road near the former Sportsmen's Ranch. The burn pit was operated and periodically burned by JCFPD. The burn pit has been in operation for about 10 years. However, in 2010, enforcement of rules limiting the materials allowed in the pit became onerous to the fire fighters, and JCFPD stepped out of the operations role for the burn pit. Indian Mountain recently adopted new procedures for use of the pit. It will be available to Lost Park Ranch property owners on a fee basis. The fire district will continue to conduct controlled burns of the slash in the burn pit during the winter when there is snow on the ground to assure that fire will not escape the pit.

6.2.5 REDUCTION OF STRUCTURE VULNERABILITY

Fire research has demonstrated that the intense heat of a crown fire exposes a structure for 90 seconds or less. This is sufficient time for the heat of such a fire to ignite the structure. Anecdotal evidence, confirmed by post-fire damage assessment studies conducted by the National Institute of Science and Technology (NIST), suggests that wind-driven firebrand attack is another source of structure ignition. A NIST research program is underway to develop amendments to building codes in California and other states with high wildfire risks to address this firebrand issue. There are many ways to reduce the vulnerability of structures to wind driven embers and these are outlined in CSFS documents.[16] The measures include the use of fire resistant roofing materials, storing firewood away from structures, use of fire resistant decking, installation of screens to prevent buildup of embers under porches or decks, and use of vent screening and chimney caps.

15 "Burn Permit," JCFPD Website, http://jcfpd.org/BurnPermit.htm.

16 "Firewise Construction: Design and Materials," CSFS Website, http://csfs.colostate.edu/pdfs/construction_booklet.pdf.

6.3 FUELS TREATMENT

Two primary concerns determine the forest prescriptions for Lost Park Ranch. The first concern is the high risk of high intensity wildfires, and the second is the threat posed by mountain pine beetle. Wildfire risk is highest in the areas dominated by Engelmann spruce while pine beetle is a greater concern in the areas of ponderosa, limber pines and bristlecone pines. Proper management of the forests can address both concerns.

6.3.1 FOREST RESTORATION

Restoration is a form of fuels treatment wherein the forest is returned to its historic (reference) condition before people interfered with its natural maintenance. Knowing how a site once looked is an important tool in setting management goals and strategies for forest restoration. Restoration treatments seek to lower fire danger while increasing the overall biological diversity and long-term health of treatment areas. Restoration treatments might involve mechanical thinning to remove excess trees and removal of ladder fuels to reduce the likelihood that a surface fire will become a crown fire. Such treatments also include reduction of the connectivity of tree crowns, which makes it more difficult for a crown fire to spread through the canopy.

Restoration treatments are focused on long-term rather than short-term health of the ecosystem. Instead of focusing only on altering forest structure, restoration treatments also aim to alter forest function. For that reason, they have the potential to provide a long-term solution to wildfire threats, which are really only a symptom of a larger problem, i.e., an unhealthy ecosystem. The CSFS has provided guidance on restoration treatments.[17]

6.3.2 FOREST THINNING

Thinning the dense stands of trees that exist throughout Colorado would reduce the risk of catastrophic wildfires and improve forest health. Numerous thinning prescriptions have been implemented, primarily on public lands, but thinning within subdivisions also is beneficial. Many mitigation treatments on private property focus solely on removal of ladder fuels and reducing crown connectivity. In the simplest situation, chainsaws are used to remove lower branches or entire trees and to clear dead and down trees. In larger and more complex projects, mechanized equipment might be used. The cut wood is harvested for use as logs, posts or fuel; chipped or shredded for forest mulch; or burned at a controlled site. The internet has information on tools used for thinning.[18]

6.3.3 FIREBREAKS AND FUEL BREAKS

17 "Forest Restoration," CSFS Website, http://csfs.colostate.edu/pages/forests-restoration.html.

18 "Safe Chainsaw Operation," A. Scott Reed, Jack True, University of Minnesota Extension, http://www.extension.umn.edu/distribution/naturalresources/dd2487.html; "Chipper Shredder," Manufacturers' Website, http://www.chippershredders.net/.

Firebreaks and fuel breaks are two different management techniques used to improve the ability to suppress wildfires, though the terms are often confused. A firebreak is a complete gap in vegetation or other combustible material that is at least 30 feet wide and acts as a barrier to slow or stop the progress of a wildfire. A firebreak may occur naturally where there is a lack of vegetation or fuel, such as a waterway, lake or rock outcrop or be man-made including roadways and logging trails.

There are more than 21 miles of county-maintained gravel roads in the Lost Park Ranch subdivision. Each property owner is encouraged to maintain 10 feet of cleared space adjacent to any road with which their property abuts. The width of the roads in the subdivision plus 10 feet of clear space on either side would provide effective firebreaks throughout the community.

A fuel break is a natural or manmade change in fuel characteristics, which affects fire behavior so that fires burning into them can be more readily controlled. A man-made fuel break typically is 200-300 feet wide (or more on steeper terrain) and involves thinning to separate tree crowns, reduction of understory fuels, and removal of tree branches to a specified height, usually 8-10 feet above the ground, to keep fire from climbing into the tree tops. Fuel breaks commonly cross multiple property lines to provide a measure of protection to areas larger than a single property.

6.3.4 PRESCRIBED BURNS

The decision to use fire as a tool in forest management is a complicated process undertaken by fire management professionals. Among forest managers, carefully planned "prescribed" use of fire is considered a "Best Management Practice" for certain large acreage forest treatments. These fires help maintain and restore fire dependent ecosystems by imitating the vegetative disturbance of periodic natural fires. In addition to considering the basic elements of fire behavior (fuels, terrain and weather) in designing a prescribed burn, forest and fire managers take into account the wildlife habitats, soils, historical or cultural impacts, air and water quality, and safety. Planning is a long-term process and unless all conditions of the prescription are met, no planned ignition will occur.

The Polhemus Fire near Deckers, Colorado was a prescribed burn in October 2001 conducted by the USFS. Treatment included forest thinning followed by a prescribed "broadcast burn" of ground fuels. Eight months later, the Hayman fire burned uncontrolled through tree crowns to the boundary of the Polhemus burn where it dropped to a ground fire and went out. The USFS has published guidelines and procedures for prescribed burns.[19]

6.4 LOST PARK RANCH FOREST MANAGEMENT

Foresters manage trees not as individuals but in groups called stands. A stand of trees is defined as a group of trees that is similar with respect to age, species composition and other characteristics. Each stand is different from the ones nearby, and each landowner may have other objectives in addition to wildfire mitigation.

19 "Interagency Prescribed Fire Planning and Implementation Procedures Guide," USFS Website, http://www.fs.fed.us/fire/fireuse/rxfire/rxfireguide.pdf.

Thus, the information that follows is intended to be a general and highly simplified summary of the basic concepts of wildfire mitigation. It is only intended to give the reader an idea of how foresters approach the process of prescribing treatments for fire mitigation. The forest conditions in Lost Park Ranch vary widely. When planning fire hazard mitigation, an initial consultation with a forester is recommended. Specific prescriptions for any forest stand are best developed when the existing conditions of the stand and the landowner's specific objectives are known.

Although foresters may use many characteristics of trees to categorize them, the most common—and useful when discussing fire mitigation—is the tree's tolerance to shade. Shade tolerance means the ability of a tree to germinate and grow in the shade of other trees. Species of trees vary in their tolerance to shade, but they can be grouped by those that require sunlight for germination and those that require shade. Forests in the upper montane zone, such as those in Lost Park Ranch, tend to be a mixture of shade tolerant and shade intolerant trees. Such a mixture is called mixed conifer. Forests in the community also have stands of aspen intermingled with the conifers.

6.4.1 SHADE INTOLERANT TREES

Shade intolerant trees are those that require full sunlight to sprout and grow to maturity. Such trees are the first to colonize a site after a disturbance, such as wildfire, removes the existing trees. For this reason, ecologists call these pioneer species. Aspen, the most shade intolerant of local species, will send up new sprouts within days after a fire destroys the old trees. Shade intolerant trees common to Lost Park Ranch include aspen, ponderosa pine, lodgepole pine, bristlecone pine and limber pine.

It follows that if the trees in a particular area grow back following a disturbance, all the trees in a stand will be of roughly the same age. Since the trees compete for sunlight, water and nutrients, the most vigorous trees dominate the new stand. A dominant tree soon outgrows its siblings. The weak trees remain in the understory, stunted and overtopped. Thus, in shade intolerant stands, small trees are not young trees, but merely trees with suppressed growth.

6.4.1.1 PONDEROSA PINE

Of all the species of trees in the local area, ponderosa is the best adapted to survive a low intensity wildfire. First, the thick bark of the tree acts as insulation from the heat of the fire. Second, as the upper branches shade the lower ones, the low branches die, and, in time, break off. Thus, there are fewer low hanging branches to act as ladder fuels. Fires that burn in the grass and litter under a mature ponderosa rarely harm the tree.

6.4.1.2 ASPEN

As noted earlier, aspen are the most shade intolerant of local trees. Unlike the ponderosa, aspen bark is thin and even a cool fire burning on the ground may kill the tops of the trees. The root system, however, is insulated from the fire's heat by the ground, and when the treetops die, the roots respond by vigorously resprouting. As a deciduous tree, aspen will not carry a fire in the tree crowns, thus fires drop to the ground in aspen stands. For this reason aspen are desirable trees to retain in fuel breaks and survivable spaces. Furthermore, aspen are desirable wildlife trees, but years of fire suppression may

result in conifers shading many stands of aspen. Since wildfire mitigation practices usually require thinning, some landowners assume that aspen should be thinned as well, but they should not. Thinning aspen is rarely recommended since the falling trees invariably wound the remaining trees. The bark on aspen is so thin that any wound will expose the tree to many different fungal diseases that are eventually fatal (see the insect and disease section, below). Fortunately, there are extensive stands of aspen in Lost Park Ranch. Many of these have large amounts of Engelmann spruce in the understory, and the spruce will eventually overtop the aspen. Fire mitigation in aspen should be limited to removal of dead trees if care is taken to avoid wounding live trees, cleaning up down or dead wood, and removing conifer regeneration from the aspen understory.

6.4.1.3 LODGEPOLE PINE

There may be some scattered lodgepole in Lost Park Ranch, but there are no extensive stands of this tree. Lodgepole tend to grow at higher elevations than ponderosa, and unlike ponderosa, they are not well adapted to survive frequent low severity fires. Instead, they are prone to infrequent stand-replacing crown fires. Lodgepole resprout after a fire by virtue of their closed or serotinous cones. Serotinous cone scales are "glued" shut by sap, and the heat of the passing fire melts the sap causing the cones to pop open. Seeds fall on the bare ground free of competition from other plants. As the seeds sprout, a new dense stand of lodgepole—called dog hair as in "thicker than the hair on a dog's back"—develops. The dense nature of lodgepole stands has important implications when attempting to mitigate wildfire hazard. The density of the stand protects the trees from the wind, and they do not become firmly rooted. If one attempts to thin lodgepole heavily, the remaining trees will often blow down. Lodgepole should be thinned lightly or in patches cut to avoid blow down.

6.4.1.4 BRISTLECONE PINE

In Lost Park Ranch, bristlecone pines tend to occupy drier southern exposures in association with ponderosa pine, and the stands are usually open. Bristlecone is well known for its longevity—often living for millennia. The age of a tree cannot be determined visually, so it is impossible to know the age of the trees in Lost Park Ranch without actually counting the annual rings. In open stands, such as those in Lost Park Ranch, it appears that bristlecone is moderately able to withstand low intensity ground fires, but not high intensity fires. Bristlecone is resistant, but not immune to ponderosa pine dwarf mistletoe, and moderately susceptible to mountain pine beetle.

6.4.1.5 LIMBER PINE

This short, usually multi-stemmed pine grows on poor sites, such as windswept ridge tops, and is often found mixed with other conifers. The common name derives from the fact that the branch tips are very flexible—almost to the point that they can be tied in knots. Limber pine looks similar to and is often mistaken for bristlecone pine, but a simple and accurate way to differentiate between the two is to look at the needles. Bristlecone pine invariably has a drop of crystalline appearing sap (resin) at the middle of the needle, while limber pine does not. Limber pine is extremely drought tolerant, but its low growth habit makes it susceptible to fire damage. Limber pine is moderately susceptible to ponderosa pine dwarf mistletoe, and mountain pine beetle.

6.4.2 SHADE TOLERANT TREES

Shade tolerant trees are those that will sprout from seed and grow in the shade of the existing forest canopy. Tolerant trees are usually found on the cooler, moister, north-facing slopes of hillsides and in moist drainages. In fact, most shade tolerant trees require shading for the seedlings to survive. Direct sunlight will often burn a seeding. As a result, stands of shade tolerant trees contain trees of many ages. The most common shade tolerant trees in the area are Colorado blue spruce, Engelmann spruce, and Douglas-fir.

6.4.2.1 SPRUCE

Colorado blue spruce and Engelmann spruce are so similar that they may be considered together for discussion of fire mitigation. Colorado blue spruce is usually found in lower altitudes (below 9,000 ft) while Engelmann spruce is usually found above 9,000 feet. The ability of seedlings to survive in the shade of mature trees usually creates dense forests with a closed canopy above and thickets of ladder fuels below. The typical fire regime in Engelmann spruce is an infrequent stand-replacing crown fire.

Like lodgepole pine, spruce tends to be shallow rooted, and excessive thinning of the upper canopy can result in wind throw in the remaining trees. This characteristic has important implications for fire mitigation in Lost Park Ranch that will be addressed in the prescriptions section, below.

6.4.2.2 DOUGLAS FIR

Typically Douglas-fir trees are found on cooler north facing slopes in lower elevations and mixed with spruce in higher elevations, although they are mixed with other trees in Lost Park Ranch. It is in the lower elevation ponderosa pine forests where Douglas-fir has become the most serious concern for wildfire mitigation. After a century of fire suppression in lower elevation ponderosa pine stands, the canopy has closed, shading the forest floor. As a result, Douglas-fir has invaded the understory of the ponderosa stands creating dense thickets of ladder fuels.

Douglas-fir trees are firmly rooted and can be thinned much the same as ponderosa pine. In lower elevation ponderosa stands, most Douglas-fir should be eliminated, especially those that create ladder fuel. There is an important exception to this general rule where the ponderosa are infected with dwarf mistletoe. In such situations, the landowner may choose to favor the Douglas-fir since it is immune to the dwarf mistletoe. In such cases, special attention should be given to providing adequate separation between the crowns of larger trees and pruning the lower branches from the Douglas-fir to reduce ladder fuels.

Where Douglas-fir is intermixed with less wind-firm spruce, it can be favored to maintain forest cover. It is still important to prune the trees to remove ladder fuels. In the high and dry conditions of Park County, Douglas-firs often self-prune so that in mature trees the lower 1/3 to 1/2 of the trunk is devoid of branches.

6.4.3 THINNING PRESCRIPTIONS FOR FUEL BREAKS

Foresters use many methods of thinning. The use of those methods on a particular property depends on the specific objectives of the landowner. Fuel break thinning is most often accomplished by thinning the canopy to create openings wide enough to prevent crown fires and by removal of ladder fuels.

For simplicity, trees can be divided into levels in the forest canopy. The largest trees at the highest level of the canopy are called dominants. These are usually the most vigorous trees since they have the largest root systems, the most leaf area and receive the most sunlight. Next are the co-dominant or intermediate trees. These trees occupy the middle level of the canopy, but tend to be crowded and of smaller diameter. They are less vigorous with smaller root systems and fewer leaves as the result of crowding by the dominant trees. At the lowest level of the forest canopy are the overtopped trees. These are completely shaded by the dominant and co-dominant trees.

Since the diameter of a tree is not a reliable indicator of its age, the co-dominant and overtopped trees, despite their smaller size, are often as old as or older than the dominant trees. For shade intolerant trees, such as ponderosa, young trees are usually found in openings in the canopy. In stands of shade tolerant trees, such as Engelmann spruce, young trees can be found underneath an existing canopy.

In either case, young trees usually have a diameter proportionate to their height and a conical shape. If there are young trees in a stand, it is desirable to leave some to increase diversity even if the larger trees are cut. Thickets of young trees should be thinned to give adequate growing space.

The dominance of shallow rooted Engelmann spruce in Lost Park Ranch requires modification of the usual prescription for fuel breaks since thinning dominant trees to reduce canopy closure could result in blow down of the remaining spruce. Fortunately, the spruce is intermixed with large patches of aspen that can be used to the community's advantage.

Thinning in patches of spruce should be limited to removal of the overtopped trees and light thinning of the co-dominants to prevent wind throw. Spruce clumps that are lightly thinned will begin to anchor themselves more firmly as they are exposed to more wind. After ten years, the clumps may be lightly thinned again to reduce canopy closure. This light thinning can be repeated at ten year intervals.

Aspen patches (stands) can be used to separate spruce clumps. It is important to preserve aspen patches. Many of them are developing an understory of spruce that will eventually overtop and shade out the aspen. To prevent this, owners should remove most of the spruce regeneration from the aspen stands. Some spruce may remain, but they should be widely spaced. Most of the down wood should be removed from aspen stands to reduce ground fuels.

It is important to maintain the health of aspen stands for effective wildfire mitigation, so owners should consider clear cutting one-half to three acre patches of over mature, diseased aspen to regenerate healthy sprouts. In addition, the low sprouts will be a source of browse for deer and elk.

6.4.4 INSECT AND DISEASE

Data from the 2014 aerial surveys by the USFS and the CSFS show that the mountain pine beetle (MPB) infestation that started in Colorado on the west side of the Continental Divide moved east of the Divide.[20] The rate of MPB infestation in Park County is declining, as shown in the following table from the CSFS report of the 2014 survey. Since there is little MPB infestation in Lost Park Ranch at this time, there is still opportunity to improve forest health before the inevitable attack comes. More detailed information insect and disease threats and treatments can be found in Appendix 1.

Host Tree	Acres Affected 2013	Acres Affected 2014	Cumulative Acres Affected 1996-2013	Cumulative Acres Affected 1996-2014
Lodgepole Pine	60	200	47,000	47,000
Ponderosa Pine	900	60	91,000	91,000
5-Needle Pines	20	40	430	470
All Hosts	980	300	137,000	138,000

In the foregoing table, 2013 and 2014 "Acres Affected" refers to acres with *active infestations* in those years. (Note: Some of the same acres were counted in both 2013 and 2014 to obtain the acreage figures for each of these years; this overlap occurs because these acres had active infestations in 2013 and again in 2014.) "Cumulative Acres Affected" are obtained by adding all active acres in the given year plus all previously affected acres. Subtracting cumulative 2013 acreage from cumulative 2014 acreage yields newly impacted.

Insects and diseases contribute to the dead and down fuels in a forest. Most do no serious or lasting damage except when the forests are in poor health. Then trees, like humans, are more prone to infection or infestation when in poor overall health. Bark beetles are always present even in non-epidemic years, and forests in poor health are at greatest risk for insect and disease epidemics. Fortunately, preventive medicine applies to forests just as it does to people. Thus, maintaining forests in good health helps to prevent or limit the damage from wildfires, insects and disease.

When planning fuel mitigation projects to mitigate wildfire hazards, it is important to address current and anticipated insect and disease issues.

6.4.5 MOUNTAIN PINE BEETLE (MPB) PREVENTION

20 Results of the 2014 Survey are summarized at http://www.fs.usda.gov/r2 .

Bristlecone and limber pine are highly prized by Lost Park Ranch landowners, and mountain pine beetles threaten these species. Mountain pine beetles prefer large diameter, mature ponderosa pines, so under normal circumstances, bristlecone and limber would not be considered at high risk. However; given the unprecedented epidemic of mountain pine beetle now underway, conditions are anything but normal. If large populations of beetles fly from the lodgepole stands to the north of Park County, the bristlecone and limber pine in Lost Park Ranch will be at risk.

No one is certain what the future may bring, but the community should begin a program to locate and remove infested trees. A MPB control program should consist of the following items:

1. A program of education for property owners so they can recognize the symptoms of attack and learn about effective treatment methods for infested trees.
2. Inspection of the areas where ponderosa and bristlecone are the dominant species to identify infested trees in October of each year.
3. Treatment of infested trees before April of each year.
4. Identify high value trees that should be preventatively sprayed if beetle populations increase in the community.
5. Encourage forest management practices that regenerate ponderosa to create diversity within the forest.

6.4.6 OTHER FOREST MANAGEMENT CONSIDERATIONS

One objective of any mitigation project should be to enhance the diversity of forest stands. If a forest stand consists of one species, owners should attempt to leave trees of different ages, or thin in such a way that regeneration of new trees is promoted. A forester can recommend methods of thinning that reduce fire hazard and increase forest diversity.

When thinning for fuel breaks it is not necessary, or even desirable, to remove all dead trees or pick up all dead wood from the forest floor. Some standing dead trees, or snags, should remain as habitat for wildlife. The most desirable snags are trees larger than ten inches in diameter that are widely spaced; owners should avoid leaving more than three snags per acre. Owners should not leave dead trees where they might fall across roads or power lines. Isolated trunks of large trees on the ground do not pose a high fire risk and may be beneficial in erosion control and habitat diversity.

6.4.7 MAINTENANCE

Creation of survivable space, thinning of fuel breaks, or any type of forest management does not end when the initial project is finished. Continued maintenance is an essential part of any forest management program. Even in well-managed forests, trees die, storms and wind damage trees, and new trees germinate.

Trees should be inspected every spring for any sign of damage from winter or spring snows or wind. Owners should prune any broken branches that are not too high in the tree, and trees bent by heavy winter snows should be removed. Owners should also check for any signs of insect activity or disease.

At five year intervals, owners should check the canopy closure, especially in zones one and two of a survivable space. They should remove any trees necessary to maintain openings in the canopy and perform additional pruning or removal of trees and shrubs to eliminate ladder fuels. To avoid damaging smaller, younger trees, at least 2/3 of green branches should remain when ladder fuels are removed.

After ten years, dense thickets of young trees (regeneration) may become established, and these will need to be thinned. Not all regeneration should be cut since trees of various ages are important for forest diversity. Young trees in openings with adequate room to grow should remain. Regeneration that is likely to become ladder fuel or crowded by other trees should be cut. Depending on their objectives, landowners may want to consider removing some of the larger trees to make room for the younger ones.

7.0 GOALS, OBJECTIVES AND PLANNED ACTIONS

This CWPP for the Lost Park Ranch subdivision is intended as a first step in the wildfire mitigation planning process. The next steps necessary are outlined below. Many of these steps are overlapping and occur throughout the years ahead. The intention is to accomplish all of the actions that are identified herein.

7.1 GOAL I - USING THIS PLAN

7.1.1 OBJECTIVE 1.1: PROVIDE A BASIS FOR MANAGEMENT OF PRIORITIES ESTABLISHED BY THIS PLAN

1. Establish a standing Lost Park Ranch Owners Association Firewise Community Committee (LPROA-FCC) with broad representation to manage activities that support the priorities and ongoing implementation of this CWPP.

7.1.2 OBJECTIVE 1.2: WITHIN THE LPROA-FCC, DEVELOP PROTOCOLS AND OUTLINE RESPONSIBILITIES FOR WILDFIRE PREVENTION

1. Establish “lead” for education, information and activities, implementation planning and funding, and contacts for collaboration with various agencies and neighboring communities.

7.1.3 OBJECTIVE 1.3: MAINTAIN CONTINUITY AND PROGRESS

1. Convene standing LPROA-FCC at least every 6 months to track and update the plan.
2. Report to Lost Park Ranch Owners Association by means of website, newsletter and at meetings such as the annual meeting.
3. Review and update CWPP every third year beginning in 2015 and develop new priorities as necessary.

7.2 GOAL II - INFORMATION AND EDUCATION

Under the management of the LPROA-FCC there are several topics that would provide necessary guidance for property owners. A major component of this plan emphasizes offering this information and educational opportunities to Lost Park Ranch property owners.

7.2.1 OBJECTIVE 2.1: PROVIDE SOURCES FOR WILDFIRE PREVENTION INFORMATION

1. Contact sources of educational materials related to wildfire (i.e., Colorado State Forest Service, Firewise, US Forest Service) and select an assortment of materials that is pertinent to Lost Park Ranch.
2. Obtain and maintain a supply of key publications including a list of web-based resources. Notify property owners of the availability of these publications.
3. Distribute copies of key publications to residents and new property owners at any community functions every year such as the LPROA Annual Meeting.
4. Place article regarding current fire prevention tips on Lost Park Ranch websites and update regularly.

7.2.2 OBJECTIVE 2.2: PROVIDE ACTIVE EDUCATIONAL OPPORTUNITIES FOR PROPERTY OWNERS

1. Create a "fire prevention moment" to describe this CWPP, show fire protection documents or videos and make motivational talks or demonstrate protection measures at Lost Park Ranch annual meetings.
2. Plan and host at least one collaborative educational project each year, including one on fire mitigation, as necessary one on mountain pine beetle, and one on emergency preparedness.

7.3 GOAL III - FUEL REDUCTION IMPLEMENTATION

This plan includes project proposals to mitigate high-risk areas in the subdivision through programs such as the LPROA chipping program. . The intent is to create an attitude of continuous improvement and maintenance of fire prevention among the owners of property in Lost Park Ranch.

7.3.1 OBJECTIVE 3.1: FUNDING OPPORTUNITIES

1. Pursue eligible grants associated with all fire prevention and fuel reduction priorities in Lost Park Ranch. Request assistance from property owners for funds to match federal and state grants where appropriate.
2. Maintain and refer to a list of interested property owners including those that are in need of financial or physical assistance to reduce wildfire hazards on private property.

7.3.2 OBJECTIVE 3.2: PROVIDE ASSISTANCE FOR SEASONAL FUEL REDUCTION PROJECTS

1. Fabricate and install signs at primary entrances to Lost Park Ranch to mimic fire danger postings of JCFPD; assign responsibility to interested property owner(s) for maintaining the signs current with the postings of JCFPD.

2. Coordinate and publicize community "chipping" dates at least once a year to provide on-site slash treatment.
3. Conduct collaborative fuel reduction project on adjoining lots having multiple owners as often as possible with available funding and volunteer labor.

7.4 GOAL IV - COLLABORATION AND COMMUNICATION

Working together as a community, with neighboring subdivisions and public land managers, the results of mitigation efforts are far reaching. Continued communications on current conditions, mitigation opportunities, and values of property owners are essential.

7.4.1 OBJECTIVE 4.1: CREATE AND MAINTAIN VARIOUS LEVELS OF COMMUNICATION WITH AGENCIES AND PROPERTY OWNERS.

1. Contact public land managers in the area (Colorado State Land Board, BLM and USFS) to establish and maintain a collaborative working relationship regarding fire mitigation activities on lands adjoining Lost Park Ranch.
2. Contact CSFS, USFS, BLM, JCFPD, Park County (Sheriff, Planning, etc.), Indian Mountain, Buffalo, and Elkhorn Subdivisions to establish points of contact for ongoing cross boundary fire prevention measures in the Lost Park Ranch region.
3. Maintain list of volunteers willing to assist in projects on properties in the subdivision.
4. Send list of residents that want to know more about making their property more accessible to the JCFPD. Allow fire district to manage this request.
5. Contact those wanting to know about the development of an emergency plan and historical site preservation and invite them to set up committees to address these issues.

8.0 SUMMARY

The goals and objectives outlined in this CWPP are the first steps to preserving the beauty and value of Lost Park Ranch property and improving the safety of the community as a whole. A CWPP does not compel any owner to take action, but does provide the foundation and information necessary for owners to choose which actions to take. As time passes and objectives are met or changed, this document will be re-evaluated and updated to meet the needs and goals of the community.

9.0 APPENDICES

9.1 APPENDIX 1

9.1.1 LOST PARK RANCH INSECT AND DISEASE CONDITIONS

Literally thousands of insect and diseases are present in the forests surrounding Lost Park Ranch--or any other forested area. Fortunately, like the common cold, most do no serious or lasting damage. But when in poor health, trees, like humans, are more prone to infection from other causes; the concept of preventive medicine applies to forests, as well. Maintaining forests in good health will prevent problems in the future. For the most part, forest insect and disease issues are typical for the region.

Every summer, insect and disease specialists from the USDA Forest Service and Colorado State Forest Service (CSFS) survey Colorado's forests from the air to monitor insect and disease outbreaks. These flights are an excellent means of finding new areas of insect and disease activity and monitoring trends in existing outbreaks. Maps of the previous year's findings are published in January and can be found on the CSFS website at http://csfs.colostate.edu/pages/common-insects.html.This link also contains more detailed information on the insect and disease issues presented here.

The unnaturally dense forest conditions that cause the potential for hazardous fire also create the potential for cyclical insect and disease outbreaks. Trees weakened by overcrowding and severe competition for water and sunlight are susceptible to invasion by insects and disease. When planning wildfire hazard mitigation projects, it is important to address current insect or disease issues and prevent those that are likely to become a problem. Following is information on some of the common forest insect and disease problems that have been identified in the region.

9.1.1.1 MOUNTAIN PINE BEETLE (MPB)

Due to the massive mountain pine beetle epidemic in the western United States and Canada, MPB is the most feared insect in the forest. Pine beetle is currently the greatest threat to Lost Park Ranch. The beetles have crossed the Continental Divide in northern Park County and northern Larimer County, and activity currently is confined mostly to higher altitude lodgepole pine. It presently is not known if or when the beetles will reach into the lower-elevation ponderosa forests, but where they have reached ponderosa, heavy mortality has occurred.

Adult beetles fly from midsummer through the first frost, although the vast majority fly between mid-July through the middle of September. Females seek a large, weak tree in which to mate and lay eggs. Vigorous trees generate enough pitch to prevent the female from burrowing through the bark, and this attempt by the tree to prevent entry creates the pitch tubes symptomatic of beetle attack. Pitch tubes are **not** a particularly reliable indicator of a successful attack. If pitch tubes are seen, check for reddish boring dust (fine sawdust) at the base of the tree and in the bark crevices. Boring dust is a more reliable indicator of successful attack.

Once a female penetrates the bark, she hollows out a circular mating chamber between the bark and the wood, releasing a pheromone (scent) to attract a mate. The pheromone also attracts additional females to the tree and the tree is attacked en masse. After mating, the female burrows up the trunk between the bark and wood laying eggs. She inoculates the tree with spores of bluestain fungus, which provides food for the larvae. The fungus clogs the tissues that conduct water throughout the tree, leading to death within a few weeks.

Boring dust on a ponderosa pine after bark beetle attack. The reddish brown sawdust at the base of the tree and in the bark crevasses is a strong indication of successful beetle attack. Colorado State Forest Service photo by David Leatherman.

Mountain pine beetle galleries under the bark. The maternal beetle burrowed straight up the tree, creating the darker central gallery. Larval beetles feed horizontally, creating the smaller galleries. A larva is in the upper right and pupae in the lower left. Note the bluestain in the wood. Colorado State Forest Service photo by David Leatherman.

Eggs hatch within a few days. The developing larvae feed horizontally from the maternal gallery over winter. The vertical maternal gallery and horizontal larval galleries are characteristic of the mountain pine beetle. The feeding larvae spread the bluestain fungus horizontally through the tree, and it becomes visible in the wood around February. The presence of bluestain is absolute confirmation that beetles have successfully attacked a tree.

Woodpeckers feed on the larvae through the fall and winter. The holes made by the woodpeckers are a visual clue to an infested tree. Untrained observers often are confused by the holes woodpeckers make when they feed on beetle larvae and sapsuckers feed on the sap. Woodpecker feeding is characterized by random holes about one-half inch in diameter that make it appear as though the tree was peppered with a shotgun. Sapsuckers, on the other hand, make a small hole about one-eighth inch in diameter, and the holes are in straight lines or a grid pattern. Sapsuckers do not indicate the presence of beetles in the tree.

Although the tree is dead within a few weeks of successful attack, needles remain green until the following spring. Within the space of a few weeks, in late May or early June the tree will turn straw-

yellow and then reddish-brown. Once beetles invade a tree, nothing can be done to save it; the tree must be cut and disposed of in a way that will kill the beetles. No insecticide is available to kill beetles under the bark; thus, some sort of mechanical treatment is necessary. Any wood greater than four inches in diameter may harbor beetles and must be treated.

Following are treatment options for beetle-infested trees:

1. Cut the tree and move all wood greater than four inches in diameter to a designated mountain pine beetle-safe site – usually an area at least one mile away from the nearest pine tree.
2. Move all wood to a landfill or bury it under at least eight inches of dirt.
3. Completely debark any wood that is larger than four inches in diameter.
4. Chip the tree. Many tree services have chippers capable of chipping large diameter trees. The beetles are killed when the wood is chipped.
5. Cover wood with at least six-mill clear plastic. This method, known as solar treatment, warms the wood to lethal temperatures and increases moisture, encouraging mold growth in the logs, which kills the beetles. Treat the wood properly for successful control. Cut into firewood lengths and stack no more than two logs high. Be sure there are no exposed stubs or sharp edges that might tear the plastic. Trench around the pile and, if possible, wet down the pile to encourage mold growth. Cover the pile with plastic, push the edges of the plastic into the trenches, and seal the edges with dirt. Check periodically to be sure the plastic has not torn. If torn, it can be repaired with duct tape.

It is best to check for infested trees in October of each year – remember that infested trees, although dead, are still green at this time. Pitch tubes and boring dust will be the most obvious clues. If infested trees are located early, there is adequate time to treat them.

While no insecticide effectively treats infested trees, spraying with insecticides such as carbaryl or permethrine prevents attack. Preventive sprays will not kill beetles under the bark. Spray trees between May 1st and July 1st each year for maximum effectiveness. It is not practical to spray every tree on a large tract of land, so choosing which trees to spray depends on the landowner's budget and the value of individual trees to the landowner. It is advisable to solicit bids from several different spray companies, as prices can vary widely. It also is wise to request and check references.

Thinning forests for increased health and vigor by far is the best preventive measure for mountain pine beetle. Because trees require several years to respond to thinning, it is best done before beetles reach epidemic levels. Follow thinning guidelines for wildfire mitigation to reduce susceptibility to MPB.

9.1.1.2 WESTERN SPRUCE BUDWORM (WBSW)

The western spruce budworm a defoliating insect of Douglas-fir and spruce, is a growing threat in northern Teller County. Depending on the intensity of defoliation, budworm may damage or kill the host tree.

A severe outbreak of WSBW in the late 1980s damaged or killed large areas of Douglas-fir throughout the region. Trees with dead branch tips or those with forked or dead tops are legacies of the previous

epidemic. Many of the dead Douglas-fir were first weakened by budworm and then killed by Douglas-fir beetles.

The grayish, mottled adult moths are active in July and August when females lay eggs on the underside of needles. Eggs hatch within days and the larvae migrate to bark scales where they overwinter. The following spring, larvae invade the new buds and feed on the emerging needles. Webbing around the new growth is an obvious sign of budworm activity and if heavy defoliation continues for three to five years, the tree will die. If shorter-term defoliation occurs, the branch tips or the entire top of the tree could die.

WSBW larva feeding on the needles of Douglas-fir. Note the typical webbing in the bottom of the photo. Colorado State Forest Service photo by David Leatherman.

Natural predators or severe winter weather helps control budworm populations, which keeps them at non-threatening levels. Spraying with *Bacillus thuringensis* may be useful to protect high value trees, but is not practical on a large scale.

9.1.1.3 DWARF MISTLETOE

Dwarf mistletoe is a parasitic plant that robs moisture and nutrients from the host tree. Over many years, it causes the tree to decline in vigor and eventually may cause death. More commonly, the tree declines to the point where bark beetles attack and kill it.

Three common species of dwarf mistletoe are found in the region, each named after its principle host – ponderosa pine, lodgepole pine and Douglas-fir. Locally, ponderosa and lodgepole varieties grow on any pine species, but Douglas-fir dwarf mistletoe is exclusive to Douglas-fir trees. Spruce, true firs and deciduous trees are immune to all three species of dwarf mistletoe.

The most obvious symptom of dwarf mistletoe infection is the dense, distorted growth of the branches, called witch's brooms because they appear to be twisted or tied in knots. The shoots of ponderosa and lodgepole dwarf mistletoe are visible on the branch as thick fingerlike growths extending out of the branch or trunk. The shoots of ponderosa and lodgepole dwarf mistletoe are long and obvious to casual observation, but Douglas-fir dwarf mistletoe shoots are shorter than the needles and are not easy to see.

Mistletoe shoots are only reproductive structures with no photosynthetic function. Removing the shoots from a branch does not control dwarf mistletoe, except to temporarily halt seed production. Structures called sinkers, (analogous to roots in plants) embedded in the wood cause the damage, and the mistletoe plant continues to absorb the host tree's water and nutrients. Shoots that are removed grow back in two or three years.

During the growing season, dwarf mistletoe shoots develop berries containing a seed. In August, the berries fill with water and explode, shooting the seed as far as 40 feet. Most seeds strike branches of the host tree and do not travel the full 40 feet, so the expansion of dwarf mistletoe pockets averages two feet per year. When the seed strikes a branch, it germinates and the sinkers penetrate the bark into the tree's conductive tissues. The growing mistletoe begins to steal the tree's food and water. The first visible symptom of infection is swelling in the branch at the site of the growing mistletoe plant, but nubs of the emerging shoots won't be visible for three years and a shoot won't bear its first seeds until seven years after. As seeds spread, all susceptible trees in the vicinity may become infected; it is extremely rare to find an isolated infected tree in the forest.

A ponderosa pine with advanced dwarf mistletoe infection. Note the heavy contorted "witch's brooms" in the lower branches. After long periods of infection, the needles at the top of the tree become sparse and shorter. Colorado State Forest Service photo by Dave Root.

The tendency of mistletoe to infect all trees in a stand makes eradication difficult. No effective chemical treatment exists for mistletoe, and the only way to kill the parasite is to kill the host. In stands where only the susceptible species of tree exists, total eradication of the mistletoe would require a clearcut, which is unacceptable to most landowners.

Fortunately, mistletoe kills trees slowly, so it is not necessary to eradicate the parasite. The disease can be controlled by a program of thinning to increase tree vigor. Pruning the more heavily infected

branches also helps, even if not all the mistletoe is eliminated. The final step in the process is to replant with non-susceptible species so that new trees will grow before the mistletoe kills the remaining trees.

The spread of mistletoe can be halted by a minimum 40-foot buffer zone between infected and non-infected trees. In this situation, cut 20 feet into non-infected trees to remove any mistletoe that is not yet visible; cut the remaining 20 feet into the infected stand. Non- infected trees outside the buffer should be checked each spring for mistletoe and any infected branches should be immediately pruned before seeds develop.

In forest stands with mixed tree species, it may be possible to eliminate all mistletoe by retaining only non-susceptible trees if they are in good health.

Dwarf mistletoe treatment is a complicated process that depends on the site conditions and the landowner's tolerance for cutting trees. In most cases, a combination of treatment methods will best suit the landowner's objectives. Consultation with a qualified forester is recommended to develop an effective and acceptable treatment plan.

9.1.1.4 DOUGLAS-FIR BEETLE

Douglas-fir beetles have not been observed in the community, but considering the stresses of mistletoe and drought the potential of attack is present. Some similarities exist between Douglas-fir beetle and MPB, but there are important differences that require different treatment strategies for infested trees.

Both species burrow under the bark to lay eggs and both carry blue stain fungus that kills the tree within a few weeks of infestation. Each beetle prefers dense stands with large diameter, low vigor trees; thus, thinning Douglas-fir for wildfire mitigation also reduces susceptibility to beetles'.

Pitch streamers on the bark of a beetle-infested Douglas-fir. Not all infested trees will exhibit pitch. Trees should be checked for boring dust in the early fall. Colorado State Forest Service photo by Dave Root.

Adult Douglas-fir beetles emerge in mid-June, and a few adults may overwinter in trees and emerge as early as April. There are no insecticides available for treatment of beetle infested trees. Infested trees should be treated prior to April of each year to prevent emergence of overwintering adults. Effective treatments are whole tree chipping, debarking of all wood greater than four inches in diameter, transportation to a safe site or landfill, and burying under eight inches of dirt. Solar treatments should begin in the fall, preferably early fall.

Preventative spraying is an option for high value trees. Permethrine or carbaryl are effective as Douglas-fir beetle preventatives, but, because of the earlier emergence of overwintering adults, spraying should be done in April. Preventative sprays are not an effective treatment for infested wood.

Unlike MPB-infested trees, Douglas-fir trees do not form pitch tubes when attacked, so there may not be an obvious visual indication of infestation. Some Douglas-fir bleed sap when attacked, resulting in rivulets of sap on the trunk; however, this does not occur in all infested trees. Trees should be checked carefully for boring dust in early October. Later in the year, woodpecker holes may provide a visual clue that trees are infested.

Trees partially defoliated by western spruce budworm (see the following section) are particularly susceptible to attack by Douglas-fir beetles. Injury, overcrowding or any conditions that adversely affect the vigor of the tree will make it more susceptible. Managing the forest for open, vigorous stands of Douglas-fir is the best prevention.

9.1.1.5 IPS (ENGRAVER) BEETLES

There are several species of these small bark beetles that may infest ponderosa pine piñon pine or spruce. Piñon ips is active along the Highway 115 corridor south of Colorado Springs. The other species are always present in the forest, but are not currently at epidemic levels. Ips beetles usually attack trees less than four inches in diameter and, in such circumstances, may be useful in thinning dense stands of young trees. Thus, it usually is not considered as threatening as its larger cousin. Ips will attack larger trees if they are severely weakened by disease (most often dwarf mistletoe), or are damaged by construction, lightning strikes or in horse corrals where soil compaction injures the roots. Like the mountain pine beetle, ips burrow beneath the bark and inoculate the tree with bluestain fungus, often following mountain pine beetles into larger trees.

The reddish-brown sawdust on this freshly cut ponderosa pine slash indicates it has been invaded by ips beetles. Adult beetles will emerge in eight weeks if the slash is not properly treated.

Colorado State Forest Service photo by Dave Root.

The differences between mountain pine beetle and ips are significant to anyone implementing a forest management program. In contrast to MPB, which produce one generation per year, ips may produce up to four. Ips become active in spring when the weather exceeds 50 degrees F, developing from egg to adult within eight weeks. They continue to attack trees until the first fall frosts. For this reason, preventive spraying should be done with permethrine or carbaryl in April and repeated in July. When spraying preventively for ips, it is important to spray the branches, as well as the trunk.

Ips attack causes no pitch tubes to form on live trees, so the only visual clue is boring dust or woodpecker holes in the trunk. Smaller trees quickly turn reddish-brown, but when they attack larger trees, ips often infests only the upper portion of the tree. The first symptom is browning of the top, but subsequent generations emerge and continue down the tree.

Ips will infest green slash and downed logs from forest management projects. If slash is not promptly treated, ips will emerge to attack living trees; treat slash within four to six weeks after cutting. If weather conditions permit, thinning trees in winter when ips are dormant will prevent problems with beetles in slash. However, slash cut after March 1 may still be green enough to attract ips when the weather warms.

Chipping slash will kill ips beetles. Lopping and scattering slash into lengths less than 24 inches promotes rapid drying and prevents infestation. Slash cut late in fall that is subsequently infested can be treated or piled and burned over the winter, but untreated slash left over the winter will produce live broods the following April. Due to their short lifecycle, solar treatment of ips-infested logs is ineffective. Bucking larger diameter logs and promptly splitting them into firewood accelerates the drying process and usually is effective in preventing ips infestations.

Many high value trees have been lost as a result of the common, and ultimately costly, practice of stacking firewood against green trees. Ips beetles will burrow out of infested firewood directly into standing trees.

9.1.1.6 REFERENCES FOR APPENDIX 1

1. Cranshaw, Whitney, David Leatherman, Boris Kondratieff, Paul Opler, and Casey Sclar. Nd. *Insects and Diseases of Woody Plants of the Central Rockies.* Bulletin 506A, Colorado State University Cooperative Extension.

2. Furniss, R.L., and Carolin, V.M. (1977). *Western Forest Insects.* Miscellaneous Publication No. 1339 USDS Forest Service.

3. Johnson, Warren T., and Lyon, Howard H. 1991. *Insects that Feed on Trees and Shrubs.* Comstock Publishing Associates, Cornell University Press.

4. USDA Forest Service, Forest Health Management Rocky Mountain Region. 2009. *Sudden aspen Decline in Colorado.*

9.2 APPENDIX 2

9.2.1 WEBSITES

1. Colorado State Forest Service: http://www.csfs.colostate.edu/
2. CSFS, Woodland Park District: http://csfs.colostate.edu/pages/woodlandparkdist.html
3. Firewise Communities: http://www.firewise.org/
4. Park County: http://www.parkco.us/
5. Park County CWPP: http://parkco.us/documentcenter/view/213
6. Colorado State University Extension: http://www.extension.colostate.edu/chaffee/
7. Pike National Forest: http://www.fs.usda.gov/psicc
8. Bureau of Land Management, Royal Gorge Field Office: http://www.blm.gov/co/st/en/fo/rgfo.html
9. Natural Resources Conservation Service: http://www.co.nrcs.usda.gov/

9.2.2 PUBLICATIONS

9.2.2.1 COMMUNITY WILDFIRE PROTECTION PLANNING

1. How to evaluate a community Wildfire Protection Plan: http://csfs.colostate.edu/pdfs/eval_9-8-08_web.pdf

9.2.2.2 WILDFIRE MITIGATION

1. Fuel Break Guidelines for Forested Communities:
   http://csfs.colostate.edu/pdfs/fuelbreak_guidellines.pdf
2. Protecting Your Home from Wildfire: Creating Wildfire Defensible Zones:
   http://csfs.colostate.edu/pdfs/FIRE2012_1_DspaceQuickGuide.pdf
3. Firewise Landscaping:
   http://csfs.colostate.edu/pdfs/06303.pdf
4. Firewise Plant Materials:
   http://csfs.colostate.edu/pdfs/06305.pdf
5. Forest Home Fire Safety
   http://csfs.colostate.edu/pdfs/06304.pdf
6. Grass Seed Mixtures to Reduce Wildfire Hazard:
   http://csfs.colostate.edu/pdfs/06306.pdf
7. Living With Fire: A guide to the Homeowner:
   http://csfs.colostate.edu/pdfs/LWF51303.pdf
8. Firewise Construction: Site Design and Building Materials:
   http://csfs.colostate.edu/pdfs/firewise-construction2012.pdf

9.2.2.3 FOREST HEALTH AND MANAGEMENT

1. Gambel Oak Management:
   http://csfs.colostate.edu/pdfs/06311.pdf
2. Landowner's Guide to Thinning:

http://csfs.colostate.edu/pdfs/landowner_g4thin_scr.pdf

3. Landowner's Guide to Living With Bark Beetles:
   http://csfs.colostate.edu/pdfs/MPB_Newspaper_Insert_Final.pdf
4. Landowner Assistance Programs in Colorado:
   http://csfs.colostate.edu/pdfs/Landowner-Assistance-Programs-rev112610.pdf

9.2.2.4 FOREST INSECT AND DISEASE INFORMATION

1. Dwarf Mistletoe Management:
   http://csfs.colostate.edu/pdfs/DMT.pdf
2. Mountain Pine Beetle:
   http://csfs.colostate.edu/pdfs/MPB.pdf
3. Solar Treatment for Mountain Pine Beetle:
   http://csfs.colostate.edu/pages/documents/Solar_Treatment_for_Mountain_Pine_Beetle_April_2009.pdf
4. Products used to Prevent Mountain Pine Beetle:
   http://csfs.colostate.edu/pdfs/Web__Revision_June6_MPB_Prev_Products_QG.pdf
5. Ips Beetles:
   http://csfs.colostate.edu/pdfs/Ips.pdf
6. Western Spruce Budworm:
   http://csfs.colostate.edu/pdfs/05543.pdf
7. Firewood and House Log Insects:
   http://csfs.colostate.edu/pages/documents/firewood_insects.pdf
8. Protecting Trees During Construction:
   http://csfs.colostate.edu/pdfs/construction.pdf

9.3 APPENDIX 3

9.3.1 SLASH TREATMENTS

Slash is the material left after any useable wood is removed from a forest restoration project. It usually consists of branches and tree tops that are too small in diameter to use, but may include larger diameters of wood. Proper cleanup of slash is essential to reduce fire hazard, maintain aesthetic values and for forest health. Following is a brief list of the slash treatments most commonly available to landowners.

9.3.2 LOP AND SCATTER

This treatment consists of using the chainsaw to cut the slash into small pieces so that the height of the remaining slash is 6 inches or less. It may be the only practical treatment in areas where chippers are unavailable or prohibitively expensive. It is usually the lowest cost treatment since no special equipment, other than a chainsaw, is needed.

The treated slash is left to decompose. Over the course of several winters, snow pack pushes the slash down and it becomes unnoticeable. This process usually requires three to five years. . It is the most aesthetically unappealing since the slash remains visible until it breaks down.

Lop and scatter should not be used in the defensible zones around structures since the woody material will burn in the event of a fire. The increased fire risk is most prevalent until the needles fall off the wood, but persists until the slash is on the ground and decomposing. In areas away from structures, the slight increase in ground fuel is still a great improvement over the risk of crown fires in an untreated stand. Often lopped and scattered slash is broadcast burned at a later date.

Lopped and scattered slash can also lead to problems with *ips* beetles. The beetles may lay eggs in green slash and the resultant brood may emerge to attack living trees. This problem can be alleviated by doing any forest restoration treatments requiring this method in the fall and winter when ips are not active and by cutting slash into small pieces that dry out quickly.

9.3.3 CHIPPING

Chipping in this context refers to chipping the remaining slash after the trees have been cut and removed for a wood product. Masticating machines, on the other hand, usually chip whole trees as part of the harvest operation itself.

This method may be very labor intensive if the slash must be carried to the chipping machine by hand. As more labor is required to accomplish the task, the cost will rise. On difficult terrain, where slash must be hauled long distances to the chipper this may be a cost prohibitive method.

Chipping is the most common method of slash disposal in the defensible zones around structures. Chips do not significantly contribute to fire hazard around structures since they are close to the ground. They may smolder, but do not produce any significant flame. Large piles of chips should be avoided as they could smolder for a significant amount of time. Chips should be spread along the ground to a depth of less than four inches.

Chipping is an effective means of treating wood infested with bark beetles since the insects will not survive in the small bits of wood. Green slash that is promptly chipped will not harbor infestations of *ips* or other bark beetles.

Chippers are available from many equipment rental businesses, although the rental tends to be expensive and the homeowner must have a vehicle capable of towing a machine. Many communities own chippers and will make them available to landowners doing defensible space projects. Local fire protection districts usually have this information.

9.3.4 PILE AND BURN

Any form of open burning requires a permit, and burning must be done only under the conditions stipulated in the permit. The permitting process varies from county to county. Local fire departments will be able to tell a landowner how to obtain a permit.

For most landowners the slash is piled by hand and burned when conditions are safe—usually a certain amount of snow on the ground. Piles burn best when they are compact and the height is greater than the diameter. This arrangement promotes hotter burning and less smoke.

Location of burn piles is important as well. Piles should be located as far away from standing trees as possible. Even when burning in the winter it is possible to scorch living trees from the heat of the burning pile. Avoid making burn piles on top of stumps. The fire could smolder long distances through the roots of the stump.

The green branches and wood placed in piles will be left in branch lengths long enough to dry out. As a result, piles carry the risk of harboring broods of *ips* beetles which may emerge to attack living trees. On the other hand, burning is an ideal method of killing any bark beetles infesting the wood.

Often piles from wood cut one winter must sit through the following summer in order to dry, or piles from one season may be left over the next summer if proper burning conditions were not available during the winter. In each case the dry wood piles will sit through a burning season with the risk of ignition.

The fire should be monitored during the day and for several days thereafter. The center of a pile usually burns completely, but often wood around the edges does not. To ensure that the slash at the edge of each pile burns it is necessary to "chunk in" the piles periodically. This means that as the fire at the middle of the pile burns down, wood from the edges should be thrown into the center to insure complete burning of all slash.

For several years after a pile is burnt, an unsightly black ring remains where the heat of the fire scorched the soil. Many landowners find these unpleasant to look at. They may also present an opportunity for noxious weed to colonize the bare soil. Breaking up the bare soil with a rake and reseeding with native plants is recommended.

9.3.5 BROADCAST BURNING

This method is more often used by government agencies with extremely large tracts of land than by private landowners. No landowner should attempt a broadcast burn without consulting an individual with expertise in planning and executing broadcast burns.

The permitting procedure for a broadcast burn is quite complex. Smoke management is often the most difficult part of the process. Smoke from a fire must be carefully controlled to minimize annoyance to the public. Broadcast burns must be done under carefully prescribed weather conditions. Burns can be delayed for years if the proper conditions do not occur. Depending on the circumstances, broadcast burns may require large numbers of personnel to hold the fire. Often, such burns are done with the assistance of local fire protection districts as training exercises.

Once the difficulties are overcome, however, broadcast burning may be the best method of accomplishing forest restoration as well as slash treatment. Light fire on the ground is nature's way of maintaining ponderosa pine or mixed ponderosa and Douglas-fir forests. It should be noted that

lodgepole pine types and spruce/fir types are adapted to a fire regime of infrequent, stand replacement fires, and broadcast burning may not be suitable in these types.

Unlike chipping or lop and scatter methods which still leave fuel, albeit in a modified condition, burning consumes the slash. Once burned, there is no longer any fuel to feed a wildfire. Broadcast burning, unlike other methods leaves a seed bed ideal for regeneration of new trees.

On the other hand, broadcast burning, by removing the existing ground vegetation may also encourage invasion of noxious weeds. Burned areas should be carefully monitored after burning. Usually the heat produced by broadcast burning does not damage the soil and reseeding is not necessary. Green slash left to cure over the warm season may also be a brood site for *ips* beetles.

9.4 APPENDIX 4

9.4.1 GLOSSARY

1. **Abiotic Factors:** The non-living components of the environment, such as air, rocks, soil, water, peat, and plant litter.
2. **Afforestation:** The establishment of trees on an area that has lacked forest cover for a very long time, or has never been forested.
3. **Aerial fuels:** Standing and supported live and dead combustibles not in direct contact with the ground and consisting mainly of foliage, twigs, branches, stems, cones, bark, and vines: typically used in reference to the crowns of trees.
4. **Cambium:** A single layer of cells between the woody part of the tree and the bark. Division of these cells result in diameter growth of the tree through formation of wood cells (xylem) and inner bark (phloem).
5. **Canopy:** The forest cover of branches and foliage formed by tree crowns.
6. **Chain:** A measuring tape, often nylon, 50 meters or 75 meters in length, used to measure distances. This term is derived from an old unit of measurement (80 Chains = 1 mile).
7. **Chimney:** A topographical feature such as a narrow drainage on a hillside or the upper end of a box canyon that could channel wind, smoke or flames up the slope; acting as a fireplace chimney would to draw smoke and heat upward.
8. **Class A Roof:** Effective against severe fire test exposures, as classified by the Universal Building Code (UBC). Under such exposures, roof coverings of this class are not readily flammable, afford a fairly high degree of fire protection to the roof deck, do not slip from position, and are not expected to produce flying brands.
9. **Class B Roof:** Effective against moderate fire test exposures, as classified by the Universal Building Code (UBC). Under such exposures, roof coverings of this class are not readily flammable, afford a moderate degree of fire protection to the roof deck, do not slip from position, and are not expected to produce flying brands.
10. **Class C Roof:** Effective against light fire test exposure, as classified by the Universal Building Code (UBC). Under such exposures, roof coverings of this class are not readily flammable, afford a measurable degree of fire protection to the roof deck, do not slip from position, and are not expected to produce flying brands.
11. **Clearcut:** An area of forest land from which all merchantable trees have recently been harvested.
12. **Climax Forest:** A forest community that represents the final stage of natural forest succession for its locality, i.e. for its environment.
13. **Coarse Woody Debris (CWD):** Sound and rotting logs and stumps that provide habitat for plants, animals, and insects, and a source of nutrients for soil development.
14. **Colorado Champion Tree:** The largest known tree of its species in the state. Trees are ranked by a point system based on three measurements: trunk circumference in inches at 4.5 feet above the ground, tree height in feet, and the average crown spread in feet.
15. **Commercial Thinning:** A silviculture treatment that "thins" out an overstocked stand by removing trees that are large enough to be sold as poles or fence posts. It is carried out to improve the health and growth rate of the remaining crop trees.

16. **Competing Vegetation:** Vegetation that seeks and uses the limited common resources (space, light, water, and nutrients) of a forest site needed by preferred trees for survival and growth.
17. **Conifer:** Cone-bearing trees having needles or scale-like leaves, usually evergreen, and producing wood known commercially as "softwoods."
18. **Conservation:** Management of the human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations. It includes the preservation, maintenance, sustainable utilization, restoration, and enhancement of the environment.
19. **Crown fire / Crowning:** A form of extreme wildland fire behavior consisting of fire that advances from top to top of trees or shrubs more or less independent of a surface fire. Crown fires are sometimes classed as running or dependent to distinguish the degree of independence from the surface fire.
20. **Deciduous:** Perennial plants that are normally leafless for some time during the year.
21. **Defensible Space:** An area within the perimeter of a parcel, development, neighborhood, or community where basic wildland fire protection practices and measures are implemented, providing the key point of defense from an approaching wildfire or defense against encroaching wildfires or escaping structure fires. The perimeter as used herein is the area encompassing the parcel or parcels proposed for construction and/or development, excluding the physical structure itself. The area is characterized by the establishment and maintenance of emergency vehicle access, emergency water reserves, street names and building identification, and fuel modification measures. In simplest terms, it is adequate space between structures and flammable vegetation which allows firefighters a safe working area from which they can attack an oncoming wildfire. Defensible Space is the best element of fire protection for individual property owners.
22. **Defoliator:** An agent that damages trees by destroying leaves or needles.
23. **Dripline:** The outer most leaves on a tree defines its dripline and the ground within the dripline is known as the drip zone; also defined as the area defined by the outermost circumference of a tree canopy.
24. **Deforestation:** The removal of a forest stand where the land is put to a non forest use.
25. **Eave Opening:** A vent located in an eve or soffit which allows airflow into the attic and/or walls of a structure.
26. **Ecosystem:** A functional unit consisting of all the living organisms (plants, animals, microbes) in a given area, and all the non-living physical and chemical factors of their environment, linked together through nutrient cycling and energy flow. An ecosystem can be of any size a log, pond, field, forest, or the earth's biosphere but it always functions as a whole unit. Ecosystems are commonly described according to the major type of vegetation; for example, forest ecosystem, old-growth ecosystem, or range ecosystem.
27. **Escape route:** A preplanned and understood route firefighters take to retreat from an unsafe or fire-threatened area and move to a safety zone or other low-risk area**.**
28. **Extreme fire behavior:** A level of fire behavior that ordinarily precludes firefighting methods involving direct attack on the fire. One or more of the following is usually involved: high rate of spread, prolific crowning and/or spotting, presence of fire whirls, strong convection column. Predictability is difficult because such fires often exercise some degree of influence on their environment and behave erratically, sometimes dangerously.
29. **Felling:** The cutting down of trees.

30. **Firebrands:** Flaming or glowing fuels lofted into the air during intense burning by strong upward convection currents. Also referred to as airborne embers.
31. **Fire break:** A natural or constructed fuel-free barrier used to stop or check fires that may occur, or to provide a control line from which to work.
32. **Fire front / Flame front:** The part of a fire within which continuous flaming combustion is taking place. Unless otherwise specified, the fire front is assumed to be the leading edge of the fire perimeter.
33. **Fire Dependent:** Requiring one or more fires of varying frequency, timing, severity, and size in order to achieve optimal conditions for population survival or growth.
34. **Fire Hazard Mitigation:** Various methods by which existing fire hazards can be reduced in a certain area, such as fuel breaks, non-combustible roofing, spark arresters, etc.
35. **Fire Management:** The activities concerned with the protection of people, property, and forest areas from wildfire and the use of prescribed burning for the attainment of forest management and other land use objectives, all conducted in a manner that considers environmental, social, and economic criteria.
36. **Fire Suppression:** All activities concerned with controlling and extinguishing a fire following its detection.
37. **Firewise:** A National Fire Protection Association's (NFPA) program encouraging local solutions for wildfire safety by involving homeowners, community leaders, planners, developers, firefighters, and others in the effort to protect people and property from wildfire risks.
38. **Forest Fire:** Any wildfire or prescribed burn that is burning in forest, grass, alpine, or tundra vegetation types.
39. **Forest Type:** A group of forested areas or stands of similar composition (species, age, height, and stocking) which differentiates it from other such groups.
40. **Fuel:** Any living or dead material that will burn.
41. **Fuel break:** An existing barrier or change in fuel type (to one that is less flammable than that surrounding it) or a wide strip of land on which the native vegetation has been modified or cleared, that acts as a buffer to fire spread so that fires burning into them can be more readily controlled. Often selected or constructed to protect a high value area from fire.
42. **Fuel Management:** The act or practice of controlling flammability and reducing resistance to control of wildland fuels through mechanical, chemical, biological, or manual means, or by fire in support of land management objectives.
43. **Fuel reduction zone:** An area similar to a fuel break but not necessarily linear, in which fuels have been reduced or modified to reduce the likelihood of ignition and/or to reduce fire intensity thereby lessening potential damage and resistance to control.
44. **Germination:** The development of a seedling from a seed.
45. **Home Ignition Zone (HIZ):** An area including the home and its immediate surroundings within which burning fuels could potentially ignite the structure; usually considered to be an area extending out roughly 100 feet from the home. The HIZ is often used to describe the area in which fuel modification measures should be taken to protect the home.
46. **Ladder Fuels:** Fuels that provide vertical continuity between the surface fuels and crown fuels in a forest stand, thus contributing to crown fires.
47. **Lines of Effort:** Tasks sets or sets of actions that are linked or coordinated with other task sets to accomplish a larger mission or reach a desired end state. Lines of effort allow leaders and decision makers to direct a variety of separate actions toward a unified result.

48. **Maximum Density:** The maximum allowable stand density above which stands must be spaced to a target density of well-spaced, acceptable stems to achieve free-growing status.
49. **National Fire Protection Association (NFPA):** A private, non-profit organization dedicated to reducing fire hazards and improving fire service.
50. **Phloem:** A layer of tree tissue just inside the bark that conducts food from the leaves to the stem and roots.
51. **Pitch Tubes:** A tubular mass of resin that forms on bark surface at bark-beetle entrance holes.
52. **Prescribed Burning:** Controlled application of fire to wildland fuels, in either their natural or modified state, under certain conditions of weather, fuel moisture, soil moisture, etc. as to allow the fire to be confined to a predetermined area and at the same time to produce results to meet planned land management objective.
53. **Ready, Set, Go (RSG):** A program, managed by the International Association of Fire Chiefs (IAFC), seeking to develop and improve the dialogue between fire departments and residents. The program helps fire departments teach individuals who live in high-risk wildfire areas how to best prepare themselves and their properties against fire threats.
54. **Regeneration:** The act of renewing tree cover by establishing young trees, naturally or artificially note regeneration usually maintains the same forest type and is done promptly after the previous stand or forest was removed.
55. **Saddle:** A depression, dip or pass in a ridgeline; significant in wildland firefighting because winds may be funneled through a saddle, causing an increase in wind speed.
56. **Safety zone:** An area essentially cleared of flammable materials, used by firefighters to escape unsafe or threatening fire conditions. Safety zones are greatly enlarged areas in which firefighters can distance themselves from threatening fire behavior without having to take extraordinary measure to shield themselves from fire/heat.
57. **Sapwood:** The light-colored wood that appears on the outer portion of a cross-section of a tree.
58. **Serotinous:** Pertaining to fruit or cones that remain on a tree without opening for one or more years note in some species cones open and seeds are shed when heat is provided by fires or hot and dry conditions.
59. **Shaded fuel break:** A fuel break built in a timbered area where the trees within the break are thinned and limbed up to reduce crown fire potential, yet retain enough crown canopy to provide shade, thereby making a less favorable microclimate for surface fires.
60. **Silviculture:** The art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands. Silviculture entails the manipulation of forest and woodland vegetation in stands and on landscapes to meet the diverse needs and values of landowners and society on a sustainable basis.
61. **Snag:** A standing dead tree or part of a dead tree from which at least the smaller branches have fallen.
62. **Stand:** A continuous group of trees sufficiently uniform in age-class distribution, composition, and structure, and growing on a site of sufficiently uniform quality, to be a distinguishable unit.
63. **Spot Fire / Spotting:** Fires ignited beyond control lines or outside the perimeter of a fire by firebrands landing on/among flammable material. Spot fires/spotting are a form of extreme fire behavior typically resulting from high wind conditions.
64. **Structure protection:** A defensive strategy in wildland firefighting in which firefighters are assigned to evaluate, prepare and, when possible, defend structures/homes that may be threatened by a wildfire.

65. **Structure triage:** Evaluating and sorting structures/homes into categories based on their relative likelihood of surviving a wildland fire threat (*defensibility*). Triage decisions are based multiple factors and conditions occurring during an actual fire - weather, fire behavior, home ignition potential, defensible space, presence of escape routes, and availability of firefighting resources, among others - with the goal of doing the most good with the resources available.
66. **Succession (or Ecological Succession):** The replacement of one plant and/or animal species over time by another in progressive development toward climax vegetation.
67. **Surface fuels:** Fuels lying on or near the surface of the ground, consisting of leaf and needle litter, dead branch material, downed logs, bark, tree cones, and low-lying live vegetation.
68. **Survivable space:** A term typically used to describe the area around a structure/home indicating that fuels in the area have been reduced to the point that there is little or no serious fire threat to the structure; the structure has a high probability of surviving a wildland fire without anyone on scene providing active protection.
69. **Thinning:** A cutting made in an immature crop or stand primarily to accelerate diameter increment, but also, by suitable selection, to improve the average form of the tree that remain.
70. **Torching:** The burning of the foliage of a single tree or a small group of trees, from the bottom up. Sometimes, also called candling. Torching is an extreme form of fire behavior, similar to but less extreme than crowning in that crowning affects larger numbers, even entire stands of trees.
71. **USDAFS:** United States Department of Agriculture - Forest Service, what is commonly known as just "The Forest Service"
72. **Windbreak:** A strip of trees or shrubs maintained mainly to alter wind flow and microclimates in the sheltered zone, usually farm buildings.
73. **Wildland-Urban Interface or Wildland-Urban Intermix (WUI):** The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. Although ***Interface*** is the more general, more commonly used term; it technically refers specifically to the area where development and wildlands meet. ***Intermix*** indicates the presence of wildland vegetation/fuels intermingled throughout the developed area.