

# **Western Saguache County Community Wildfire Protection Plan**



Land Stewardship Associates, LLC.  
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# Community Wildfire Protection Plan Western Saguache County

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**Vulcan Area**



**Sargents Area**

## **Preface:**

A Community Wildfire Protection Plan (CWPP) is a local wildfire protection plan that can take a variety of forms, based on the needs of the community. The CWPP may address issues such as wildfire response, hazard mitigation, community preparedness, or structure protection – or all of the above.

The process of developing a CWPP can help a community clarify and refine its priorities for protection of life, property and critical infrastructure in the wildland-urban interface. It also can lead community members through valuable discussions regarding management options and implications for the surrounding watershed.

CWPPs also improve a community's ability to compete for grants to fund hazard mitigation projects prevention and preparedness education of residents in the community.

The wildland urban interface (WUI) is another term found throughout this document. It can be simply described as the geographical area where structures and other human development meet or intermingle with wildland or vegetative fuels. For the purposes of community wildfire protection planning a more specific definition is used. The Healthy Forest Restoration Act defines wildland-urban interface as:

- a.) an area extending ½ mile from the boundary of an at risk community.
- b.) an area within 1.5 miles of the boundary of an at risk community, including any land that;
  - 1. has a sustained steep slope that creates the potential for wildfire behavior endangering the at risk community,
  - 2. has a geographic feature that aids in creating an effective fire break, such as a road or ridge top,
- c.) an area that is adjacent to an evacuation route for an at risk community that requires hazardous fuels reduction to provide safer evacuation from the at risk community.

## **COMMUNITY IDENTIFICATION AND DESCRIPTION**

The Western Saguache County (WSC) area is located in Saguache County on the west side of the Continental Divide in south central Colorado. It covers an area of approximately 809 square miles or 518,060 acres and ranges in elevation from 8,000 feet on the north edge to over 11,970 feet at Long Baldy Mountain on its eastern boundary. Tomichi and Cochetopa Creeks are the primary drainages in the area. The Gunnison Fire Protection District (GFPD) provides both structure and wildland fire protection to 475 square miles or 304,002 acres of western Saguache County, which is most of the county on western side of the Continental Divide. The Sargents Private Fire Brigade provides protection for the Sargents area which is totally surrounded by the GFPD.

The boundary follows the western edge of Saguache County and lies on the western side of the Continental Divide. Gunnison is the largest town in the vicinity. US Hwy 50 and State Hwy 114 are the two principal travel routes through the area. The following vicinity map identifies the location of the area and its proximity to the remainder of the San Luis Valley.

Four Wildland Urban Interface (WUI) areas have been identified within WSC. They are listed in Table 1 and encompass 15,863 acres that have been designated as WUI in WSC.

The lower elevations are dominated by sagebrush with forested areas on north facing slopes and transitions to ponderosa pine/Douglas-fir/aspen montane forests at higher elevations. Ponderosa pine/Douglas-fir forests are generally dense enough to sustain a substantial crown fire resulting in a high fire risk.

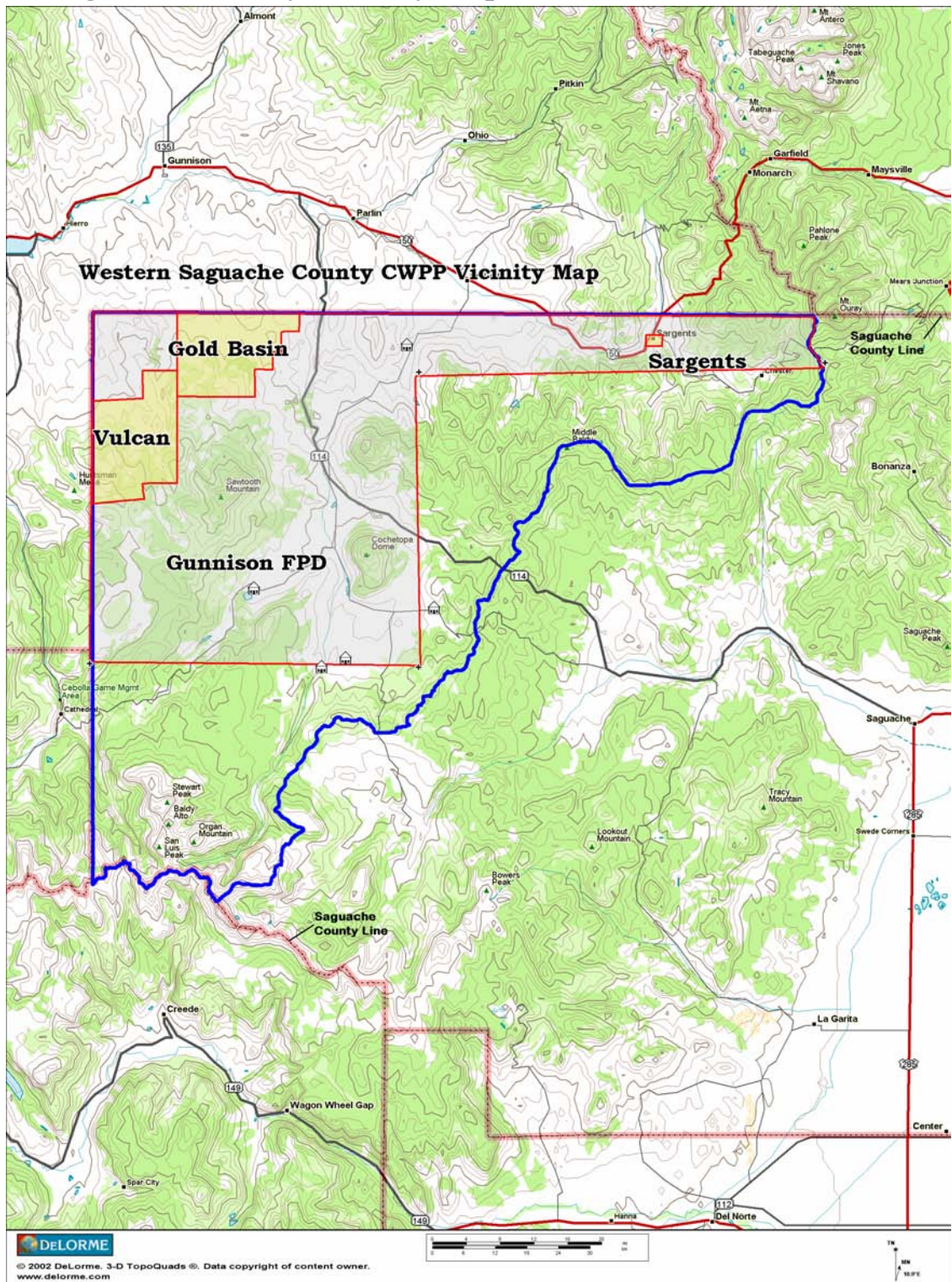
Western Saguache County is characterized by rural subdivisions with parcels usually in the thirty five acre size class. Sagebrush is the dominant fuel type and will carry moderate intensity, fast moving wildfires on a dry windy day.

There are also numerous structures scattered outside the GFPD that are unaffiliated with any fire protection district that rely on the GFPD, federal land management agencies and the State for whatever wildland fire protection they may be able to get.

Public lands in the form of Bureau of Land Management, Colorado State Land Board, and US Forest Service dominate the area. Numerous private parcels are scattered throughout these public holdings.



## Western Saguache County Vicinity Map



US Hwy 50 and Colorado State Highways 114 provide primary paved access with numerous high quality County gravel roads providing access to the various neighborhoods. Road quality within subdivisions varies dramatically.

GFPD has its' main station located in Gunnison and another in Sargents. Mutual aid from other Fire Districts such as Crested Butte, Northern Saguache County, Poncha Springs, Salida and Montrose take considerable time to arrive on scene

The initial CWPP Core Team meeting was held on January 4<sup>th</sup>, 2008. Participants included members of the Gunnison Fire Protection District, Gunnison County Office of Emergency Management, Colorado State Forest Service, Saguache County Sheriff's Department, Bureau of Land Management, US Forest Service, and Land Stewardship Associates.

The Core Team reviewed the overall wildland fire protection situation in the WSC and discussed issues, concerns and opportunities. WUI boundaries were delineated on a map. Station wildland resource inventories were discussed. Area Stake holders were invited to attend the meeting using direct mailings to all Saguache County landowners on the west side of the Continental Divide, newspaper articles, radio public service announcements and posters in various locations throughout Gunnison. Unfortunately no stakeholders chose to attend the workshop.

**Table 1 Wildland Urban Interface Communities (WUIs) in Western Saguache County**

<b>WUI Name</b>	<b>Acres</b>
Deer Haven Estates	833
Gold Basin	9,388
Sargents	837
Vulcan	4,805
<b>Total Acres</b>	<b>15,863</b>

## COMMUNITY ASSESSMENT

The overall risk within Western Saguache County from wildland fire varies from high to low depending upon a wide variety of factors. This section will discuss the facets considered that led to the overall ratings.

### Fuel Hazards

Dense ponderosa pine and Douglas fir stands cover mountainous portions of the planning area while grass and shrub types are found at lower elevations. Most of the WUI areas are located at lower elevations.

Foothills grass and shrub fuel loading are highly variable ranging from good strong fuel models 1 & 2 and some 6. Fires in the denser grass and shrub types can be very difficult to control on a typical dry, windy afternoons that are common in the region. See Appendix B for a full discussion of Fuel Models

Fuel models associated with the mountainous WUIs include 1, 2, 6, 8 9 and 10. All stands adjacent to structures with crown densities greater than forty percent are problematic. Continuous surface and crown fuel arrangement, both horizontally and vertically, render these areas susceptible to torching, crown fire, and ignition by embers, even under moderate weather conditions.

The following maps show WSC WUIs and Fuel Models. Fire Hazard maps for the individual WUIs are located in Appendix A Maps. These maps indicate the majority of the WUIs have a fuel hazard assessment of low to moderate with segments of high scattered throughout. Local topography and poor vehicle access further aggravates fire behavior and control.



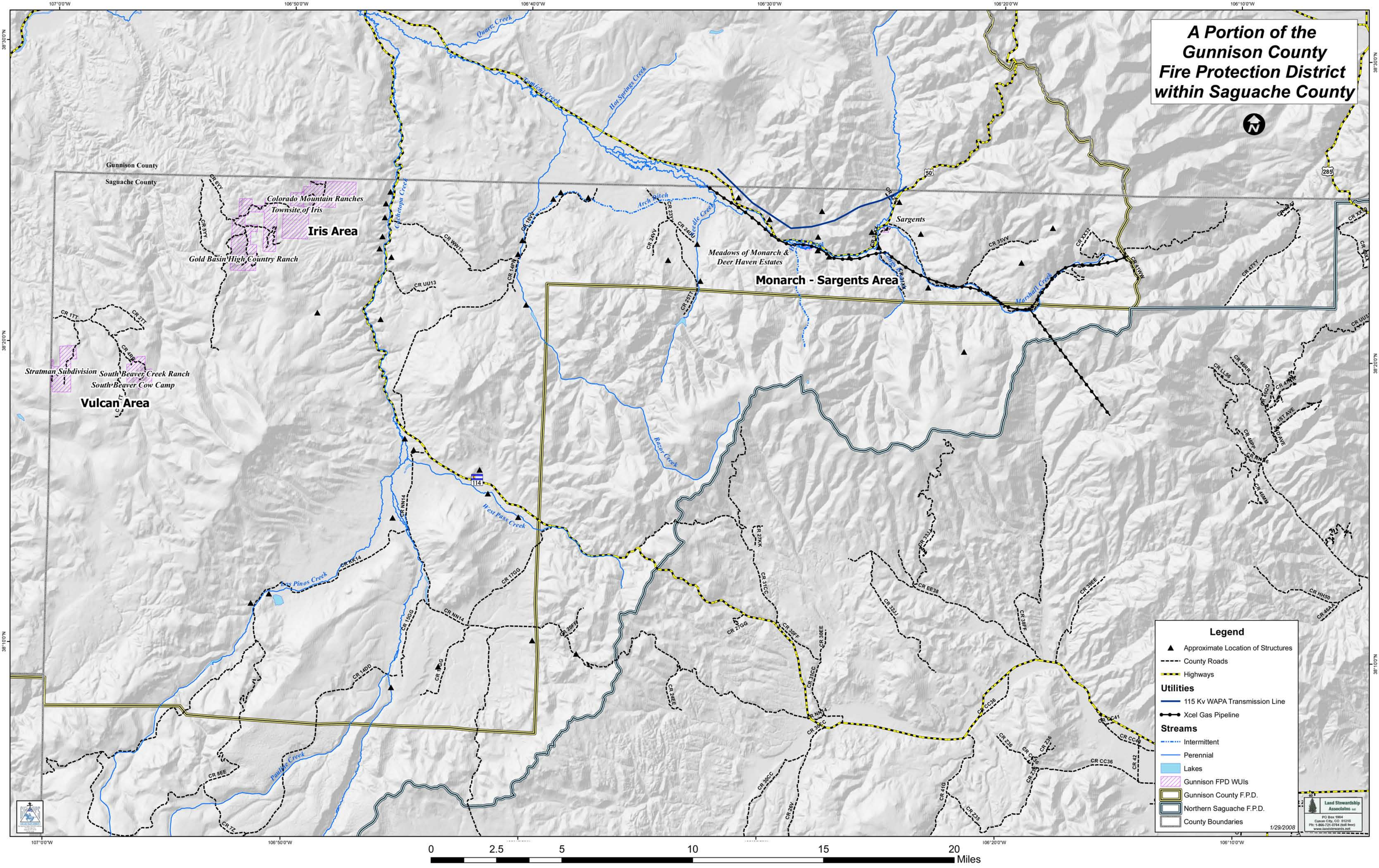
Sage brush in Gold Basin  
(4 feet tall)



Grass/Aspen in Gold Basin



**A Portion of the  
Gunnison County  
Fire Protection District  
within Saguache County**



**Legend**

- ▲ Approximate Location of Structures
- County Roads
- Highways
- Utilities**
- 115 Kv WAPA Transmission Line
- Xcel Gas Pipeline
- Streams**
- Intermittent
- Perennial
- Lakes
- Gunnison FPD WUIs
- Gunnison County F.P.D.
- Northern Saguache F.P.D.
- County Boundaries

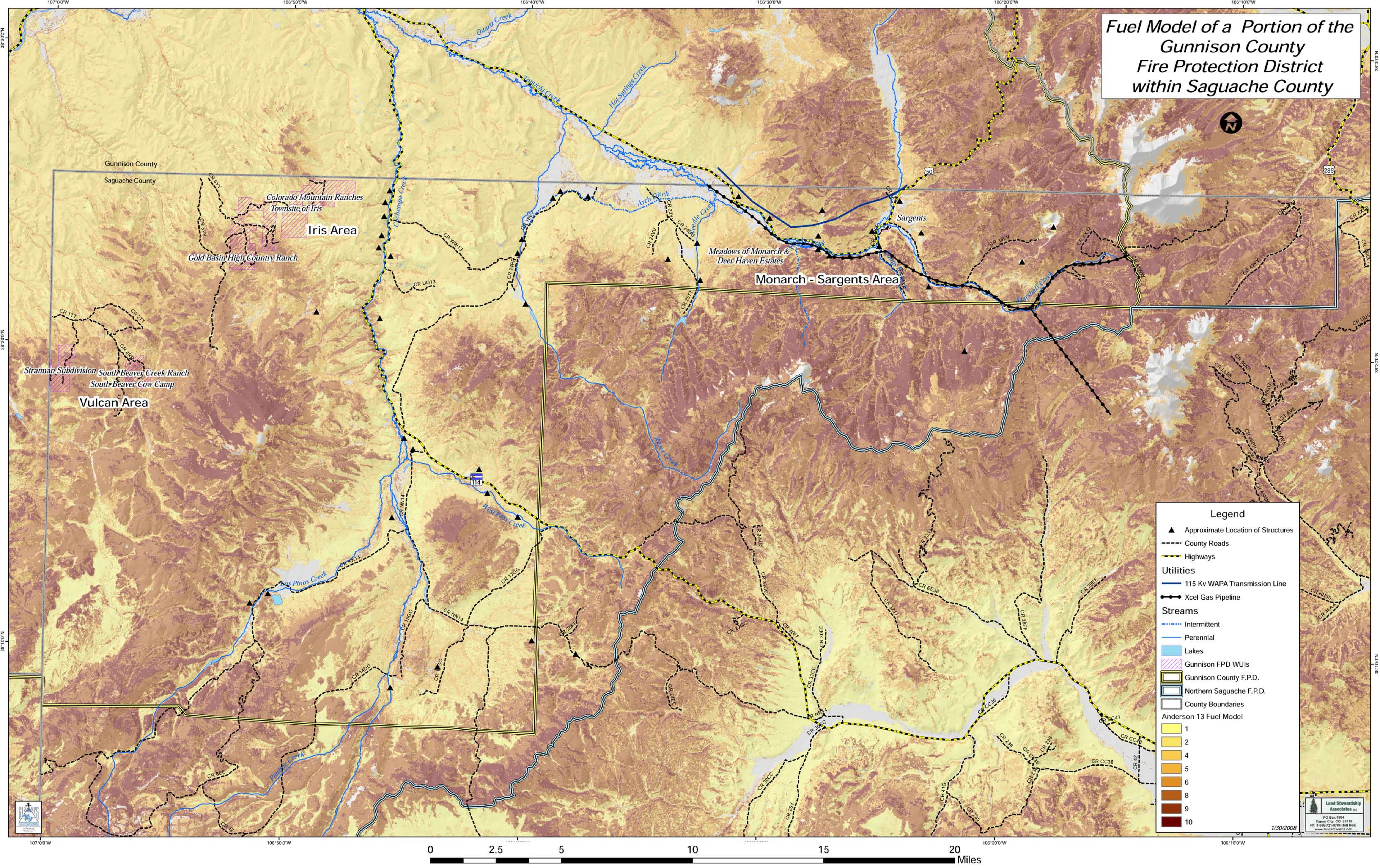
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*Fuel Model of a Portion of the  
Gunnison County  
Fire Protection District  
within Saguache County*



**Legend**

- ▲ Approximate Location of Structures
- County Roads
- Highways
- Utilities**
  - 115 Kv WAPA Transmission Line
  - Xcel Gas Pipeline
- Streams**
  - Intermittent
  - Perennial
- Lakes
- Gunnison FPD WUIs
- Gunnison County F.P.D.
- Northern Saguache F.P.D.
- County Boundaries
- Anderson 13 Fuel Model**
  - 1
  - 2
  - 3
  - 4
  - 5
  - 6
  - 8
  - 9
  - 10



### **Risk of Ignition and Wildfire Occurrence**

Wildland fires have burned throughout the fire protection district ever since lightning and dry biomass has been present on the landscape. An astute observer will note the many old fire scars in forested areas. Charred stumps, snags and large aspen stands date back to the late 1800s when drought combined with lightning to create a vegetative mosaic we enjoy today. Wildfires were less prevalent during the 1900s due in part to a moister climate and to rapid initial attack of small fires. The recent increase in wildfire numbers and intensity is attributable to a prolonged drought and forest stands that are much denser and hence; more prone to hot crown fires. Four large fires have burned in the area recently. The Merry-go-round fire (1997) burned 400 acres. Six homes have been built in the footprint of this burn. The Stubs Gulch fire (1999) burned eighty acres. The Vulcan fire (2002) burned 220 acres east of Vulcan and the Cochetopa Canyon fire (2003) burned fifteen acres and threatened a home. This fire was kept relatively small through super efforts on the part of the wildland fire agencies in the area.

Low fuel moistures and relative humidity are common in the area, as are periods of high winds. When dry, windy conditions coincide, the stage is set for large, troublesome wildfires. Human population is increasing in the area. Fires originating in or near communities are the most immediate concern, but fires starting well beyond the boundaries of the WUI area can have profound effects upon the communities if they burn with typical rates of spread and intensity. Rapid rates of spread and long distance spotting (1/4 to 1 mile) are the norms for fires in the vicinity. Areas classified as high to moderate fuel loading are the most worrisome. Table 2 provides fire behavior predictions for several fuel models during representative weather conditions.



There are also other risks in Vulcan area

**Table 2: WSC (Gunnison FPD) Fire Behavior Predictions**

<b>FUEL MODEL</b>	<b>RATE of SPREAD</b> (ft/hr)	<b>FLAME LENGTH</b> (Feet)	<b>SIZE @ 1 HOUR</b> (Acres)	<b>PERIMETER @ 1 HR.</b> (Feet)	<b>SPOTTING DISTANCE</b> (Miles)
<b>1</b>	1,162	2	21	3,500	0.4
<b>2</b>	1,947	6	30	4,686	0.5
<b>6</b>	3,128	7	77	7,524	0.5
<b>9</b>	165	2	.4	462	0.4
<b>2/9</b>	2,376	8	43	5,610	0.5
<b>10</b>	712	6	4	1,716	0.6

*Note: Flame lengths shaded in orange exceed the 4 foot hand crew control threshold. Crown fires are likely when canopy closure exceeds 40%.*

In fuel model 1, grass is the primary fire carrier. Fuel model 2 is composed of a mix of grass and shrub wherein the shrubs add fuel bed depth and fire intensity. Young dense stands of conifers are usually classified as fuel model 6 when the crowns will be the primary carrier of fire. Tall Dense sagebrush is also fuel model 6. Short needled conifer stands of spruce and fir are fuel model 8. Taller closed canopy ponderosa pine stands usually are classified as fuel model 9 due to the long needled litter layer that covers the ground. The combination of fuel models 2 & 9 best represents the fire characteristics manifested by fires in the vegetative mosaics found in the pine/shrub transition zone. Fuel model 10 represents the stands of Douglas-fir that have considerable dead/downed woody material on the forest floor.

### **Community Values at Risk**

- *Values* – There are four communities, “neighborhoods” or subdivisions with concentrated home sites in the WSC WUI areas. Table 3 gives a summary of the neighborhood wildfire hazard evaluations. Many have heavy fuels nearby and around them. Others have rather light fuels in their vicinity.

Less than a third of the structures have recognizable defensible space. Many have flammable material near by, on the porch or

under decks, increasing their vulnerability. Composition and wooden roofs tend to hold pine needles and forest debris allowing accumulations that also increase vulnerability to fire brands. Most of the structures are vulnerable to wildfire damage occurring from firebrand ignition and/or radiation ignition due to the heavy forest fuels within the area. The details of neighborhood hazard evaluations are contained in Appendix G: Subdivision Hazard Evaluation Form.

**Table 3: Neighborhood Wildfire Hazard**

<b>Low</b>	<b>Moderate</b>	<b>High</b>
<b>Sargents</b>	<b>Gold Basin</b>	<b>Deer Haven</b>
	<b>Vulcan</b>	

- *Access* – The primary and secondary road access within the WSC area is good. Road access within the various neighborhoods is much less predictable. Not all developments have more than one way into or out of the WUI, while others have two means of departure but one is so substandard that normal passenger vehicles would not be able to use it. Roads within subdivision areas and driveways are often narrow and steep. Turnarounds are marginal or lacking. Road signs and home / cabin addresses are spotty at best.
- *Risk* – Because survivable space is lacking around many home sites, natural fuel continuity and steep slopes between some of the neighborhoods, it would be very difficult to protect some home sites from wildfire during periods of high to extreme fire danger.
- *Evacuation* – Evacuation planning is needed to minimize fire emergency confusion and risk to residents who might be asked to evacuate in the event of an emergency. There is basically only one way into and out of these subdivisions. Appendix D provides location of evacuation routes and other fire control features including safety zones, and guidelines for developing an evacuation plan.

County road 38 to Gold Basin and County road 31 to Vulcan are long, narrow and spend considerable time in drainage bottoms. Two way traffic, during emergency situations will be problematic.



Evacuees will slow progress of fire apparatus since the roads are narrow and don't lend themselves to two way traffic.

### **Local Preparedness and Protection Capability**

Gunnison FPD equipment is housed at the Gunnison fire station.

ITEM	#	NEEDED
Total Volunteers	40	40
Wildland Qualified	25	25
Incident Commander Type IV	0	1
Strike Team Leader	0	2
Wildland Firefighter	25	25
Brush Truck Type 6	2	2
Water Tender Type 3 (3,000 gal.)	1	1
Water Tender Type 3 (1,550 gal.)	1	1
Engine Type 1	2	2
Equipment/Personnel Carrier Type X	1	1
Portable Pumps (High Pressure)	2	2
Portable Pumps (Volume)	7	7
Fire Tool Cache	1	1- 40 person
Hand Held Radios	20	20

The Sargents Private Fire Brigade station in Sargents has the following resources available:

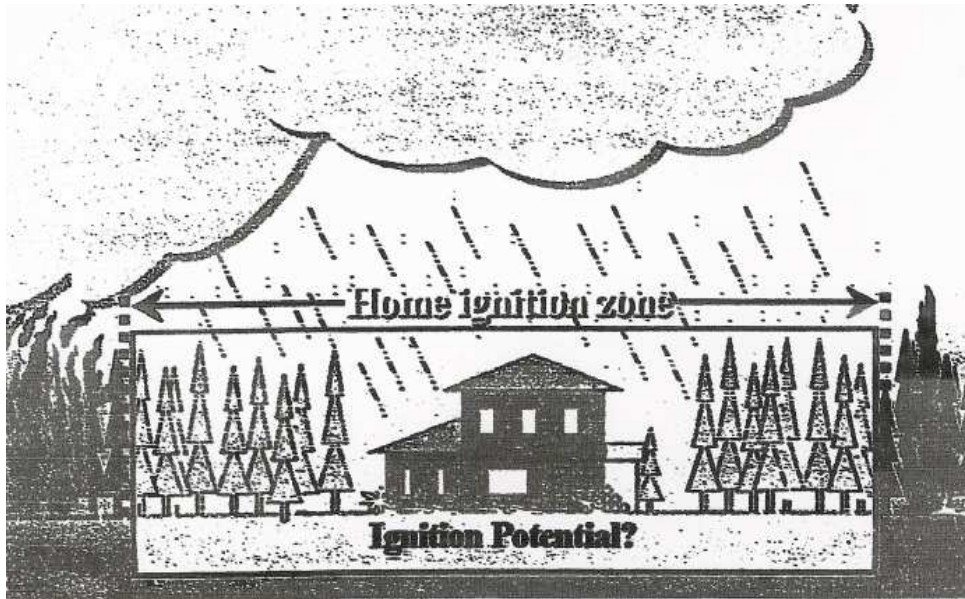
ITEM	#	NEEDED
Total Volunteers	15	15
Wildland Qualified	1	5
Brush Truck Type 6	1	1
Water Tender Type3 (500 gal.)	1	1
Water Tender Type 3 (800 gal.)	1	1
Engine Type 1	2	2
Equipment/Personnel Carrier Type X	1	1
Portable Pumps (High Pressure)	2	2
Portable Pumps (Volume)	7	7
Fire Tool Cache	1 – five person	Add five more sets of web gear & tools
Hand Held Radios	17	22

Federal land management agencies (BLM & USFS) have the following wildland fire suppression resources located in Gunnison:

<b>TYPE RESOURCE</b>	<b># ON HAND</b>
Permanent employees Break Down by Red Card Qualifications.	7
Seasonal employees	4
Type 6 (300 gal.) Wildland engine	2
20 person Initial Attack Cache	1
Mark IV portable pumps	4
Floto Pump	1
Small portable pumps	4
Fold-Tank (1,500 gal)	1
Blivets (80 gal)	2

- **Water Supply** Cochetopa and Tomichi Creeks are reliable sources of water year round and during dry spells. Other creeks in the area may have reduced flows during drought to the point that they are difficult to draft out of. There are numerous springs and ponds throughout the area. Reaching them to draught water can be problematic with large fire apparatus. GFPD has two Floto-pumps that facilitate filling tankers wherever sufficient water can be found.
- **County Wildfire Responsibilities:** Saguache County has not been fully engaged in wildland fire activities on the western side of the Continental Divide in the past. Gunnison FPD, BLM, USFS and CSFS personnel take initial action on all the fires in the area. If/when initial fire control action fails and suppression actions are extended beyond 24 hours, the County is responsible for actions on private lands. Apparently previous Saguache County Sheriffs have been reluctant to assume responsibility for operations after the first twenty four hour period on fires in the western part of the county. Core Team members discussed the issue and agreed to work to make sure the current Saguache County Sheriff and County Commissioners understand the roles and responsibilities of the various entities involved in wildland fire protection in the area.

### ***Land Owner Responsibilities:***



Recent research into the cause for loss of homes during wildfires indicates that home ignitability, rather than wildland fuels, is the principal cause of home losses during wildland/urban interface fires. Key items are flammable roofing materials (e.g. cedar shingles) and the presence of burnable vegetation (e.g. ornamental trees, shrubs, wood piles, and pine needle accumulation) immediately adjacent to homes (Cohen, 1999).

The home ignition zone includes a home and its immediate surroundings within 100 to 150 feet of the structure. Fuel conditions within this zone, to a large degree, will determine whether a home will survive a wildfire. High intensity fire behavior beyond the home ignition zone does not transfer enough energy directly from its flames to ignite a wooden structure. The fuels surrounding a home within the home ignition zone principally determine the potential for directly igniting the home. Firebrands lofted from extreme wildfires must directly ignite on a structure to be an effective ignition source. If firebrand ignitions occur in the fuels surrounding a home, then those fuels determine the home's ignition potential. Thus, regardless from how far firebrands travel a home's exterior materials and design principally and fuels in the home ignition zone determine its ignition potential from firebrands.

The primary and ultimate responsibility for home wildfire protection lies with private homeowners, not public land management agencies (or taxpayers). It is critical that special attention be given to removing fuels in the home ignition zone as well as preparing a defensible space around structures to improve their chances of surviving a wildfire. This includes insuring that there are no combustible

materials like concentrations of pine needles, dry grass, hay or straw, firewood, deck furniture, open windows, open vents, household trash, flammable materials such as gasoline, diesel or paint thinners, paper boxes, and fabrics near the structure or in the home ignition zone for fire brands to land on. In the past few years research has found that a significant number of homes destroyed in wildfires burned as the result of the presence of combustible materials within the home improvement zone. Some homes burned as long as 8 hours after the fire front passed.



## **COMMUNITY MITIGATION PLAN**

The Core Team developed the following mitigation plan based on their knowledge of the wildland fire issues in western Saguache County. The strategy basically addresses fuel treatments, both mechanical and prescribed fire, and survivable space needs.

Involvement of the private landowners and “ownership of the fire problem” is essential to the success of the plan. While the GFPD and CSFS have worked hard to promote survivable space and responsible land management, private landowners must also accept responsibility for completing work on their own lands. Incorporated in the private land treatments is the task of working with individual landowners to improve survivable space in the ignition zone around the buildings.

### **Commendations:**

Colorado State Forest Service has been leading an effort to develop a Community Wildfire Protection Plan for the Gold Basin area. They have worked with the Bureau of Land Management to coordinate fuel reduction projects on public lands with fuel reduction efforts on private lands. Over 1,315 acres have been mowed, thinned, piled and burned, and fecon bull hogged for a variety of resource management purposes in the vicinity of Gold Basin. Approximately 819 acres in the area were treated specifically to reduce wildland urban fire hazard issues. An additional 207 acres of treatment work has been contracted and will be completed in 2008. The Gold Basin WUI map shows the accomplished and planned mitigation work to date. The Gold Basin CWPP is included in Appendix L.

The Gunnison Ranger District is known for its outstanding prescribed burning program. It focuses on vegetative restoration and creating big horn sheep habitat. No other area in the state of Colorado uses prescribed burning to the degree found in the Gunnison Basin.

Substantial fuel treatment, including mowing, thinning, pruning and prescribed burning, has been done by the USFS in the past 10 years. The various WUI maps show the wildfire mitigation and forest restoration projects completed on over 7,500 acres by the US Forest Service over the last ten years.

### **Fuel Hazard Reduction**

One of the best ways to reduce structure loss in the wildland urban interface is to avoid placing structures in close proximity to flammable vegetation. However, it is unlikely that development in the WUI will decline as long as property owners have the right to live in forested areas and develop their land however they choose.

The other option is to reduce the intensity of wildfires that will burn through areas surrounding structures. Much of this responsibility falls on the homeowner, developer and future purchasers. When isolated private parcels are scattered across public lands the question becomes how culpable is the State, County and federal government for developments placed in naturally hazardous vegetation. In the past, private land owners have expected their public land neighbors to do most of the fire hazard reduction on lands immediately adjacent to private lands. This convenient transfer of responsibility to the public saved private land owners money and allowed them to have a more “*natural setting*” around their home. When the inevitable fire burns across the landscape it does not discriminate between public or private lands. Crown and spot fires have a way of neutralizing well intended, limited scale, fuel reduction projects. A well tended forest a half mile from a structure may reduce the intensity of a fast moving wildfire but it will not significantly improve survivability of structures in developments that have not completed their own fire hazard reduction work.

A long overdue movement is in the wind. WUI fires are very expensive and dangerous. Wildland fire agencies are starting to expect folks to tend to their structures survivability. Placing firefighters in the jaws of a fast moving, high intensity fire to save structures is not an acceptable practice today.

Reducing flammability around all structures is the key to reducing structure loss. One of the most cost effective tools land managers have to treat large expanses is prescribed burning. Prescribed fire is an appropriate tool to reduce fire hazard and at the same time promotes long term vegetative health. This plan calls for applying prescribed fire to all ponderosa pine and Douglas-fir stands on public lands, within the CFPD wildland urban interface areas. This approach will also be cost effective.

Tables 4-4B depict, in detail, the strategy for addressing fuel reduction needs within the WSC (Gunnison FPD). The geographic location of treatment units in Table 4 are displayed on Appendix A: Maps.

Appendix A: Maps: contains maps of fuel treatments for the various WSC WUIs. They depict locations of the suggested treatment areas listed in Tables 4 -4B. Priorities for reducing fuel hazards were based on the following criteria:

*Priority 1:* Protection of structures; survivable space around structures and areas adjacent to communities.

*Priority 2:* Thin or mow fuels along roads for evacuation and firefighter ingress and egress.

*Priority 3:* Prescribe burn all ponderosa pine and Douglas-fir areas within and adjacent to WUIs on public lands.

**Table 4: WSC Fuel Treatment along Evacuation Routes & Safety Zones**

<b>WUI AREA</b>	<b>MOWING SHRUBLAND MILES OR ACRES</b>	<b>MOW COST \$/ACRE</b>	<b>TOTAL COST \$</b>	<b>PRIORITY</b>
CR 31 Vulcan to State Hwy 149	11 miles =528 acres	80	42,240	2
Vulcan Safety Zones	2 at 20 acres each	80	1,600	1
CR 38 Gold Basin to Gunnison	10 miles = 480 acres	80	38,400	2
Gold Basin Safety Zones	3 at 20 acres each	80	4,800	1

**Table 4A: Gold Basin CWPP Fuel Breaks**

<b>FUELBREAK #</b>	<b>TOTAL ACRES</b>	<b>THIN ACRES</b>	<b>MOW ACRES</b>	<b>TOTAL COST \$</b>	<b>PRIORITY</b>
1	45	38	7	58,400	n/a
2	47	23.5	23.5	36,660	1
3	74	10	64	20,140	n/a
4	61	12	49	20,940	2

Note: Refer to the Gold Basin WUI map for locations.

**Table 4B: Vulcan Hazardous Fuel Treatments**

<b>SUBDIVISION</b>	<b>TREATMENT</b>	<b>PVT ACRES</b>	<b>BLM ACRES</b>	<b>TOTAL ACRES</b>	<b>TOTAL COST \$</b>
South Beaver	Mow	442	352	794	63,520
Stratman	Mow		78	78	6,240
Stratman	Thin		59	59	88,500

### **Wildfire Prevention and Fire Loss Mitigation**

Prevention strategies focus on education, burning restrictions and closure orders. The coordination of fire restrictions is detailed in County Annual Fire Operating Plans. There is a need to improve the process of initiating and coordinating fire restrictions. The best and most favored approach is to develop uniform actions based on the National Fire Danger Rating System adjective ratings. In depth discussions about thresholds for various restrictions can occur during the winter and be automatically triggered when fire hazard warrants without a flurry of last minute phone calls. Prearranged actions take a lot of the hassle out of the implementation of fire restrictions and facilitate communications among cooperators.

Survivable space is the key to structure survival. GFPD along with Saguache County and CSFS should initiate an on going program to encourage individual landowners to redeem their responsibility while living in wildfire prone areas. This includes advocating FireWise home construction.

### **Communications**

Hand held radios are an important communications tool during wildland fire control activities. Firefighters are often scattered across the fire area and not necessarily in close proximity to their

trucks. Communications between the lookout and personnel on the fireline is critical.

### **County Wildfire Standards for Subdivisions**

Saguache County needs to develop a set of requirements when properties in fire prone areas are proposed for development. Private land development in fire prone areas should not be permitted without wildfire hazard reduction as part of the improvement. Land development without attendant fire hazard reduction exacerbates the fire hazard problem and perpetuates the expenditure of public funds to protect structures in a wildfire situation.

Many of the basic wildfire hazard issues such as poor access i.e.; one way ingress and egress, steep/narrow road grades, cul-de-sac diameter, vegetative flammability, building construction, roofing materials and survivable space requirements are best addressed at the time a subdivision is being designed and approved.

Colorado counties have a wide variety of wildfire hazard mitigation standards for land development. They range from no mention of wildfire issues to complex standards that stipulate specific criteria for wildfire hazard mitigation, road and driveway design, emergency water supplies, survivable space, and fire resistant structure construction. Generally the more urban forested counties have the strictest fire codes.

The “*International Urban-Wildland Interface Code*” of 2003 establishes minimum regulations for land use and the built environment in designated urban-wildland interface areas using prescriptive and performance related provisions. It is founded on data collected from tests and fire related incidents, technical reports and mitigation strategies around the world. It is a good reference to work from as Saguache County develops its wildfire hazard mitigation standards.

Archuleta County provides a good example for Saguache County to emulate. The following information, extracted from Archuleta County’s Planning and Zoning guide and their Road and Bridge Standards, is suggested as a starting point for consideration:

#### *5.2.2.4 Wildfire Hazard Areas:*

*The County shall not approve any development if the proposed project is located in an identified wildfire hazard area, or is suspected by the County to be in a wildfire hazard area, unless the developer can submit adequate*



*evidence, prepared by a qualified professional forester, that the proposed project meets the following criteria:*

*5.2.2.4.1 Any project in which residential activity is to take place shall be designed to minimize significant hazards to public health and safety or to property.*

*5.2.2.4.2 All projects shall have adequate roads for emergency service by fire trucks, fire fighting personnel, and firebreaks or other means of mitigating conditions conducive to fire.*

*5.2.2.4.3 Precautions required to reduce or eliminate wildfire hazards shall be provided for at the time of initial development.*

*5.2.2.4.4 The project will adhere to the Guidelines and Criteria for Wildfire Hazard Areas promulgated by the Colorado State Forest Service.*

*5.2.2.4.5 Consideration shall be given to the recommendations of the Colorado State Forest Service, resulting from review of a proposed project in a wildfire hazard area.*

*5.3.9 Fire Protection System:*

*If the project is within an existing fire protection district, written confirmation is required that current fire code requirements have been met. If outside a fire protection district a fire protection plan shall be reviewed by the Saguache County Sheriff, Fire Chief of the appropriate Fire Protection District or other qualified individual. The County shall not approve any project without implementation of an adequate fire protection plan.*

Archuleta County Road and Bridge Standards that relate specifically to emergency vehicle access include maximum grades by road type and the following wording scattered throughout the document:

*Where cul-de-sac road are approved turnouts shall be provided. Bulb type turnarounds shall have a minimum road surface of 90 feet in diameter and minimum right-of-way of 110 feet in diameter. An alternative to the bulb type turnaround is the use of hammerhead turnaround.*

*The maximum length of roads ending in turnarounds shall be 600 feet in areas with a high wildfire hazard and 1,000 feet in all other areas. When a variance from this standard is requested at least one of the following shall be provided:*

- a. central water service,*
- b. an alternative water supply acceptable to the local fire authority,*
- c. monitored residential sprinklers in all residences on the cul-de-sac.*

*In addition, turnouts may be required when a variance is requested.*

*Driveway Widths: The dimensions of driveway widths and centerline curve radii shall be as shown in Table 27-12.*

*Single family residence driveways in excess of 400 feet in length shall provide an adequate turnaround for emergency equipment within 150 feet of the dwelling unit. Driveways serving multi family, industrial or commercial development shall provide a turnaround as specified in Figure 27-7 if the driveway has a dead end.*

The County can also take a significant step in reducing structure losses from wildfire by stipulating the following improvements in the building permit process:

- At least two ways into and out of the subdivision
- Adequate driveways with turn-arounds suitable for use by fire fighting equipment
- Street signs constructed of non-flammable materials
- Addresses that are posted at the intersection of the main road and the driveway
- Propane tanks that are at least 75 feet from structures
- Fire resistant siding and roofing materials
- Chimneys and stove pipes will have caps and spark arrestors

These few requirements will have substantial impacts on survivable space and first responder efficiency.

### **Strategic Recommendations:**

GFPD relies on volunteers to provide all the fire services for a large area. Adding additional work such as FireWise consultations and working with County Commissioners to improve planning, zoning, road and bridge standards will increase the workload for this dedicated but over-committed group.

We recommend funding a part time CWPP project coordinator. This staff would work throughout western Saguache County with the Office of Emergency Management to improve policies and regulations related to wildfire hazards in the Land Development Code and provide onsite FireWise consultations to WUI residents.



**Hand piling**



**Sage brush mowing**

**Table 5: Implementation Items, Priority & Cost**

<b>MITIGATION ACTION</b>	<b>PRIORITY</b>	<b>ESTIMATED COST (\$)</b>
Provide FireWise information to all property owners with structures on their land and new property owners and applicants for building permits	1	1,000/ yr
Work with County Commissioners on wildland fire standards for subdivision developments	2	8,000
Conduct one FireWise workshop for WUI residents.	3	800/yr
Provide interested parties with FireWise on site consultations. (@ \$150 each) estimate 50 consultations over next 5 years.	4	7,500
Mow safety zones in the vicinity of Gold Basin and Vulcan on a bi-annual basis or when grass growth makes it necessary.	5	6,400
Wildland firefighter training for GFPD personnel. Get 6 more firefighters qualified as FF2 plus increase qualifications of existing personnel	6	10,000
Develop two additional dry hydrant water sources in the Sargents area	7	16,000
Thin and mow along WUI evacuation routes	8	80,400
Improve natural vegetation resistance to wildfire using prescribed burning.	9	40,000
Complete Vulcan hazardous fuel treatments	10	158,260

<b>Mitigation Action</b>	<b>Priority</b>	<b>Estimated cost (\$)</b>
Acquire five new handheld radios	11	7,500
Develop Gold Basin fuelbreak complex	12	136,140
<b>Total</b>		471,000

**NOTE:** The first 4 priorities will best be accomplished via a part time CWPP coordinator.



## **IV. IMPLEMENTATION & MONITORING**

### **Implementation:**

Table 6: Action Plan for Completing the WSC CWPP; identifies the responsibilities and tasks necessary to accomplish the job at hand. The priorities and responsibilities have been negotiated and agreed to by Core Team and various named individuals.

The Core Team will

- Seek funds for the purpose of hiring and possibly cost-sharing a coordinator (implementation manager) who, among other things, would do the following:
- Provide the leadership needed to implement this plan.
- Establish a wildfire prevention attitude in the community.

The CWPP Coordinators roles will be to:

- Strengthen public understanding, acceptance and participation in CWPP operations and improvement projects.
- Ensure follow-up to commitments by the community or within the community and on behalf of the Center FPD goals.
- Facilitate Core Team operations. This group will act as an advisory board to represent the community as a whole. This entity would do the following:
- Set priorities, develop and administer fund raising activities, interact with and coordinate with County, coordinate with State and Federal agencies on behalf of the community as a whole, and ensure follow up on all operations and/or activities.

**Table 6: Action Plan for Completing the WSC (Gunnison FPD) CWPP**

<b>MITIGATION ACTION</b>	<b>TARGET DATE</b>	<b>ASSIGNED TO</b>	<b>COMPLETE D ✓</b>
Provide FireWise information to all property owners with structures on their land and new property owners and applicants for building permits	May 15, 2008 and ongoing	CWPP Coordinator	
Work with County Commissioners on wildland fire standards for subdivision development	9/15/2008	CWPP Coordinator	
Conduct one Fire Wise workshop for WUI residents	9/15/2008	CWPP Coordinator	
Provide interested parties with on site FireWise consultations. (@150 each) estimate 50 consults in next five years	Ongoing	CWPP Coordinator	
Mow Safety zones at Gold Basin & Vulcan	8/15/08	Saguache Office of Emergency Management	
Wildland firefighter training for Sargents personnel. Get 9 more firefighters qualified as FF2	6/15/2008	Jarrood Lee Sargents Fire Brigagde	
Develop two dry hydrants in the Sargents area	9/2008	Jarrood Lee	

<b>Mitigation Action</b>	<b>Target Date</b>	<b>Assigned to</b>	<b>Completed ✓</b>
Mow along WUI evacuation routes.	1,000 acres/year	BLM	
Add five more sets of web-gear and tools to Sargents wildland fire cache	8/2008	Jarrood Lee	
Acquire five new handheld radios for Sargents	10/2009	Jarrood Lee	
Improve natural vegetation resistance to wildfire using prescribed burning	400 acres/year	BLM & USFS	
Develop Fuels Mitigation Plan for Vulcan	2010	BLM	
Develop Gold Basin fuelbreak complex	2015	CSFS	

**Monitoring:**

Monitoring progress is a crucial part of seeing any plan through to completion. Given the values at risk it will be important to assess accomplishments on an annual basis. We expect more homes to become survivable. The Core Team should revisit the CWPP and associated accomplishments every two years and make adjustments to the plan as needed.

## **Appendices**

**Appendix A: Maps**

**Appendix B: Fuel Model Descriptions**

**Appendix C: Fuel Hazard Reduction Guidelines**

**Appendix D: Evacuation Planning Guidelines**

**Appendix E: FireWise – A Homeowners Guide to Wildfire Retrofit**

**Appendix F: Fuelbreak Guidelines for Forested Subdivisions & Communities**

**Appendix G: Road & Driveway Specifications for Emergency Access**

**Appendix H: Saguache County Triage**

**Appendix I: Subdivision Hazard Evaluation Form**

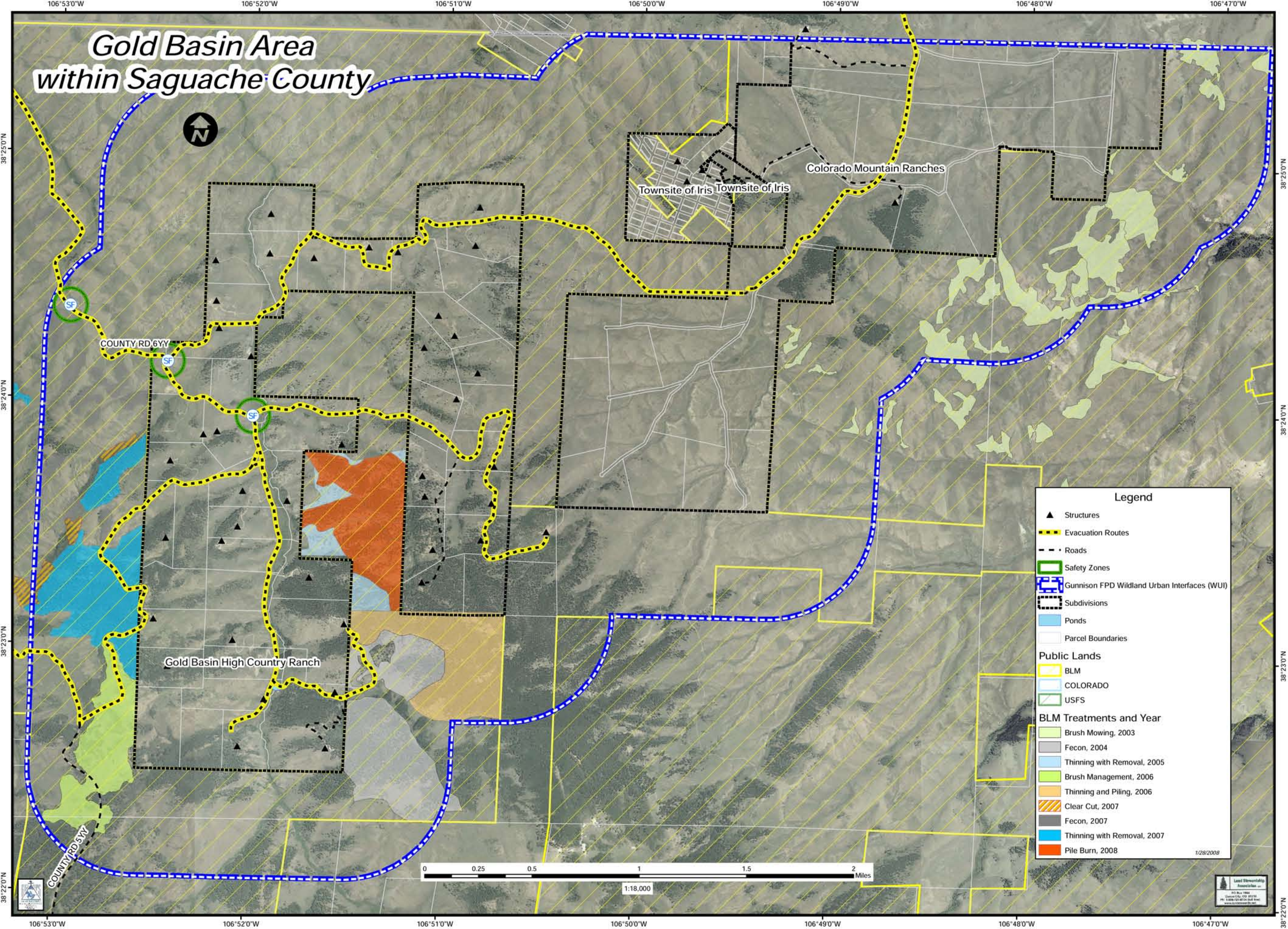
**Appendix J: Definition of Terms**

**Appendix K: References and Publications**

**Appendix L: Gold Basin CWPP by CSFS**



# Gold Basin Area within Saguache County



### Legend

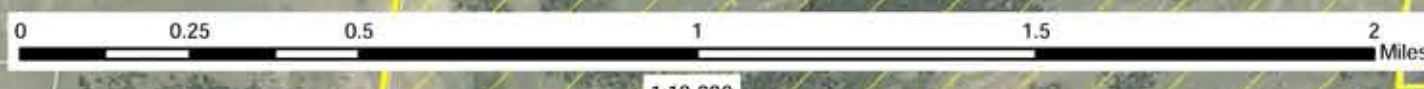
- ▲ Structures
- Evacuation Routes
- - - Roads
- Safety Zones
- Gunnison FPD Wildland Urban Interfaces (WUI)
- Subdivisions
- Ponds
- Parcel Boundaries

### Public Lands

- BLM
- COLORADO
- USFS

### BLM Treatments and Year

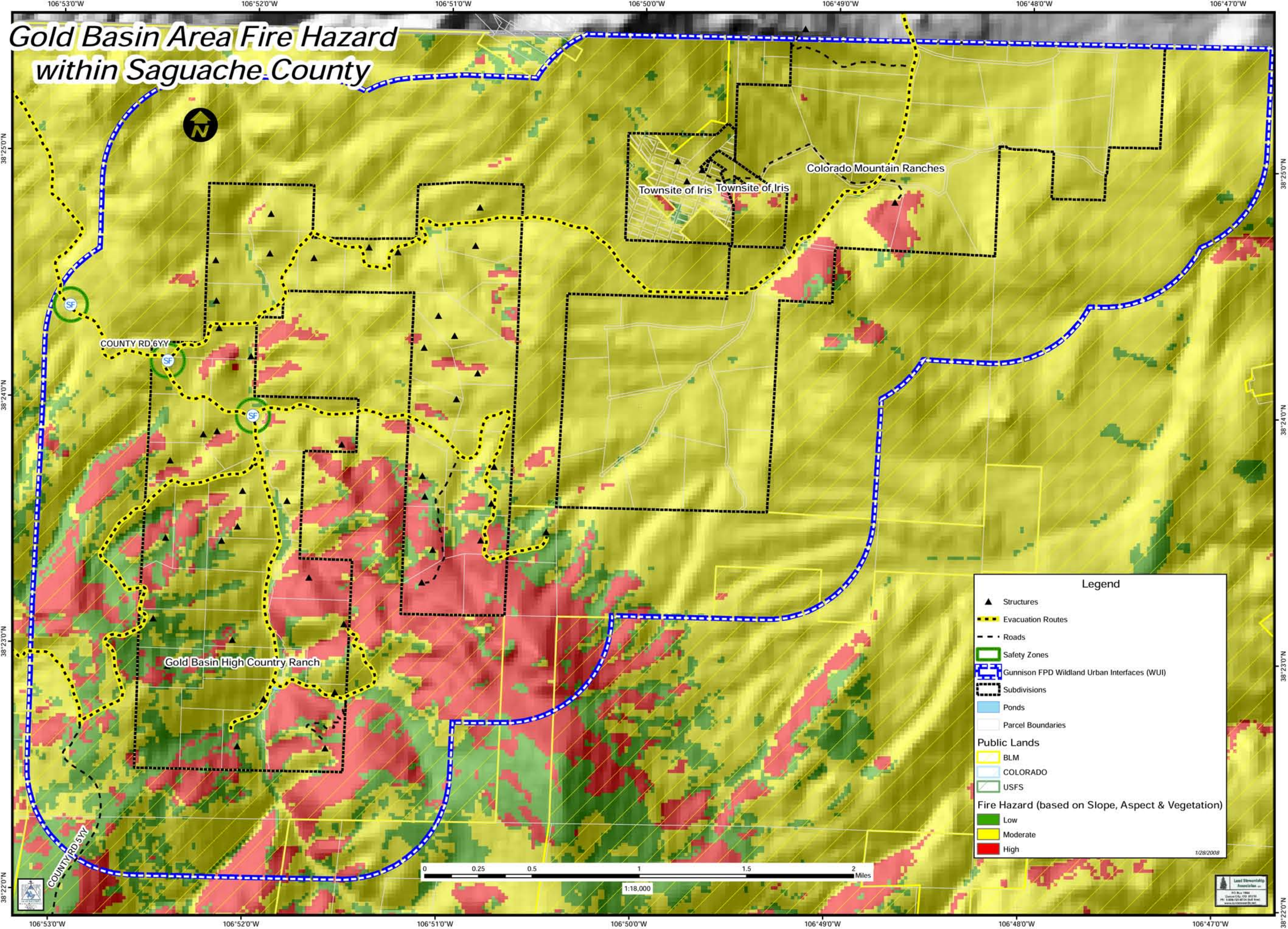
- Brush Mowing, 2003
- Fecon, 2004
- Thinning with Removal, 2005
- Brush Management, 2006
- Thinning and Piling, 2006
- Clear Cut, 2007
- Fecon, 2007
- Thinning with Removal, 2007
- Pile Burn, 2008



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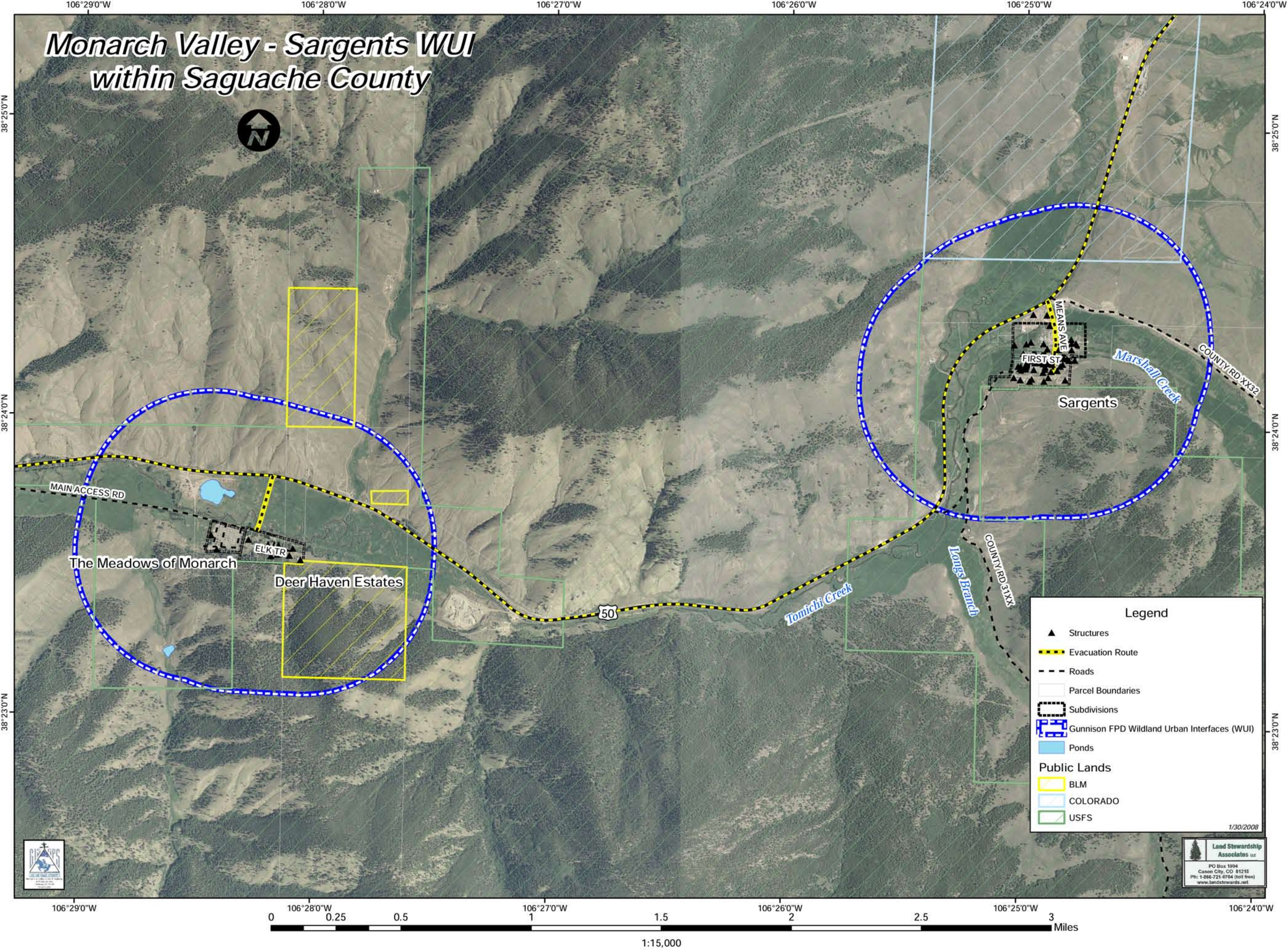








# Monarch Valley - Sargents WUI within Saguache County



## Legend

- ▲ Structures
- Evacuation Route
- Roads
- Parcel Boundaries
- Subdivisions
- Gunnison FPD Wildland Urban Interfaces (WUI)
- Ponds
- Public Lands**
  - BLM
  - COLORADO
  - USFS

1/30/2008

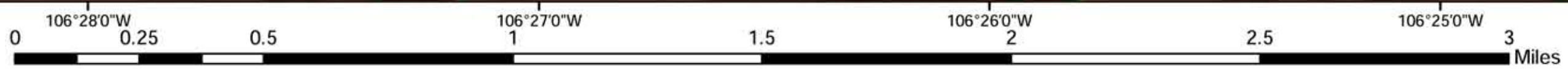
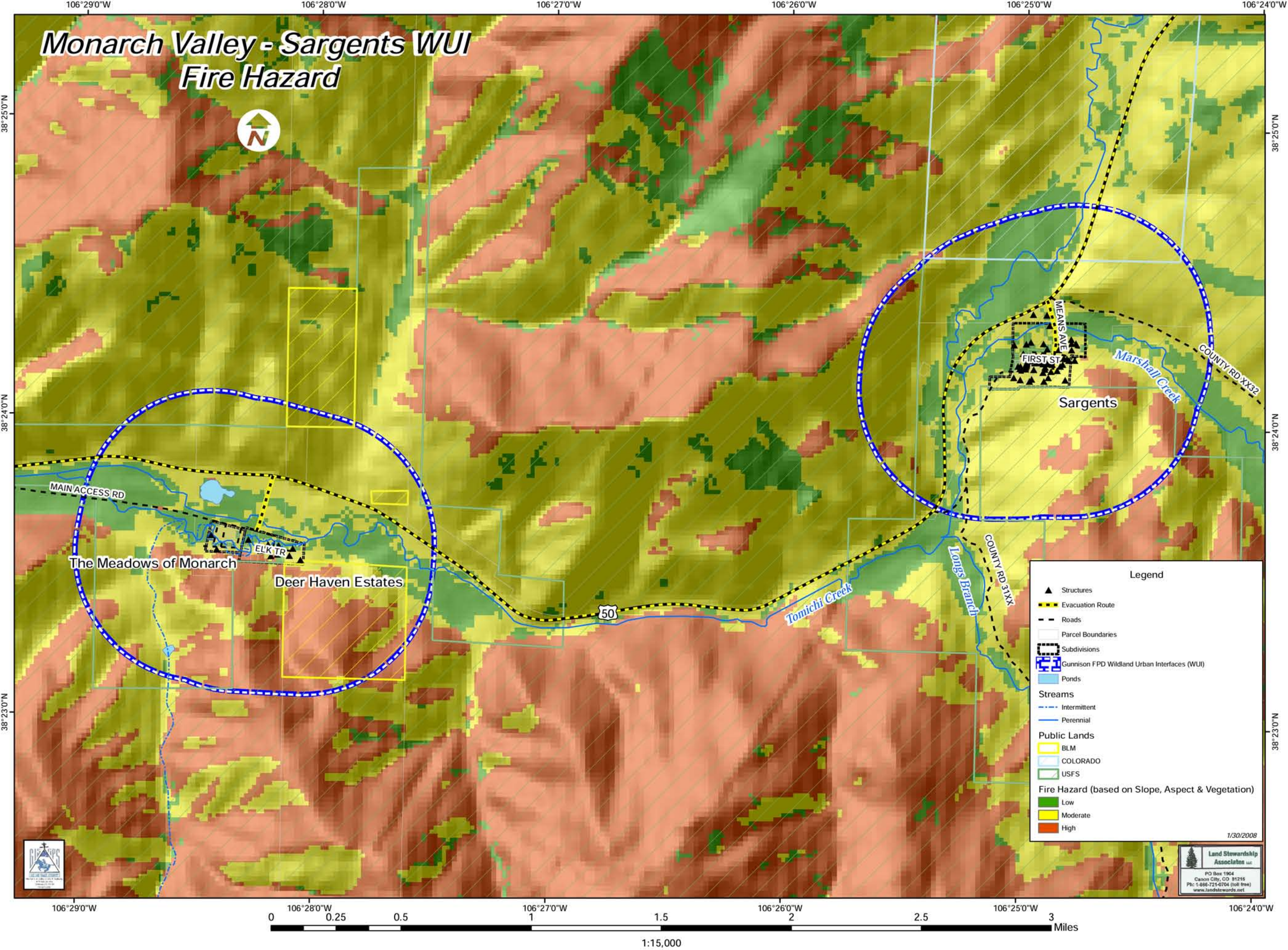


PO Box 1804  
Canon City, CO 81215  
Ph: 1-866-721-6704 (toll free)  
www.landstewards.net

1:15,000



# Monarch Valley - Sargents WUI Fire Hazard





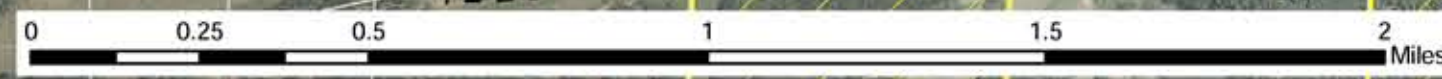
# Vulcan Area WUI within Saguache County



## Legend

- ▲ Structures
- - - Roads
- Evacuation Routes
- ▭ Parcel Boundaries
- ▭ Subdivisions
- ▭ Gunnison FPD Wildland Urban Interfaces (WUI)
- Recommended Treatments**
  - ▨ Mow
  - ▨ Thin
- BLM Treatments and Year**
  - ▨ Brush Management
  - ▨ Wildfire
  - ▨ Safety Zones
  - ▨ Ponds
- Public Lands**
  - ▨ BLM
  - ▨ COLORADO
  - ▨ USFS

1/28/2008





# Vulcan Area Fire Hazard within Saguache County



**Legend**

Structures

Roads

Evacuation Routes

Parcel Boundaries

Subdivisions

Gunnison FPD Wildland Urban Interfaces (WUI)

**Recommended Treatments**

Mow

Thin

**BLM Treatments and Year**

Brush Management

Wildfire

Safety Zones

Ponds

**Public Lands**

BLM

COLORADO

USFS

**Fire Hazard (based on Slope, Aspect & Vegetation)**

Low

Moderate

High

1/28/2008



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## **APPENDIX B – Fuel Model Descriptions**

The primary fuels within the Center Fire Protection District (FPD) are forested land, shrub areas and grasslands. The area is dominated by irrigated farmlands or high desert chico on the Valley floor and transitions to pinyon pine forest along the foothills. Ponderosa pine/Douglas-fir/aspen montane forests cover the mid-slope while Engelmann spruce and alpine meadows are found at the higher elevations. Ponderosa pine/Douglas-fir forests are generally dense enough to sustain a substantial crown fire resulting in a high fire risk.

### **Fuel Model 1**

Fire spread is governed by the fine, very porous, and continuous herbaceous fuels that have cured or are nearly cured. Fires are surface fires that move rapidly through the cured grass and associated material. Very little shrub and timber is present, generally less than one third of the area.

### **Fuel Model 2**

Fire spread is primarily through the fine herbaceous fuels, either curing or dead. These are surface fires where the herbaceous material, in addition to litter and open sagebrush contribute to the fire intensity. Open shrub lands that cover one-third to two thirds of the area may generally fit this model; such stands may include clumps of brush that generate higher intensities and that may produce firebrands.

### **Fuel Model 6**

Fire spread is primarily through dense shrubs with juniper and pinyon pine that ranges in height from 6 to 15 feet. There are occasional pockets of debris distributed throughout the unit. Fires require moderate winds, greater than 8 mph at mid flame height. Fire will drop to the ground at low wind speeds, if there is no ground slash, or at openings in the stand.

### **Fuel Model 8**

Slow-burning ground fires with low flame lengths are generally the case, although the fire may encounter an occasional “jackpot” or heavy fuel concentration that can flare up. Fire spread is primarily through short needled conifer stands of spruce and fir.

### **Fuel Model 9**

Fires run through the surface litter faster than model 8 and have longer flame height. Concentrations of dead-down woody material will contribute to possible torching out of trees, spotting and crowning. The pure stands of aspen represent this model. In the fall, after the associated grass and forbs have cured, this fuel will burn more intensely and is temporarily more of a threat.

**Fuel Model 10**

Fires burn in the surface and ground fuels with greater fire intensity than the other timber litter models. Dead-down fuels include greater quantities of 3-inch or larger limb wood resulting from over maturity or natural events that create a large load of dead material on the forest floor. Fuel model 10 represents the stands of Douglas-fir that have considerable dead/downed woody material on the forest floor.

## **APPENDIX C – Fuel Hazard Reduction Guidelines**

### ***MINIMUM TREE SPACING – RULE OF THUMB***

***Strive to reduce crown density to 40% or less.***

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

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

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

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

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

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

- ✓ Reduce numbers of trees recently killed by mountain pine beetle\* or other disturbances in other areas. Only 1 to 3 dead trees per acre are needed for wildlife habitat purposes

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

## **APPENDIX D – Evacuation Planning Guidelines**

### **Background**

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

In an emergency wildfire situation that threatens the lives and property of residents in the area, Western Saguache County (Gunnison Fire Protection District), in consultation with the county sheriffs, fire suppression teams and land managing agencies, may recommend that residents evacuate to a safe area. Prior evacuation planning is essential to implement this action effectively.

By definition, evacuation is a protective action—moving people from a place of danger to a place of relative safety. It is a temporary mass movement of people that collectively emerges in coping with threats to area residents and visitors.

An Evacuation Plan will facilitate the orderly evacuation during an emergency wildfire situation. Step by step actions provide critical information and guidance for fire suppression and law enforcement personnel during an emergency situation. Each subdivision, home site development area or land owner association should be strongly encouraged to develop an evacuation plan for their area that identifies potential evacuation routes and critical information (locked gates, inadequate bridges, etc) for a variety of wildfire threat scenarios.

### **Critical Contacts**

Saguache County Sheriff		719-655-2525
Saguache County Emergency Manager		719-588-4527
Colorado State Patrol		970-641-3500
Colorado State Forest Service		970-641-6852
Colorado Division of Wildlife		970-641-7060
Gunnison National Forest, Gunnison Ranger District		970-641-0471
Montrose Interagency Fire Management Unit		970-249-1010
Federal Emergency Management Agency		303-235-4900
Local News Media	KPKE 1490 AM	Radio 970-641-4000
	KVLE 102.3 FM	Radio 303-776-2323
Red Cross	Grand Junction	970-242-4851
Local Towing Services	Gunnison	970-641-2628



### **Check List When Potential for Evacuation Exists**

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

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

### **Emergency Evacuation Routes**

Primary emergency evacuation routes are suggested but should be validated with landowners and land management agencies involved prior to the onset of an emergency need for evacuation. These primary evacuation routes should provide multiple opportunities for evacuating traffic to exit the area. Hazardous fuel concentrations should be treated along primary evacuation routes by creating shaded fuelbreaks to reduce canopy cover to 40 percent or less and treat slash and combustible debris within 200 to 300 feet of either side of the road. Tributary roads should be identified in local developments and treated similarly to facilitate a safe and orderly evacuation.

WUI COMMUNITY	WAYS IN & OUT	ROAD IDENTIFIERS
Vulcan	1	CR 31 Vulcan to State Hwy 149
Gold Basin	1	CR 38 Gold Basin to Gunnison

### **Estimated Time to Implement an Evacuation**

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

### **Fire Behavior and Evacuation Timing**

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

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

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

When considering spotting, the rich diversity of fuel types scattered throughout the County, and the likelihood of wind, it may be prudent, when fire danger is Very High, to consider starting an evacuation process when fires are burning within 10 miles of down-wind subdivisions or home site development areas (urban interface area). Knowing the SC for the most prevalent fuel type between where the fire is and where the home site developments are can best refine this judgment call. With a SC of 44 a fire will cover 2 miles or more within 4 hours. If the SC is 22 the fire will cover at least one mile within 4 hours and 2 miles within 8 hours. If the SC is 11 the fire will cover two miles within 16 hours. If the SC is 5 the fire can cover two miles within 32 hours.

Remember the lessons of some Colorado fires:

- The Buffalo Creek Fire ran nearly eleven miles in 4.5 hours
- The Hayman Fire ran at least 16 miles in one afternoon

### **Timing**

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

Every situation will be different but it is reasonable to estimate the minimum time required to be no less than 4 hours to complete the process. As much as three hours may be required to notify residents and visitors and get them started moving and another hour to get everyone out of the area. Residents and visitors closest to the advancing threat should be notified first. Once they are driving out of the area it will take them up to an hour in most cases to exit the area if traffic is flowing at a rate of 10 to 20 miles per hour.

Driving time should be measured on each of the potential evacuation routes by driving at a conservative speed depending on road conditions and how many people are expected to be evacuated to approximate how long it would take to drive the route during an evacuation providing traffic was moving at about that rate. The following table displays the type of information that needs to be incorporated in the Evacuation Plan.

### Travel Time for Evacuation Routes

Beginning Point	Ending Point	Time Required	Miles Traveled	Average Speed

**GPS Locations for Critical Features and Facilities** – This table provides GPS coordinate locations for critical points referred to.

Feature	GPS Location

### Recommendations

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

# Is Your Home Protected



## From Wildfire Disaster?



A Homeowner's Guide  
to Wildfire Retrofit

# acknowledgments

The staff of the Institute for Business & Home Safety (IBHS) wishes to acknowledge the valuable input of all those involved in the preparation of this booklet. In particular, we extend our thanks to:

**The IBHS Wildfire Committee Members**  
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**National Institute of Standards & Technology**  
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Courtesy National Interagency Fire Center, Boise, Idaho  
Cover and page 1: Bitterroot National Forest, Montana  
Courtesy National Interagency Fire Center, Boise, Idaho  
Cover and page 2: Pine Barrens  
© J Smalley, NJ  
Opposite Table of Contents: Florida Wildfire  
© AP/Wide World Photos

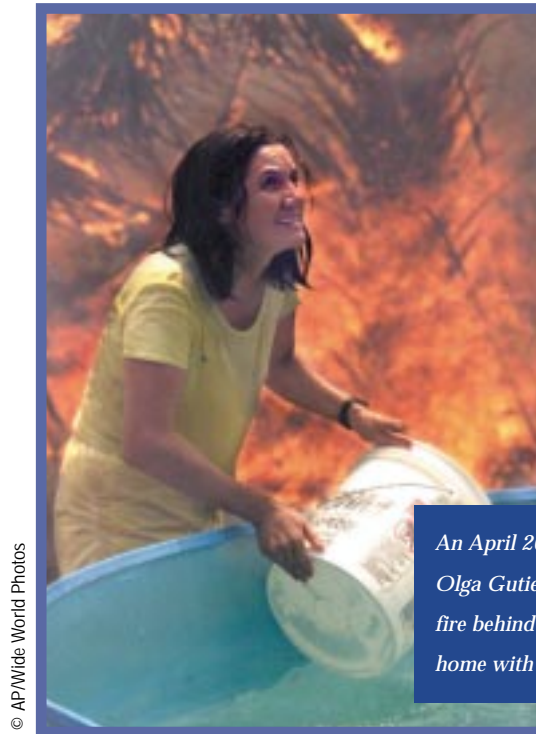
## **Disclaimer**

*The purpose of this document is to provide homeowners with guidance on ways to retrofit and build homes to reduce losses from wildfire damage. It contains suggestions and recommendations based on professional judgment, experience and research and is intended to serve only as a guide. The authors, contributors and publisher disclaim all warranties and guarantees with respect to the information in the document and assume no liability or responsibility with respect to the information.*

---

***"Nature...she pardons no mistakes."***

*Ralph Waldo Emerson*



© AP/Wide World Photos

*An April 2001 Florida wildfire caused Olga Gutierrez to desperately fight a fire behind her Port Charlotte, FL home with water from her pool.*

In 1993, a wildfire in a dry canyon north of Laguna Beach, California, raced toward hundreds of nearby homes, giving residents little advance warning of its awesome destruction. More than 14,000 acres and 440 homes went up in flames.

In the nearby Mystic Hills neighborhood, 286 homes were totally destroyed. Yet, there was one white house left standing in the midst of hundreds of piles of smoking ash that remained of its neighboring homes. This sole surviving house was built with fire prevention in mind. It stood as an example of how homes can, with a little extra attention, better withstand nature's perils. The practical methods used in and around that house can help reduce the chances of future wildfires from reducing communities to ashes. This guide is designed to make that one rare exception of survival a more common occurrence in the future.

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# Large Fire Locations

January 1 to October 3, 2000



*Courtesy National Interagency Fire Center  
Boise, Idaho*



# introduction

**N**early every state has been devastated by wildfires in the last century. More than 140,000 wildfires occur on average each year. Since 1990, more than 900 homes have been destroyed each year by wildfires.

So, what can you do to protect yourself, your home and property from wildfires? This guide will help you understand

- why your home is at risk, and
- how you can reduce the risk to your home and property.



*Bitterroot National Forest, Montana  
John McColgan  
FairBanks, AK • August 6, 2000*

# wildfires and your home

## The Wildland/Urban Interface Problem

**W**ildfires occur regularly. Whether started by humans or by lightning, they are part of a natural cycle that helps to maintain the health of our forests. Today, more than ever, people are moving into remote areas, with the desire to "get back to nature," without addressing the dangers that exist around them.

A tremendous wildfire danger exists where homes blend together with the wildland, creating the wildland/urban interface. The addition of homes there interrupts the natural cycle of wildfires. Ultimately,

this contributes to a dangerous build-up of old vegetation, leading to an uncontrollable wildfire.

## You and Your Local Fire Department

In a wildfire, your local fire department has two priorities – to remove you and your family from harm's way and to stop the progression of the wildfire. If your home happens to be in the wildfire's path, they may or may not be able to protect it – there are simply no guarantees.

Consequently, you must take action before a fire starts.

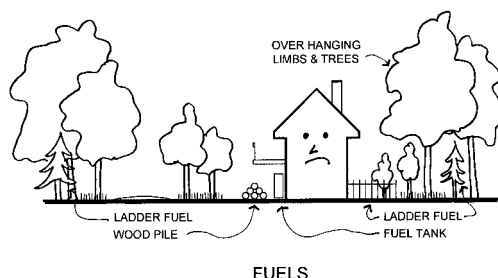


© J Smalley, NJ • Pine Barrens

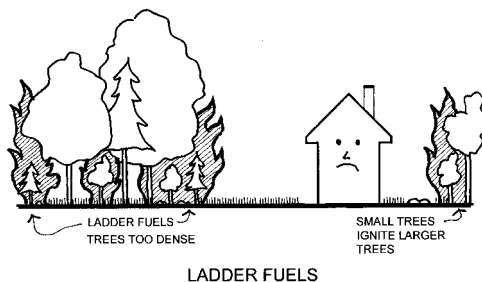
## Just the Right Conditions

Conditions must be just right for a wildfire to start and spread. Specifically, fuel, weather and topography work together to determine how quickly a wildfire travels and at what intensity.

**Fuels:** The two basic fuel types in the wildland/urban interface are vegetation and structures.



**Vegetation:** Fuel in its natural form consists of living and dead trees, bushes and grasses. Typically, grasses burn more quickly and with less intensity than trees. Any branches or shrubs between 18 inches and 6 feet are considered to be ladder fuels. Ladder fuels help convert a ground fire to a crown fire (tree tops) which moves much more quickly.



**Structural Density:** The closer the homes are together, the easier it is for the flames to spread from one structure to another.

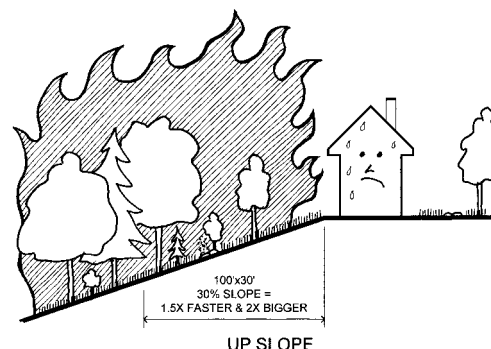


STRUCTURAL DENSITY

**Weather:** High temperatures, low humidity, and swift winds increase the probability of ignitions and difficulty of control. Short and long-term drought further exacerbates the problem.

**Slope:** Slope is the upward or downward incline or slant of terrain. For example, a completely flat plain represents a 0% slope and a hillside that rises 30 feet for every 100 feet horizontal distance represents a 30% slope.

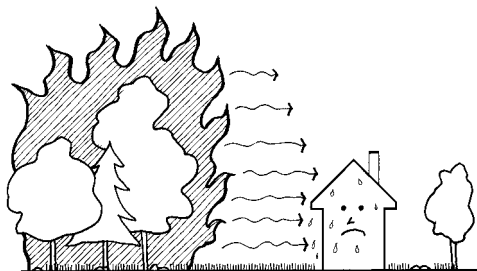
Hot gases rise in front of the fire along the slope face, pre-heating the up-slope vegetation, moving a grass fire up to four times faster with flames twice as long as a fire on level ground.



## How Your Home Catches Fire

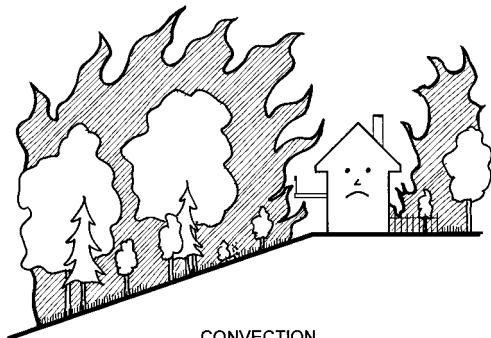
There are three ways that the wildfire can transfer itself from the natural vegetation or other burning homes to your home – through radiation, convection or firebrands.

**Radiation:** Wildfires can spread to your home by radiating heat in the same way a radiator heats your rooms in the wintertime. Radiated heat is capable of igniting combustible materials from distances of 100 feet or more.



RADIATION

**Convection:** Contact with the convection column (flames) may also cause the wildfire to ignite your house. Typically, the convec-



CONVECTION

tive heat column rises vertically, within the smoke plume.

**Firebrands:** Firebrands are burning materials that detach from a fire during strong convection drafts in the burning zone. Firebrands can be carried long distances – more than a mile – by the winds associated with the wildfire.



FIREBRANDS

In all cases, your home's building materials and design play a significant role in establishing the level of exposure that can be endured before ignition from radiation, convection, firebrands or any combination of these three.

## Taking Inventory – Is Your Property at Risk?

The first step in establishing your risk is to assess your property. The table on page 5 lists numerous factors and issues that you should consider.

This assessment will give you a good sense of your property's wildfire risk.

## Assessing Your Property

- |  |  |
|--|--|
| <input type="checkbox"/> Have wildfires occurred in your area? If so, under what conditions?       | <input type="checkbox"/> Is there a substantial amount of tall vegetation crowded in around your home? |
| <input type="checkbox"/> Do you have seasons when wildfires are more likely to occur?              | <input type="checkbox"/> Do tree limbs extend over your home?  |
| <input type="checkbox"/> Do you live in hilly or flat country?                                     | <input type="checkbox"/> Are the trees in good condition or are they dying?                            |
| <input type="checkbox"/> Are there areas around your home that are more susceptible to a wildfire? | <input type="checkbox"/> Do you have a woodpile in close proximity to your home?                       |
| <input type="checkbox"/> Do you border wildland?   | <input type="checkbox"/> Do you have any fuel tanks nearby?  |
| <input type="checkbox"/> Have you used native vegetation in your landscaping?                      | <input type="checkbox"/> Is a wood fence attached to your home?  |

### What's Your Risk Level?

The rough categories that follow on page 6 are not meant to give you an absolute score, but are to help guide you when deciding how to best protect your home.

### What You Can Do To Reduce Your Risk

Homes in a wildland/urban interface area can be designed and maintained to increase the chances of surviving a wildfire without the intervention of the fire department.

This guide will help you protect your home on two different fronts:

- Your Home's Landscape
- Your Home's Building Materials and Design

### Low Risk Areas:

- Little or no history of nearby wildfires
- Humid climate, short dry season
- Flat terrain (no grades greater than 9%)
- Limited wildland
- Home not crowded by trees
- Landscape includes native vegetation
- Manmade fuels at least 50 feet from your home.
- Fire hydrant within 300 feet
- Easy access for fire trucks

### Moderate Risk Areas:

- History of wildfires
- Climate includes a dry season less than 3 months
- Hilly terrain (grades average between 10% and 20%)
- Bordering a wildland with light brush, small trees or grass
- Trees are located in close proximity to your home
- Native vegetation has or has not been incorporated into your landscape
- Manmade fuels are within 50 feet of your home
- Fire hydrant within 500 feet
- Access for fire trucks

### High Risk Areas:

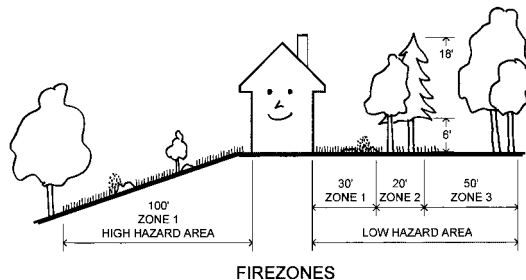
- History of nearby wildfires
- Dry climate with a dry season more than 3 months
- Steep terrain (grades average over 20%)
- Forested wildland within 100 feet of your home
- Native vegetation has not been incorporated into your landscape
- Trees are crowded within 30 feet of your home
- Manmade fuels within 30 feet of your home
- No fire hydrants
- Limited access for fire trucks

# your home's landscape

## Creating a Survivable Space For Your Home

A survivable space is an area of reduced fuels between your home and the untouched wildland. This provides enough distance between the home and a wildfire to ensure that the home can survive without extensive effort from either you or the fire department.

One of the easiest ways to establish a survivable space is to use the zone concept. Zone 1 is the closest to your home and Zones 2 and 3 move progressively further away.



**Zone 1:** Establish a well-irrigated area around your home. In a low hazard area, it should extend a minimum of 30 feet from your home on all sides. As your hazard risk increases, a clearance of between 50 and 100 feet or more may be necessary, especially on any downhill sides of the lot. Plantings should be limited to carefully spaced indigenous species.

**Zone 2** Place low-growing plants, shrubs and carefully spaced trees in this area. Maintain a reduced amount of vegetation. Your irrigation system

should also extend into this area.

Trees should be at least 10 feet apart, and all dead or dying limbs should be trimmed. For trees taller than 18 feet, prune lower branches within six feet of the ground. No tree limbs should come within 10 feet of your home.

**Zone 3:** This furthest zone from your home is a slightly modified natural area. Thin selected trees and remove highly flammable vegetation such as dead or dying trees and shrubs.

So how far should Zones 2 and 3 extend? Well, that depends upon your risk and your property's boundaries.

In a low hazard area, these two zones should extend another 20 feet or so beyond the 30 feet in Zone 1. This creates a modified landscape of over 50 feet total.

In a moderate hazard area, these two zones should extend at least another 50 feet beyond the 50 feet in Zone 1. This would create a modified landscape of over 100 feet total.

In a high hazard area, these two zones should extend at least another 100 feet beyond the 100 feet in Zone 1. This would create a modified landscape of over 200 feet total.

## The Importance of Maintenance

Once you have created your home's survivable space, you must maintain it or risk losing the benefit of its protection.



# your home's building materials and design

**C**reating and maintaining a survivable space is a necessary first step. The next step is to use fire resistant building materials and construction techniques in retrofitting your home.

## The Ideal Fire-Resistant Home

Keep in mind that a wildfire sees your home as just another fuel

source. The survivable space you construct around your home will keep all but the most ferocious wildfires at bay. However, if the wildfire does break through your first line of defense, an ignition might occur on your home's exterior. The ideal situation is for your home's exterior materials to prevent or retard the flames from burning into your interior walls, soffits, attic area, and rooms.

### Taking Inventory

Examine your home's construction and materials. Use the following as a checklist.

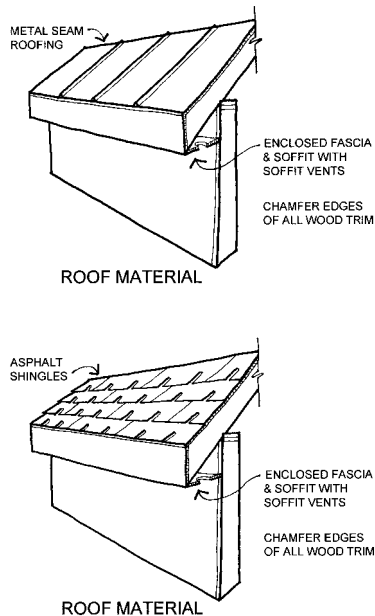
- ☐ What type of roof covering do you have? Asphalt, wood, concrete, tile or metal?
- ☐ How are your eaves, fascias and soffits constructed? Are they made from vinyl, wood or metal?
- ☐ What are your home's exterior walls covered with? Are they wood, aluminum or vinyl siding, stucco, brick or concrete masonry?
- ☐ Do you have large windows or sliding glass doors that border or face the wildland? Are they single pane, double pane or tempered glass?
- ☐ How are your home's attic and sub-floor vents protected? Are their covers metal or vinyl?
- ☐ Are spark arresters installed on all your home's chimneys?
- ☐ Does your home have a deck or balcony that overhangs a slope?
- ☐ Is there a porch, garage or wood fence that attaches directly to your home?



## Taking Action

Now you will need to decide on the best modifications for your home, given your risk.

**Roof:** The roof is the most vulnerable part of your home to wildfires. During a wildfire, firebrands can fall on your roof, landing in your roof's nooks and crannies where a fire can easily start. Once your roof covering does ignite, chances are very good that the rest of your home will follow.



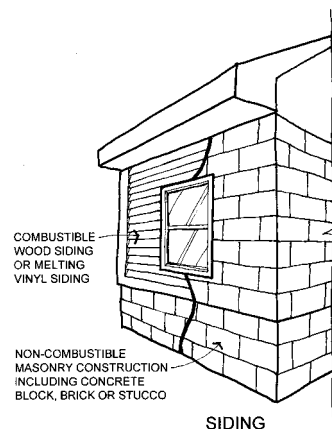
The best way to avoid this situation is to make sure your roof is fire-resistant. The two main fire resistance tests used today include: ASTM E108 and UL 790. There are three levels of classification awarded under the test protocol, A, B, and C, with A being the most

fire resistant. Some treated wood shake shingle products have ratings of Class C or better. Over time, the effectiveness of this chemical is reduced by weathering before the end of the product's useful life and may leave your roof unprotected.

If your roof needs to be re-covered, consider installing a Class A roof covering.

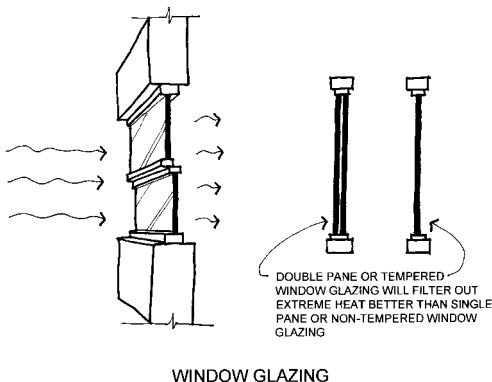
**Exterior Walls:** Exterior walls are susceptible to a wildfire's radiant and convective heat. Although a fire on an exterior wall may not penetrate inside your home, the fire can 'bridge' to more vulnerable areas such as eaves, soffits, vents and windows.

Wall materials that resist heat and flames include cement, plaster, stucco and concrete masonry such as stone, brick or block. Though some materials will not burn, such as vinyl, they may lose their integrity when exposed to high temperature and fall away or melt, providing the fire with a direct path inside the home.



**Exterior Windows, Glass Doors and Skylights:** Exposure to the heat of the wildfire can cause glass to fracture and collapse, leaving an opening for flames and firebrands to enter your home. This applies to both double pane and single pane glass, since double pane glass is only slightly more resistant to heat than single pane glass.

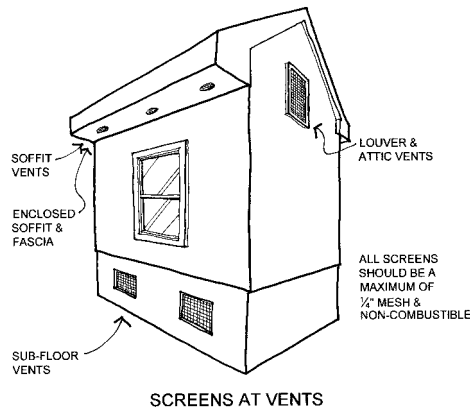
On the other hand, single or double pane tempered glass windows, doors and skylights typically fracture at higher exposures, well above the radiant heat exposures capable of igniting the surrounding wood.



**Eaves, Fascias, Soffits:** Eaves, fascias and soffits are vulnerable to both firebrands and convective exposures.

Eaves, fascias and soffits should be 'boxed' or enclosed with noncombustible materials to reduce the size of the vents. Materials that melt or

burn in relatively low temperatures, such as PVC and vinyl siding, should not be used, since they do not provide adequate protection and can melt in the heat of the wildfire. Non-combustible screening should be used in the vents.

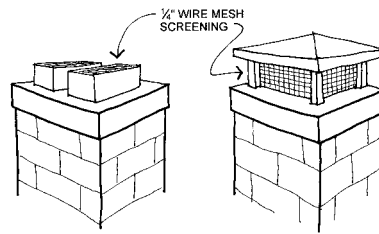


**Attic, Subfloor or Foundation Vents:** Wind and/or direct contact with a fire's convective heat can push firebrands through the vents into your home's basement or crawl space.

Your vent openings should be screened to prevent firebrands or other objects larger than 1/4 inch from entering your home. Both your vents and screens should be constructed of materials that will not burn or melt when exposed to radiate or convective heat or firebrands. Also, these vents should be corrosion-resistant to help minimize required maintenance.

**Fireplace Chimneys:** Windblown embers can access your home through your fireplace's chimney flue. Once inside, these firebrands then collect on flammable objects, greatly increasing the chance of combustion. The situation can also be reversed: embers from your own fire can fly out the chimney and start a wildfire, right in your own neighborhood.

The best way to avoid this situation is to install a spark arrestor made from welded wire or woven wire mesh with openings less than 1/4" wide.

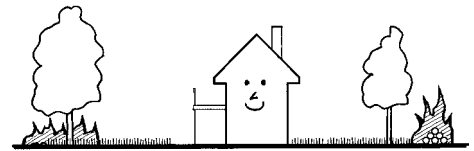


CHIMNEY SCREENS

**Overhangs and Other Attachments:** Overhangs and other attachments include any additional structures attached to a residence such as room pushouts, bay windows, decks, porches, carports and fences. These features are often very vulnerable to convective exposures.

When assessing your home and property, if the feature in question is attached to your home, it should be considered part of your home.

There are a number of ways you can reduce the vulnerability of your home's overhangs and attachments. First and foremost, remove all fuels around these areas. Next, box in the undersides of the overhangs, decks and balconies with noncombustible or fire-resistant materials to reduce the possibility of ignition. For fences, make sure that they don't attach directly to your home.



WOOD PILES, DECKS, FENCES, ETC.

# helping your local fire department

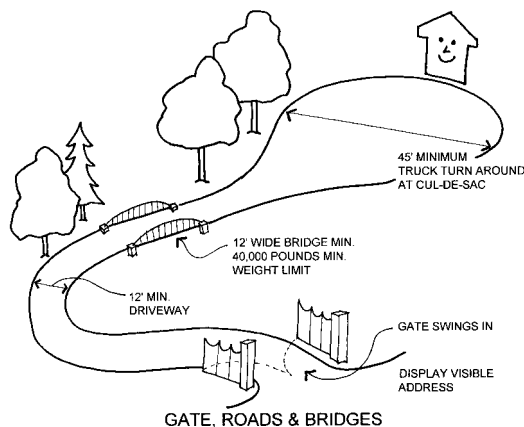
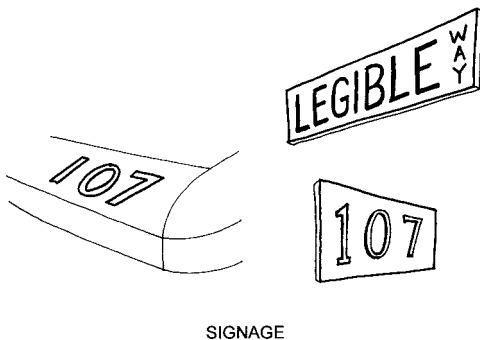
**E**ven if you modify your home's landscape to incorporate the most fire-resistant materials and design into your home's construction, there is no guarantee that a wildfire will not threaten your home. It is important that your local fire department be able to find and defend your home.

Here are some suggestions on how to modify your property to accommodate your local fire department.

**Street Signs and Numbers:** If made from combustible materials, your street signs and numbers can ignite or melt, leaving the fire department with no ability to locate your home. It is critical that signs and numbers be noncombustible and visible from the road.

**Driveways:** Fire trucks and equipment are quite large and often have difficulty in tight spots. Consequently, your home's driveway must be large enough to accommodate the typical sized trucks. Fire experts recommend a driveway at least 12 feet wide and 13 feet of vertical clearance.

**Gates:** If your home is gated, it is very important that the gate opens inward and be wide enough to accommodate the fire fighting equipment. Experts also recommend that the gate be at least 30 feet off of the main road, so that the equipment can pull off the road to open the gate. If the gate is locked, the lock should not be so strong that firefighters cannot break it in an emergency.



# wildfire safety project list

This list of home improvements is divided into cost categories. You can tackle these projects one at a time, but remember, the more you do, the better protected your home will be against wildfires.

## Category \$ (<\$300)

- Creating a survivable space;
- Maintaining your survivable space;
- Installing fire-resistant signs and address numbers;
- Modifying your attic, sub-floor, and basement vents;
- Installing a spark arrestor on your chimney.

## Category \$\$ (\$300 – \$1000)

- Boxing in overhangs and modifying other attachments;
- Boxing in your eaves, facias, and soffits.

## Category \$\$\$ (>\$1000)







- Re-covering your exterior walls with a more fire-resistant material;
- Replacing single-pane glass windows, doors, or skylights with tempered glass;
- Modifying your driveway, bridges, and gates to accommodate fire trucks.
- Re-roofing your home with a Class A roof covering.

# WILDFIRE PROTECTION CHECKLIST







## Before, During and After: Be Completely Prepared

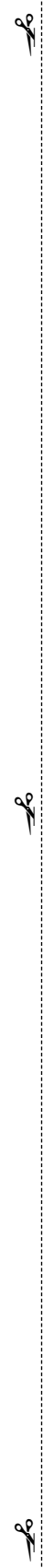
You will give yourself and your family a better chance of escaping harm during a wildfire by taking as many of the precautions outlined in this brochure as possible. But, these steps are only the beginning. To protect yourself as completely as possible, here are some added suggestions:

## before a wildfire strikes:

	Know where your gas, electric and water main shut-off controls are and how to turn them off if there is a leak or electrical short. Also, know how to use a fire extinguisher. Make sure all adult and teenage members of your family know how to shut off each utility and to use the extinguisher.
	Become familiar with your community's disaster-preparedness plans and create a family plan. Know where the closest police, fire and emergency medical facilities are located.
	Plan several different escape routes from your home and neighborhood and designate an emergency meeting place for the family to reunite. Establish a contact point to communicate with concerned relatives.
	Put together an emergency kit that includes at least a three-day supply of drinking water and food that needs no refrigeration and, generally, no cooking; emergency cooking equipment, if required; a portable NOAA weather radio; first aid supplies and medications; basic tools, such as a wrench, a flashlight and gloves; portable lanterns and batteries; credit cards and cash; and important documents, including insurance policies.
	Talk to your neighbors about wildfire safety. Plan how the neighborhood could work together before, during and after a wildfire. Make a list of your neighbors' skills such as medical or technical. Consider how you would help neighbors who have special needs such as elderly or disabled persons. Make plans to take care of children who may be on their own if parents can't get home.
	Periodically review your homeowner's insurance policy with your insurance agent or company to make sure that, if you are the victim of a disaster, you have enough coverage to rebuild your home and life.

## during a wildfire:

	If you are warned that a wildfire is threatening your area, listen to your portable radio for reports and evacuation information. Follow the instructions of local officials.
	Back your car into the garage or park it in an open space facing the direction of escape. Shut car doors and roll up windows. Leave the key in the ignition or in another easily accessible location.
	Close garage windows and doors, but leave them unlocked. Disconnect automatic garage door openers.
	Confine pets to one room. Make plans to care for your pets in case you must evacuate.
	Arrange temporary housing outside the threatened area.
	When advised to evacuate, do so immediately.
	Wear protective clothing – sturdy shoes, cotton or woolen clothing, long pants, a long-sleeved shirt, gloves and a handkerchief to protect your face.
	Take your emergency kit.
	Lock your home.
	Notify your relatives and the local officials that you have left and where you can be reached.
	Follow the evacuation route that your local officials have identified. If no official route exists, choose a route away from fire hazards. Watch for changes in the speed and direction of the fire and smoke.







If you are SURE you have the time, take additional steps to protect your home:

	Close windows, vents, doors, venetian blinds and heavy drapes. Remove lightweight curtains.
	Shut off gas at the meter. Turn off pilot lights.
	Move flammable furniture into the center of the home away from windows and sliding-glass doors.
	Turn on a light in each room to increase the visibility of your home in heavy smoke.
	Seal attic and ground vents.
	Turn off propane tanks.
	Place combustible patio furniture inside.
	Connect the garden hose to outside taps.
	Place lawn sprinklers on the roof and near aboveground fuel tanks. Wet the roof.
	Wet or remove shrubs within 15 feet of the home.
	Gather fire tools, including a rake, axe, hand/chainsaw, bucket and shovel.



## after a wildfire strikes:

	Listen to and follow the advice and recommendations of the local aid organizations, including the emergency management office, the fire department and the utility companies.
	Check for hazards, such as gas or water leaks and electrical shorts. Turn off damaged utilities. Have the fire department or gas and electric companies turn the utilities back on when the area is secured.
	Check for injuries and administer first aid as needed.
	Check your food and water supplies. Do not eat anything from open containers near shattered glass.

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Insurance Services Office, Inc. The Wildland/Urban Fire Hazard. New York, NY: ISO, 1997

International Fire Code Institute Urban-Wildland Interface Code. Whittier, CA: IFCI, 2000

National Fire Protection Association  
Firewise Landscaping Videotapes (3) and Checklist. Firewise Construction Videotapes and Checklist. Quincy, MA: NFPA, 1994

- Protecting Your Home from Wildfire. Quincy, MA: NFPA, 1987

- Standard for Protection of Life and Property from Wildfire NFPA 299. 1997 Edition. Quincy, MA: NFPA, 1997.

NFPA Journal  
Wildland/Urban Interface Fires. Quincy, MA: NFPA, March/April.

National Wildland/Urban Interface Fire Protection Program.  
Wildland/Urban Interface Fire Hazard Assessment Methodology. Washington, DC: 1997

Underwriters Laboratories  
Tests for Fire Resistance of Roof Covering Materials. UL 790. Northbrook, IL: 1997

Alberta Environment Land and Forest Service  
FireSmart: Protecting Your Community from Wildfire. Partners in Protection. Edmonton, Alberta: May 1999.

# appendix I: additional sources of information

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California Department of Forestry and Fire Protection (CDF)

<http://www.fire.ca.gov/>

Colorado State University/Colorado Forestry Service

<http://lamar.colostate.edu/~firewise/>

Firewise

<http://www.firewise.org/>

National Interagency Fire Center (NIFC)

<http://www.nifc.gov/>

U.S. Forest Service

<http://www.fs.fed.us/fire/>

Wildfire News

<http://www.wildfirenews.com/>



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# Fuelbreak Guidelines for Forested Subdivisions & Communities

By

Frank C. Dennis



*Knowledge to Go Places*

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



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



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

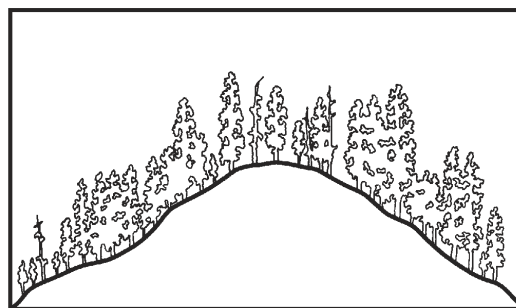
But with development inevitably comes a higher risk of wildfire as well as an ever-increasing potential for loss of life and property. Methods of fire suppression, pre-suppression needs, and homeowner and fire crew safety must all be considered in the planning and review of new developments as well as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

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

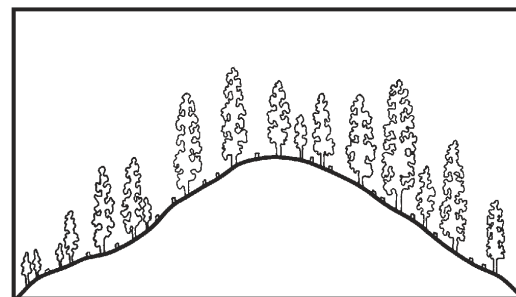
## Fuelbreak vs Firebreak

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

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



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



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

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

## Fuelbreak Limitations

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

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





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

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

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

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



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

## The Need For A Fuelbreak

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

### Potential Problem Indicator

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

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

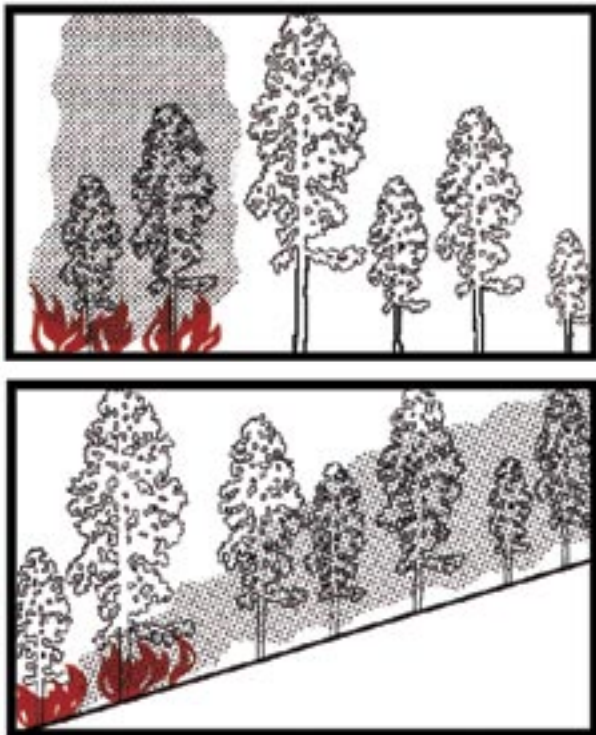
Legend: 5 – Problem may be crucial; 4 – Problem very likely; 3 – Exercise caution; 2 – Problem usually limited; 1 – No rating possible

## Wildfire Hazard Maps

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

### Slope

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



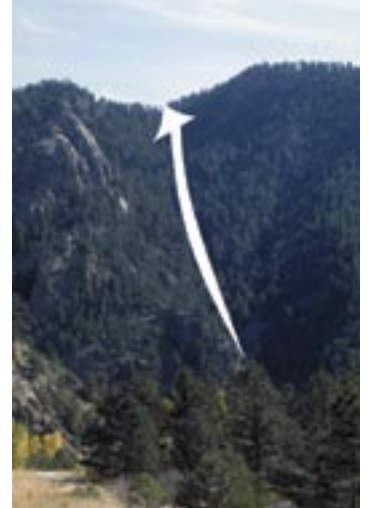
*Fire effects, flat vs steep terrain. Note preheating of fuels on steep ground from passage of smoke column.*

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

### Topography

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

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



*Chimney.*



*Saddle.*

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



*Flashover in V-shaped valley.*



## Crowning Potential

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

### Crowning Potential Key

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

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

### Ignition Sources

Possible ignition sources, which may threaten planned or existing developments, must be investigated thoroughly. Included are other developments and homes, major roads, recreation sites, railroads, and other possible sources. These might be distant from the proposed development,

yet still able to channel fire into the area due to slope, continuous fuels, or other topographic features.

### Fuelbreak Locations

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

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

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

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

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

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

## Aesthetics

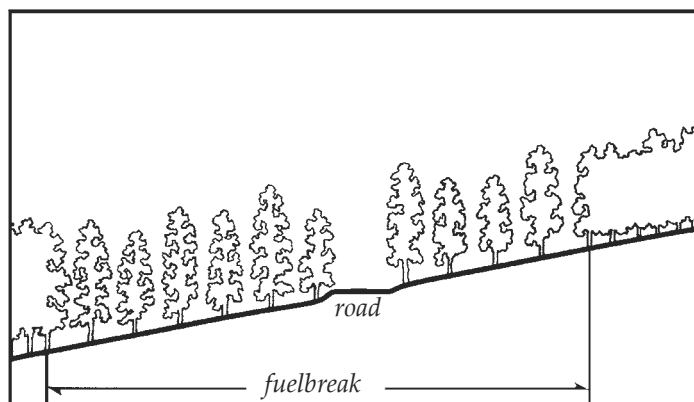
Improperly planned fuelbreaks can adversely impact an area's aesthetic qualities. Careful construction is necessary when combining mid-slope fuelbreaks with roads involving excessive cut-and-fill.



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

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

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



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

## Constructing the Fuelbreak

### Fuelbreak Width and Slope Adjustments

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

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

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

### Fuelbreak Width/Slope

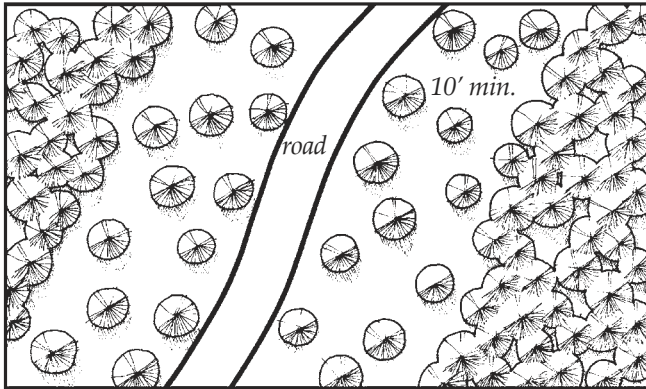
Percent Slope (%)	Minimum Uphill Distance (ft)	Minimum Downhill Distance (ft)	Total Width of Modified fuels (ft)*
0	150	150	300
10	140	165	303
20	130	180	310
30	120	195	315
40	110	210	320
50	100	225	325
60	100	240	340

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



## Stand Densities

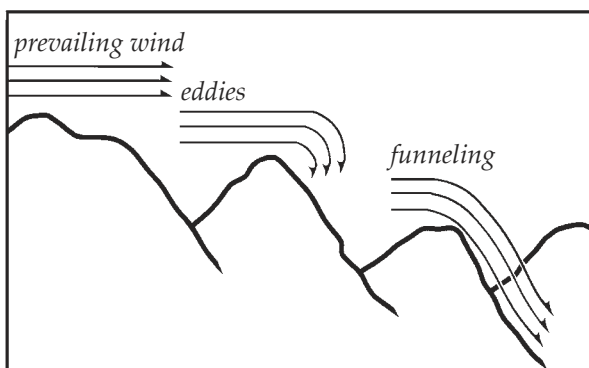
Crown separation is a more critical factor for fuelbreaks than a fixed tree density level. A *minimum* 10-foot spacing between the edges of tree crowns is recommended on level ground. As slope increases, crown spacing should also increase. However, small, isolated groups of trees may be retained for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



Plan view of fuelbreak showing minimum distance between tree crowns.

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

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



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

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

## Debris Removal

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

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



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



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



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

## Fuelbreak Maintenance

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



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

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

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

## Conclusion

An image of well-designed communities for Colorado includes:

- Forested subdivisions where the total forest cover is well-managed through carefully planned, designed, and maintained thinnings. This contributes to reduced wildfire hazards and a much healthier forest — one that is more resistant to insects and disease.
- A system of roads and driveways with their associated fuelbreaks that break up the continuity of the forest cover and fuels. These help keep fires small, while also providing safer locations from which to mount fire suppression activities. In addition to allowing fire personnel in, they will allow residents to evacuate if necessary.
- Individual homes that all have defensible space around them, making them much easier to defend and protect from wildfire, while also protecting the surrounding forest from structure fires.

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

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



## **APPENDIX G – Road and Driveway Specifications for Emergency Access**

### **Roads serving one dwelling unit shall meet the following:**

- A. Roadway shall be a total of 14' in width, including a 10' all-weather travel surface and 2' shoulders (each side). Curves and turn a rounds should have a minimum of a 30' radius at centerline.
- B. Road grade should generally not be over 7 percent. A maximum grade 10 percent to 12 percent grade would be acceptable for short distances not over 150 feet.
- C. If the driveway is less than 50' the above (A and B) do not apply.
- D. If the length of the road exceeds 150', a turnaround shall meet (template 1 or 2) standards.

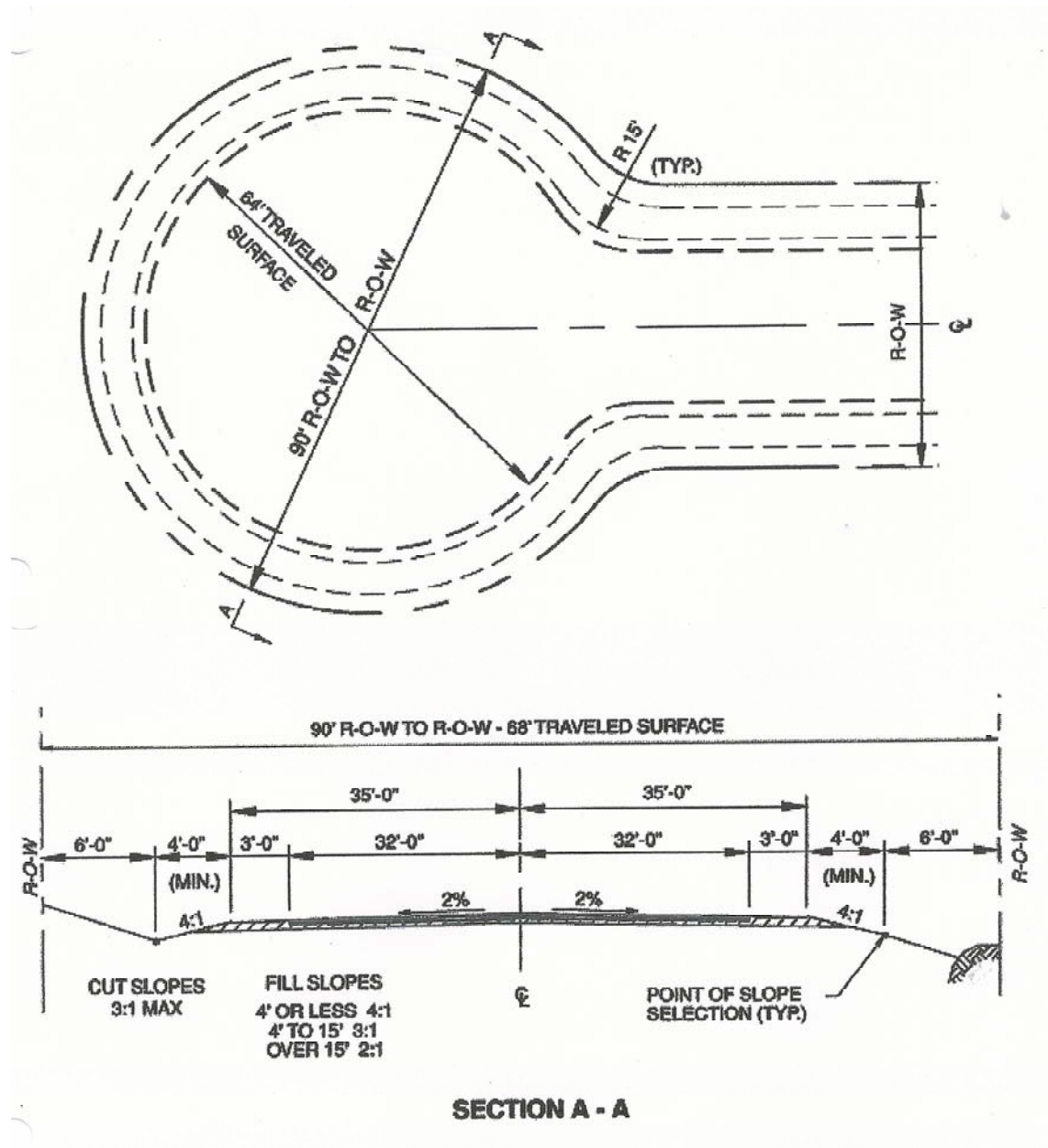
### **Roads serving more than one dwelling shall meet the following:**

- A. Roadway shall be a total of 20' in width, including a 16' all weather travel surface and 2' shoulders (template 3) to 16 units, or a total width of 14', including a 10' travel surface, with 2' shoulders on either side and pullouts at 150' intervals in accordance with (template 4).
- B. A total roadway width of 24', including an 18' paved surface and 3' shoulders in accordance with (template 3) for roads serving 16 or more dwellings, or one or more non-residential units.
- C. Grades shall be the same as for one dwelling roads/driveway identified above.
- D. If the length of the driveway is less than 50' then A and B above does not apply.
- E. If the length exceeds 150', a turnaround shall be provided in accordance with (template 1 or 2).

### **Driveway approaches and private road intersections with public roads shall meet the following:**

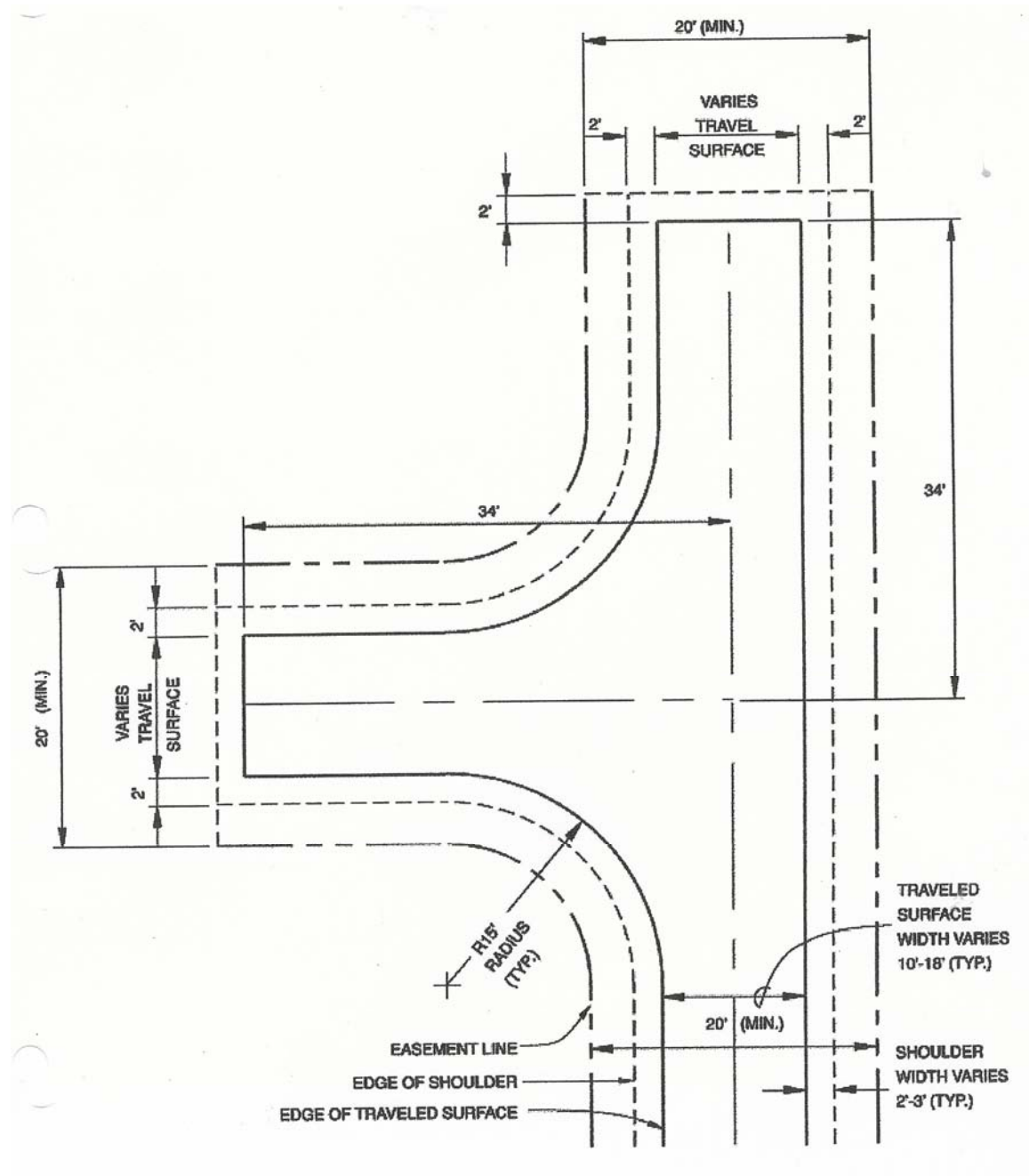
- A. Driveway approaches and private road intersections with public roads must comply with (template 5).

# TEMPLATE 1 – Cul-de-sac

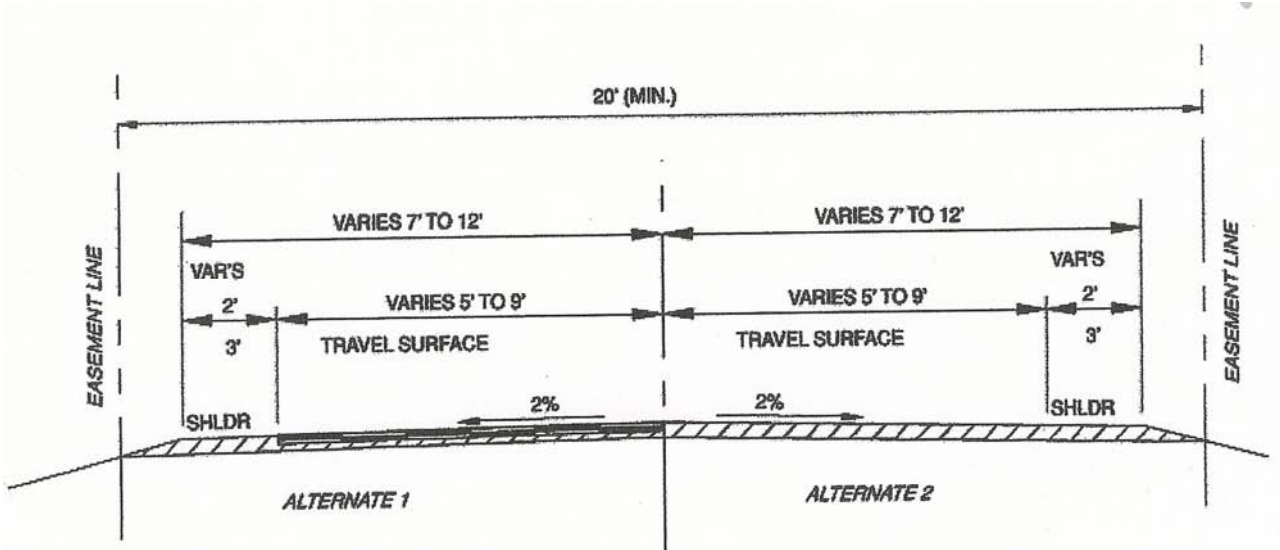




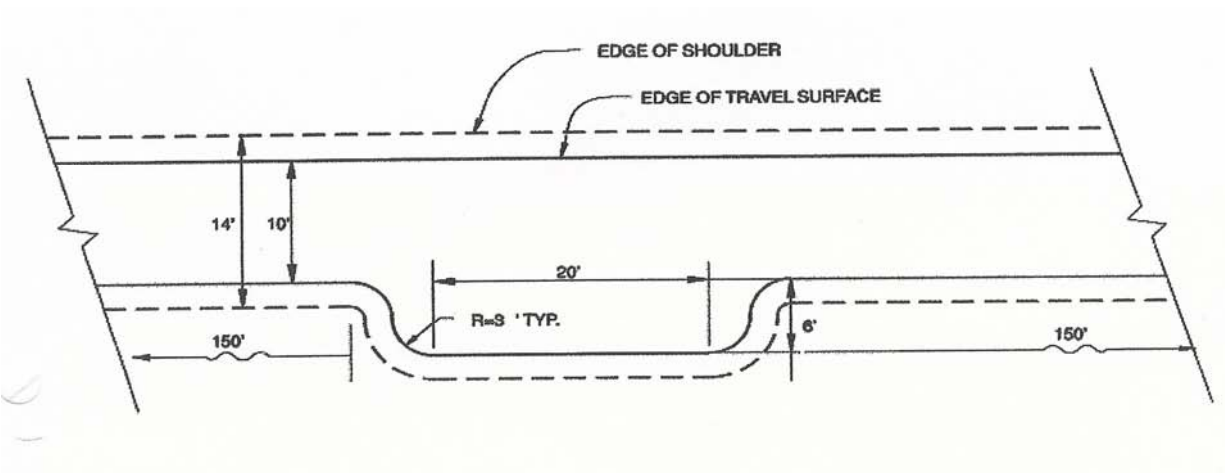
## TEMPLATE 2 – Hammerhead Turnaround



### TEMPLATE 3 – Private Road

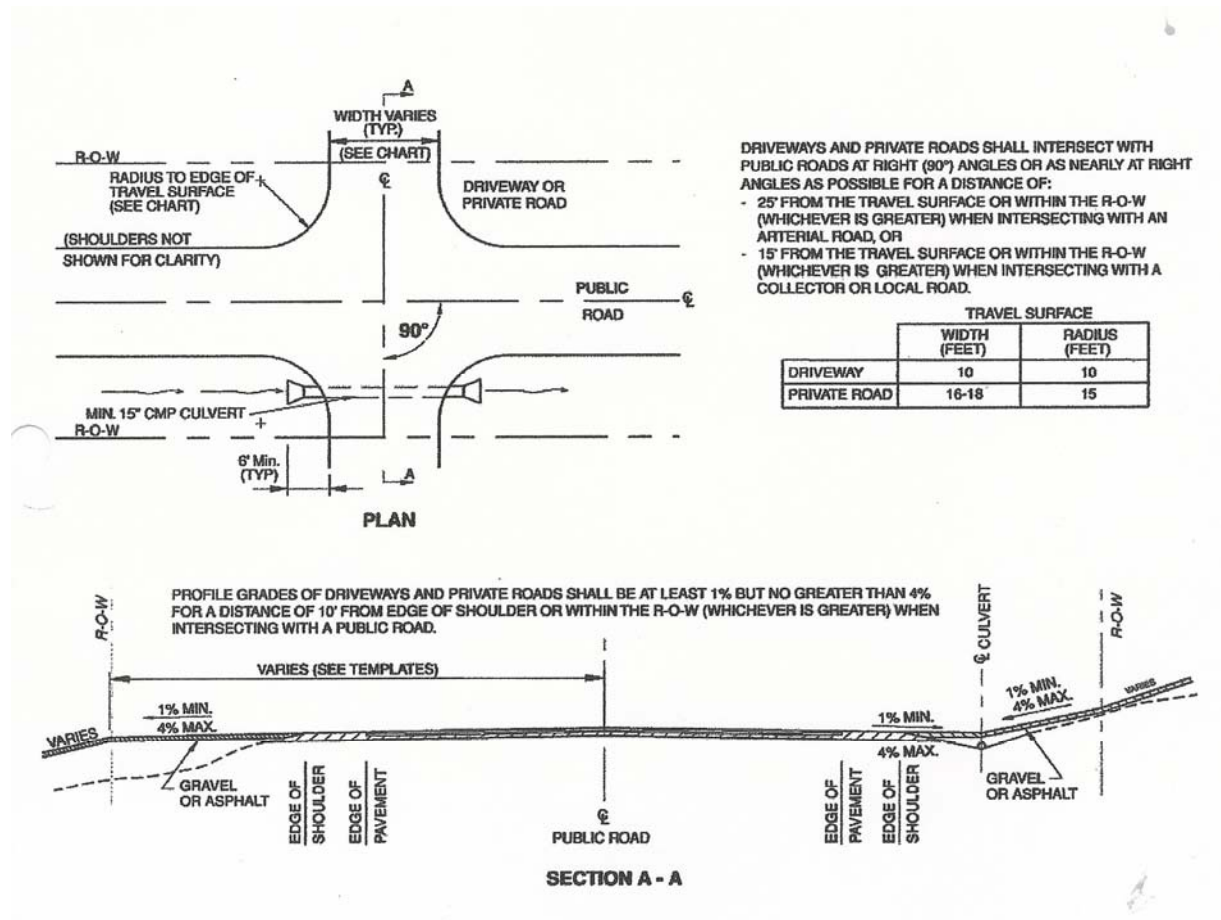


### TEMPLATE 4 – Pull Out for Private Road





## TEMPLATE 5 – Driveway Approaches for Roads



## **APPENDIX H – Saguache County Triage**

### **STRUCTURE TRIAGE**

**Triage** is the determination of priorities for action during an emergency. This describes a concise decision making process that will be used if/when a wildfire threatens multiple structures simultaneously within Saguache County. It will be done rapidly and on the move.

**Structure:**

Roof Type?

Debris on Roof?

Propane Tank?

Siding?

Fire Brand Traps?

Flammable Clutter?

**Defensible Space:**

Is There Any?

Water Supply?

Adjacent Fuel Type ?

Access?

**Current & Expected Fire Behavior?**

**Available Firefighting Resources?**

**Firefighter Safety:**

Escape Routes?

Safety Zones ?

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

Clearly communicate the priorities and firefighter evacuation criteria!

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

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



# SUBDIVISION FIRE HAZARD RATING

NAME \_\_\_\_\_ DATE \_\_\_\_\_  
 SIZE (acres) \_\_\_\_\_ # LOTS or HOMES \_\_\_\_\_  
 RATING \_\_\_\_\_ COMMENTS \_\_\_\_\_

## A. Home Site Development Area Design

1. Ingress/Egress
  - Two of more primary roads 1\_\_
  - One road 3\_\_
  - One-way in, one-way out 5\_\_
2. Width of primary road
  - 20 feet or more 1\_\_
  - 20 feet or less 3\_\_
3. Accessibility
  - Road grade 5% or less 1\_\_
  - Road grade 5% or more 3\_\_
4. Secondary road terminus:
  - Loop roads, cul-de-sacs with outside turning radius of 45 feet or greater. 1\_\_
  - Cul-de-sac turn-around radius less than 45 feet. 2\_\_
  - Dead-end roads 200 feet or less in length 3\_\_
  - Dead-end roads greater than 300 feet in length. 5\_\_
5. Average lot size:
  - 10 acres or larger 1\_\_
  - Larger than 1 acre, but less than 10 acres. 3\_\_
  - 1 acre or less 5\_\_
6. Street Signs:
  - Present 1\_\_
  - Not Present 5\_\_

## B. Defensibility

1. Fuel Load Between Home Sites:
  - Light 1\_\_
  - Medium 5\_\_
  - Heavy 10\_\_
2. Defensible Space for Individual Homes:
  - 70% or more of sites 1\_\_
  - 30 % or more of sites 3\_\_
  - Less than 30 % of sites 5\_\_

## C. Home Ignition Zone

- Thorough Litter and Debris Clean Up:
- 70% or more of sites 1\_\_
  - 30% to 69% of sites 4\_\_
  - 10% to 29% of sites 7\_\_
  - 0% to 9% of sites 10\_\_

## D. Roofing Materials (prevalent within area)

- Class A rated (metal) 1\_\_
- Class B rated (composition) 3\_\_
- Class C rated (wood) 5\_\_
- Non-rated (pine needles & debris) 10\_\_

## E. Fire Protection - Water Source

- 500 GPM hydrant within 1000 ft. 1\_\_
- Hydrant farther than 1000 ft or draft site. 2\_\_
- Water source 20 minutes or less (round trip) 5\_\_
- Water source farther than 20 minutes, and 45 minutes or less round trip. 7\_\_
- Water source farther than 45 minutes round trip 10\_\_

## F. Existing Building Construction Material (most common within subdivision)

- Noncombustible siding/decks 1\_\_
- Noncombustible siding with combustible decks 5\_\_
- Combustible siding and decks 10\_\_

## G. Utilities (gas and/or electric) (most common within subdivision)

- All underground utilities 1\_\_
- One underground, one above ground 3\_\_
- All above ground 5\_\_

## Total For Area

=====

Rating Scale:      Moderate Hazard      40 - 54  
                          High Hazard      55 - 74  
                          Extreme Hazard      75+

## **APPENDIX I–Subdivision Fire Hazard Ratings**



## APPENDIX J – Definition of Terms

**Appropriate Management Response (AMR)** - Specific actions taken in response to a wildland fire to implement protection and fire use objectives identified by appropriate government agency. AMR allows for a full range of strategies to be applied, from an intense full suppression response to wildland fire use. The first response decision to be made is whether to have a suppression oriented response or to allow the fire to burn for predetermined benefits.

**Confinement Response-** The suppression-orientated strategy employed in appropriate management response where a fire perimeter is managed by a combination of direct and indirect actions and use of natural topographic features, fuels, and weather factors. These strategies and tactics could include perimeter control.

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

**Disturbance-** A discrete event, either natural or human induced, that causes a change in the existing condition of an ecological system.

**Energy Release Component (ERC)** - An index developed through the National Fire Danger Rating System. ERC then is an indicator of dryness in the fuel, is a fuel loading based rate that predicts how much energy f fire will produce both from its consumption of available fuel and through its residence time. ERC, and 1000 hour time lag fuel moisture has been used in dry climates to track seasonal drying trends.

**Escape Fire Situation Analysis (EFSA)** - If a wildfire has escaped initial attack EFSA is the process the agency administrator or acting uses to determine the best suppression strategy for achieving appropriate suppression that best meets resource objectives.

**Fire Management Plan (FMP)** - A strategic plan that defines a program to manage wildland and prescribed fires. The plan could be supplemented by operational plans, prescribed fire plans, hazardous fuels reduction, and prevention plans.

**Fire Use** - The combination of wildland fire use and prescribed fire application to meet specific resource and landowner objectives.

**Fuel Treatment** - Programmed and contracted to reduce or change fuel loading or type on a site. Can be accomplished by mechanical, chemical or fire use.

**Full Response** - A suppression response action that can include: control lines surrounding the entire perimeter, (hot spot and cold trail may be considered completed line) including any spot fires, protection of interior islands, burn-out of fuels adjacent to control lines and mop-up to a standard adequate to hold under high fire intensity conditions. Full response objectives are based on safe yet aggressive approach to achieve containment of the fire by the beginning of the next burn period. Fire behavior may dictate, at least temporarily, the utilization of natural barriers or indirect strategies. These strategies and tactics would include direct control.

**Haines Index** - Lower atmosphere stability index (LASI) developed by Donald Haines. The index relies on two variables: dryness and stability/instability. On a scale of six, three points are given to dryness and three to the stability or instability of the atmosphere. Both these variables have a pronounced affect on extreme fire behavior. In the scaling, a 6 is extreme, 5 are high, 4 are moderate, while 3 to 1 are low.

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

**Initial Management Area (IMA)** - The size of an IMA may be adjusted based on fire behavior predictions, weather forecasts, site analysis and risk assessment. The IMA becomes fixed as an MMA once a wildland fire is placed under a stage III implementation plan.

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

**Maximum Management Area (MMA)** - The firm limits of management capability to accommodate the social, political, and resource impacts of a wildland fire. Once an approved Wildland Fire Use plan is established the MMA is fixed and not subject to change. If MMA determination is exceeded, the fire will follow the Wildland Fire Situation Analysis (WFSA) process.

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

**POL** – Stands for “Products Other than Logs” thinning to harvest poles and posts and firewood.

**Polygon** - A planning sub-unit within a fire planning area that represents similar resource values and landowners objectives, fuel conditions with associated fire behavior, Social/Political concerns and economic considerations. Polygons are categorized as A, B, C, and D areas.

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

**Prescribed Fire** - Any fire ignited by management actions to meet specific objectives. A written, approved prescribed fire plan must exist prior to ignition.

**Prescribed Fire Plan** - A plan required for each fire application ignited by management. It must be prepared by qualified personnel and approved by the appropriate agency administrator prior to implementation. Each plan will follow specific direction and must include critical elements and how to mitigate each element.

**Prescription Guidelines** - guidelines used to show upper and lower reaches of a prescription.

**Spread Component (SC)** - An index developed through the National Fire Danger Rating System. The index provides predicted rate of spread of a fire (in chains per hour) from inputted information on the fuel complex and weather information collected from a local Remote Automated Weather System (RAWS) site.

**Suppression Constraints** - A limitation placed on suppression forces to minimize adverse affects to the environment due to fire suppression activities. An example would be restricting the use of heavy equipment in certain areas.

**Suppression Oriented Response** - A range of responses to a wildland fire, which range from full response to confinement of the fire. It may also include periodically checking fire status and fire behavior.

**TSI** – Stands for “Timber Stand Improvement” thinning to stimulate growth and improve residual tree health

**Wildfire** - An unwanted wildland fire.

**Wildland Fire** - Any nonstructural fire, other than prescribed fire, that occurs in the wildland. This term encompasses fires previously called both wildfires and prescribed natural fires.

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

**Wildland Fire Situation Analysis (WFSA)** - A decision-making process that evaluates alternative management strategies against selected safety, environmental, social, economic, political, and resource management objectives.



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- Insects and Diseases Associated with Forest Fires, no 6.309, D. Leatherman, CSU Cooperative Extension, 12/2002
- Fuelbreak Guidelines for Forested Subdivisions, F. C. Dennis, CSFS/CSU, 2005

**Comment:** This should be 2005.



## **APPENDIX L–Gold Basin CWPP**

# Gold Basin Subdivision's Community Wildfire Protection Plan





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## I. Definition of Gold Basin Subdivision's Wildland Urban Interface

Wildland Urban Interface is an area where structures are built in close proximity of naturally flammable vegetation. Gold Basin subdivision is a classic representation of that specific situation. Gold Basin is located in the central Rocky Mountains. The forest within and outside of the subdivision are dense and overcrowded. The sage in the area is also dense and very wildfire receptive. This creates the situation where if a wildfire emergency was to occur, the likelihood of potential loss of property and life are high. A collaborative effort of forest management and organization between subdivision residents and adjoining neighbors is the only solution.

Gold Basin subdivision covers 2,010 acres at an average altitude of 8,000 feet. 49 lots are located within the subdivision, with the average mean size of the lots being 35 acres. The average slope of the subdivision is 15%, with a range of 5-45%. South is the predominate aspect of the subdivision.

The ecosystem surrounding the subdivision is very diverse. The higher elevations and north aspect slopes are covered in dense Douglas fir and aspen with a peppering of Lodge pole and Ponderosa Pine. The low elevation areas are covered by dense sage with a grass understory. The subdivision is a high country desert with very little water.

The Wildland Urban Interface map illustrates the boundaries of the interface. The WUI is represented by a blue line and covers an area of 11,268 acres. The WUI boundaries are based upon wildfire potential. The boundary encompasses the area that has the highest potential to spread a wildfire onto Gold Basin land. The subdivision boundary is represented by a blue line. The public lands within the WUI boundary are represented by a purple line. All public lands within the WUI are managed by the Bureau of Land Management. Cross boundary efforts are essential for wildfire prevention. Fire is capricious and will always find the defenses weakest link. Fire does not respect human boundaries but rather mitigated fuels and natural barriers (less flammable vegetation, rock outcrop etc.).

### A. Location

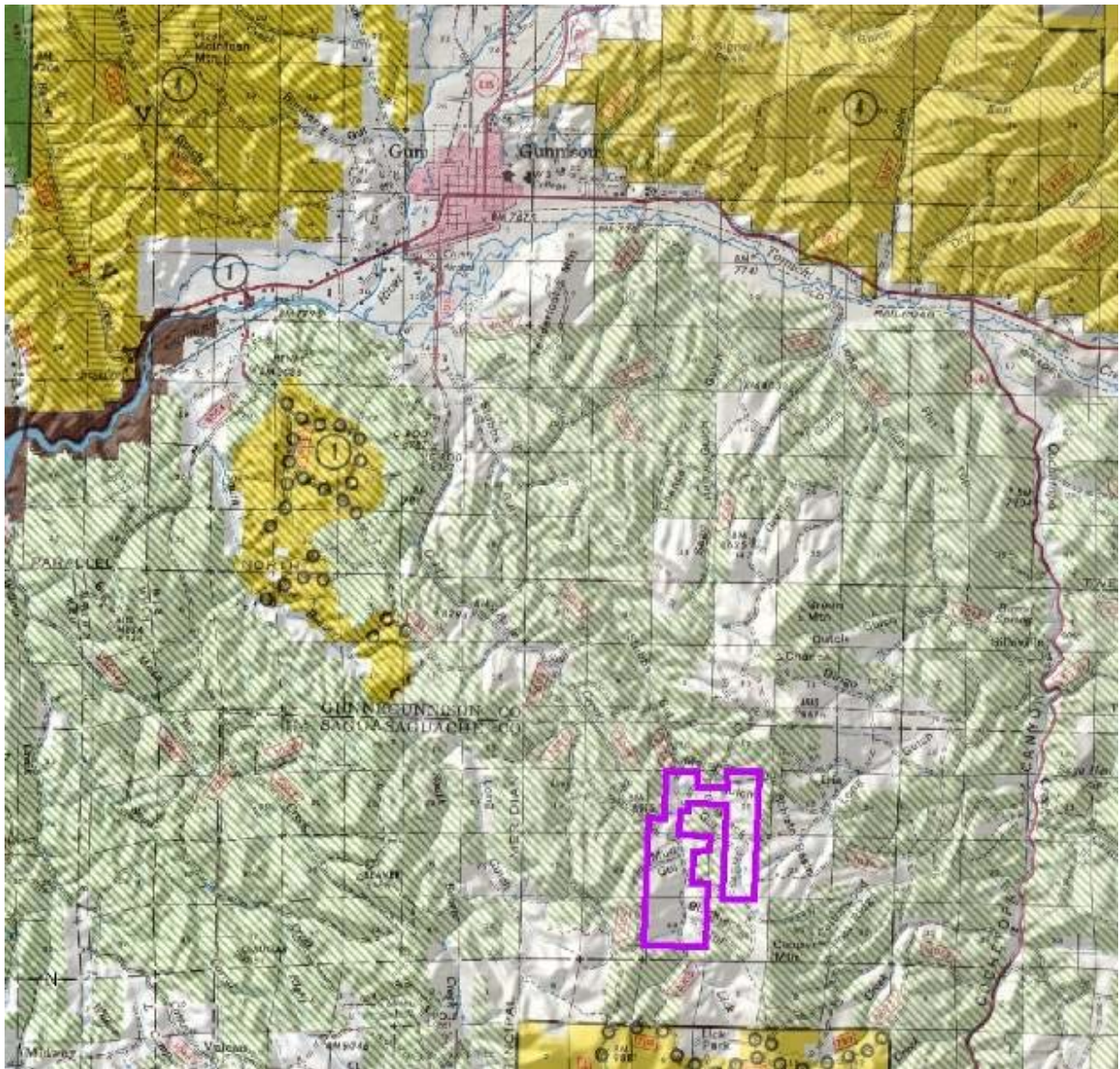
1. County: Saguache, Colorado
2. Geographic Area: 13 miles South of Gunnison (south of airport)
3. Legal Description R1E, T48N, Sections 21,22,23,29,28,27,26,33 NMPM
4. USGS Map Quadrangles: Iris NW

B. Ingress/Egress

1. Routes: Hwy 50 to County Rd 38 North entry 13 miles south (past airport and BLM Hartman's rocks)
2. Directions: From Gunnison, go west just past airport and before twin bridges, make left onto County Rd 38 go south for 13 miles, through 3 cattle guards, subdivision starts at stop sign.



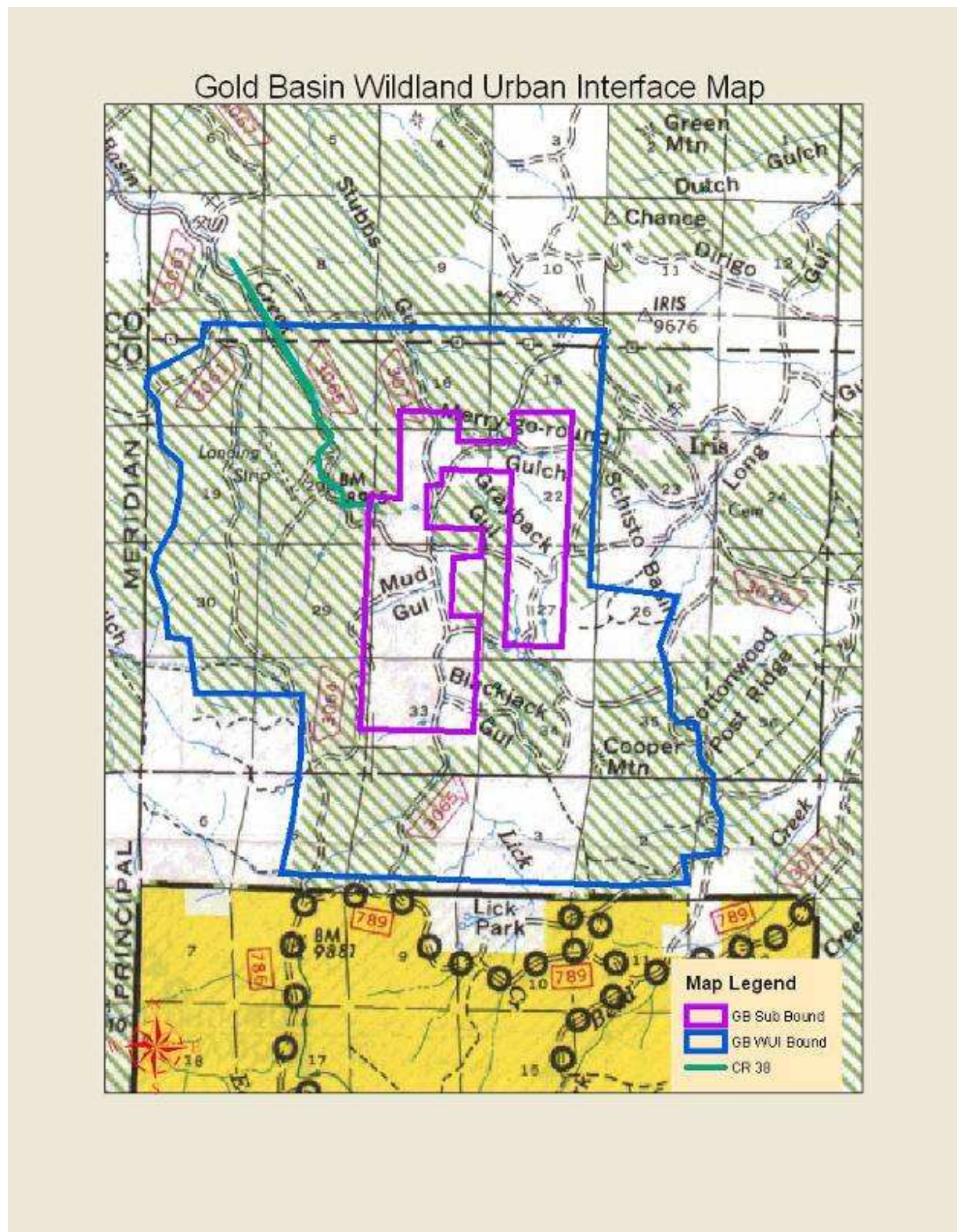
### C. Map of Location of Subdivision



\* Purple outline is the subdivision boundary

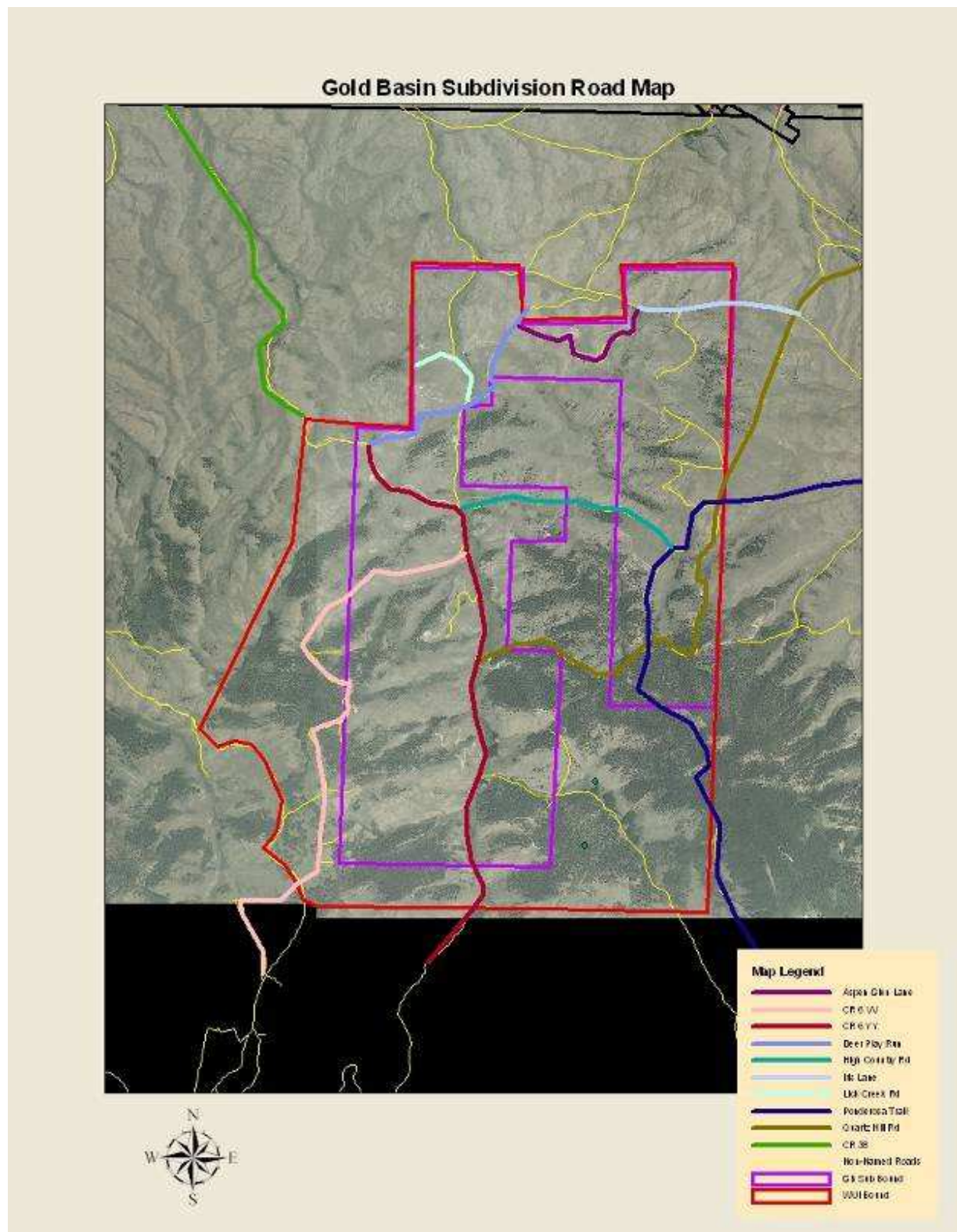


D. Gold Basin Subdivision Wild Land Urban Interface





E. Gold Basin Subdivision Road Map



## DATA IS IN THE WORKS

### II. Structure/Lot Wildfire Hazard Evaluation/ Fire Behavior

#### A. Structure/Lot Wildfire Hazard Evaluation

1. Subdivision - The subdivision has been rated utilizing the CSFS "Wildfire Hazard Rating Form".

The results are:

# Points        67

Description   High   ( *Moderate, High, Extreme* )

2. Structures - All structures have been rated utilizing the CSFS "Wildland Home Fire Risk Evaluation System". A description is found in Appendix 5.

Results are:

Number of Structures			
Extreme	High	Moderate	Low
17	5	10	1

#### B. Expected Fire Behavior (head fire only):

##### Aspen Stands

Fires are low to moderate in intensity except when they consume pockets of dry grass, sage -brush or conifer. Typically fires are of short duration. Rate of spread is moderate to high but fairly easy to stop.

##### Conifer Stands

Crowning out, spotting, and torching of individual trees are more frequent in this fuel situation, leading to potential fire control difficulties. Fire is of high intensity and can be of short or long duration, Rate of Spread is moderate to fast.

##### Douglas fir Timber

These fuels respond quickly to changes in weather. They will dry or absorb moisture rapidly. Increases in wind speed or slope will cause fire to increase in flame height and intensity. Fire behavior can range from low when burning conditions are marginal to extreme during hot, dry weather.

1. Specific - Determined utilizing BEHAVE (The Fire Behavior Prediction System) and NFFL fuel models.
  - a. Input data. 30 percent slope was used to show the fire behavior that could be expected on the more steep slopes in the Subdivision. The



Extreme rated lots at the south end of the subdivision (see Appendix 6) are located on steep slopes of 20 percent. Extreme rated lots on the West side of the subdivision are located above slopes exceeding 50 percent.

	Average Day	Red Flag Day
Date	7-31	7-31
Time (hrs)	1500	1500
Temperature (F)	65	75
Min. Relative Humidity (%)	18	10
Average Wind Speed (MPH)	6	15
Live Fuel Moisture (%)	150	100
1 Hr. Fuel Moisture (%)	5	2
10 Hr. Fuel Moisture (%)	8	5
100 Hr. Fuel Moisture (%)	14	10
Average slope (%)	30	30
Fuel Model	10	10

b. Outputs

1) Average Day

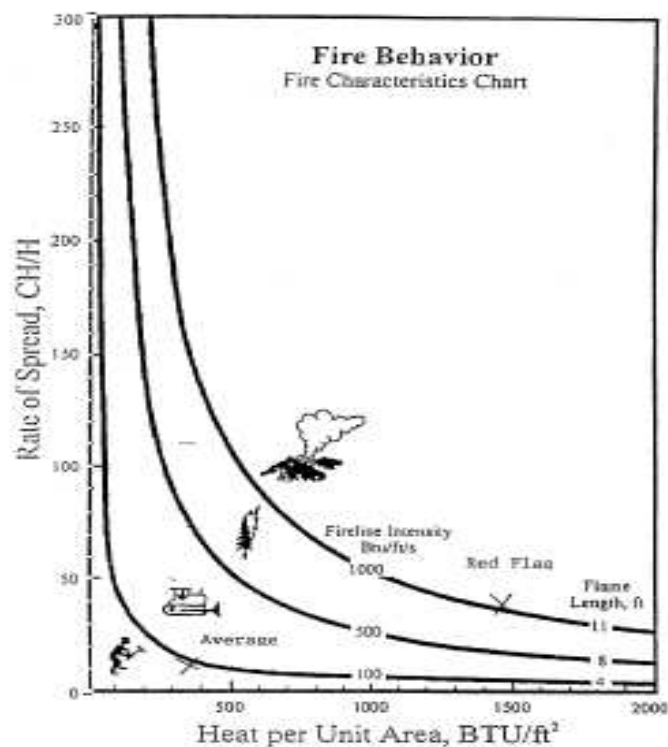
	AVERAGE DAY	
Rate of spread (chains/hr)	9.4	
Fireline intensity (Btu/ft/s)	100	
Average flame length (ft)	5.3	
	Response Time	
	.3 HOUR	1 HOUR
Area (acres)	.6	6.5
Perimeter (ft)	660	2310
Estimated spotting distance (mi)	.2	

## 2) Red Flag Day

	RED FLAG DAY	
Rate of spread (chains/hr)	49	
Fireline intensity (Btu/ft/s)	746	
Average flame length (ft)	12.5	
	Response Time	
	.3 HOUR	1 HOUR
Area (acres)	10	117
Perimeter (ft)	3498	11748
Estimated spotting distance (mi)	.4	

## 2. Fire Characteristics Chart (Projected)

This chart shows the BTU per square foot at increasing rates of spread. Rates of spread are graphed in chains per hour. One chain equals 66 feet. The Average Day and Red Flag Day Fire Behavior are plotted on the chart.





### III. Community Values to be Protected (Map - appendix 5, pg 51)

This section addresses the essential community values that can be destroyed due to a wildfire. The highest priority for protection is human life. The community preparedness section (CPS) on [pg 17](#) has a wealth of information to help residents become safer both before and during a wildfire emergency. Part 2 of the CPS on [pg 20](#) has a response plan. The response plan, under section E on [pg 21](#), designates locations of command post, staging areas, safety zones and helispots. These locations are also mapped on the logistics map in appendix 4 on [pg 50](#). Under [section F # 1](#) of the CPS response plan on [pg 22](#) is the evacuation procedure. Section 2 on [pg 22](#) has the specific evacuation travel routes. Please refer to the road maps on [pgs 7-8](#).

The highest value is the residential structures. The first step in protecting structures is to refer to the Defensible Space section of the CWPP on [pg 13](#). This topic is further illustrated in appendix 2 on [pgs 50-51](#). Subtitle a. of section A of part 1 under the CPS ([pg 17](#)) covers actions homeowners should take prior to a wildfire emergency. These steps will help ensure the protection of structures.

The second community value to be protected is the snow fence located north of the subdivision along CR38. It starts at the Saguache county line and goes until the stop sign at the confluence of CR # 38 and CR # YY. The fence is located on BLM property. This fence was a combined effort between the Gold Basin HOA and the county of Saguache. The fence is designed to keep snow from drifting on the county road. This provides for a safer road. Over \$20,000 has been invested in the fence. The fence can be protected from wildfire by mowing a strip of sage on each side of the fence that is 70 feet wide. In the event of a wildfire emergency the fence can be protected by a slurry drop or a foam line.

### IV. Reducing Structural Ignitability

A wildfire is capricious and will always find the weakest link in your defense. The goal of this section is to help residents make decisions in building materials and home maintenance, making their structures more fire resistant.

#### A. House Site Location

The first step in structure protection, for someone building a new home, is choosing a building site. When determining where a structure will be built, the developer and owner should consider how the native vegetation and topography variations affect wildfire behavior.

#### B. Roof

The second building standard that should be considered is the roofing material. One of a structures most vulnerable area is the roof, which is due to the amount of surface area. The roof can be continually inundated with flying firebrands.

### C. Siding/Walls

The third consideration to look at while building or remodeling is the siding and walls. Use construction materials that are fire resistant or non-combustible whenever possible. Use a minimum of a class 3 flame spreading siding material. The best materials are brick or stucco type products. The walls should be constructed of fire resistive materials from the ground to the roof overhang.

### D. Foundation

The fourth consideration is the foundation. The area is often the first area to come in contact with a spreading wildfire. Construct a closed foundation with concrete block, cement wall, or use other fire resistive materials.

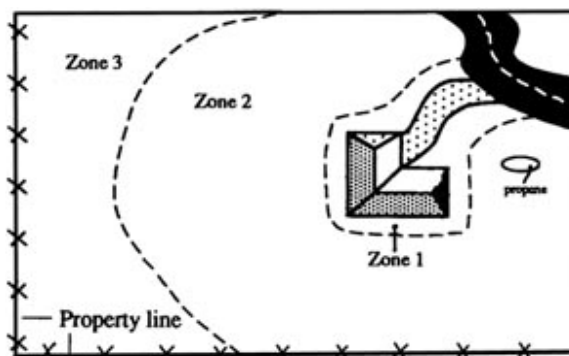
### E. Windows

The fifth consideration is the window area and is often overlooked as a hazard. Radiant heat can pass through them and set fire to curtains or furniture. Minimize the size and number of windows on the side of the house that is likely to be exposed to wildfire. Consider size and materials for windows, choose double pane glass for reducing the amount of radiant heat; plastic skylights can melt rapidly.

## V. Defensible Space

Two factors have emerged as the primary determinates of a structure's ability to survive wildfire. These are the structure's roofing material and the quality of the defensible space surrounding it. Defensible space is an area around a structure where fuels have been mitigated to slow the spread of a wildfire. It also reduces the chances of a structure fire becoming a wildfire. Creating a defensible space involves developing a series of management zones in which different treatment methods are used depending upon the fuel type present. An example is found in the diagram below.

### A. Defensible Space Zones



Zone 1: This area receives the most modification and treatment. It consists of an area 15 feet around structure in which flammable vegetation is removed. These 15 feet are measured from the outside edge of the home's eaves.



Zone 2: This area receives a fuel reduction treatment. The size of the area is determined by the average slope of the property. Within this zone continuity and arrangement of vegetation is modified. Remove stressed, diseased, dead or dying trees and shrubs. In the event of a crown fire reaching this zone, fuel will be broken up in such a way that the fire returns to the ground.

Zone 3: This area receives a traditional forest management treatment. The area starts from the end of zone 2 and ends at the landowner's property boundary. Landowners should contact the Colorado State Forest Service (970-641-6852) for assistance in managing this zone.

## B. Steps to Determine Recommended Size of Defensible Space

The size of your defensible space is determined by the average slope of your property. A proper defensible space size can be determined using the three step process below.

### 1. 3 steps

Step 1. Determine average % slope of property ([appendix 2b, pg 51](#))

Step 2. Determine size of zone 2 using provided graph in [sec. 2, pg 15](#)

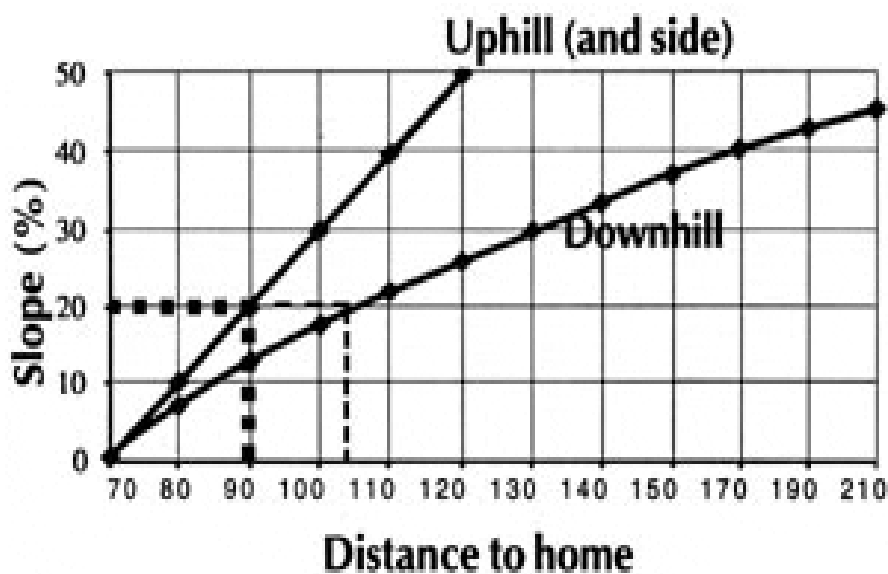
Step 3. Determine fuel type and appropriate mitigation recommendation in [sec. 3, pg 15](#)

Remember: Zone 1 is always 15 feet wide measured from the outside eaves and zone 3 extends from the end of zone 2 to the property boundary.

### 2. Zone 2 graph

This graph illustrates the recommended size of zone 2.

Directions: Find the property's average slope on left side of graph. Then follow that line over until it intersects with either the uphill or downhill line. Follow the point of intersection down to the bottom series of numbers. This number is the measurement from the eaves of the structure to the far edge of zone 2.



### 3. Fuel Types and Mitigation Recommendations for Defensible Space

Note: The subdivision has made a stump dump available to its residents. The dump is open to all material removed during fuels mitigation projects. It is located next to the clubhouse on Gold Basin Dr..(BM logistics map appendix # 4 pg 50)

- a. Aspen with Vegetative Understory
  - 1) Zone 1: Remove all **flammable** vegetation 15 feet out from the eaves.
  - 2) Zone 2: The vegetation in the understory should be mowed to a minimum height of 4 inches. This should be maintained throughout the year with periodic mowing.
  - 3) Zone 3: Monitor for insect and disease. Refer to [appendix #7-8 pg 56-57](#) for information regarding common Aspen disease problems.
- b. Mixed Conifer (fir, spruce)
  - 1) Zone 1: Remove all **flammable** vegetation 15 feet out from the eaves.
  - 2) Zone 2: The mixed conifer fuel type has a higher wildfire danger than Aspen due to its volatile needles. It requires significant fuel modification in order to reduce the wildfire danger. The idea for this fuel type in this zone is to break up the continuity, thus reducing the chances of a crown fire. Trees should be thinned to 10-12 foot spacing between stems. All residual trees should be pruned up 10 feet from ground level. Remove or evenly distribute all slash.
  - 3) Zone 3: This is an area of traditional forest management. The same prescription as zone 2 can be followed. With less attention paid to detail. Slash can be lopped and scattered up to a depth of 12 inches. Trees do not have to be limbed up. This area should be monitored for insect and disease problems. Refer to [appendix 8 pg](#)



57 for information on prominent conifer insects in the Gold Basin area.

Precaution: If your trees or home site are susceptible to wind throw and the trees have never been thinned, reduce the amount of trees removed in the first year. Engelmann spruce and Sub-alpine fir are especially prone to wind throw. Some good indicators of wind sensitive areas: 1) blown down trees 2) large root ball holes 3) ridge tops. If you have a wind sensitive area gradually remove the trees over a 6 year period. Remove more trees every 3 years until you have reached the recommended spacing. Only remove 1/3 of the large trees from a wind sensitive stand per entry.

c. Sage

- 1) Zone 1: Remove all **flammable** vegetation 15 feet out from the eaves.
- 2) Zone 2: This fuel is considered “flashy” due to its rapid response to changes in weather. It dries and absorbs moisture swiftly. The sage in zone 2 should be mowed to a height of 6 inches. Follow d-space size guidelines for conifer type fuels.
- 3) Zone 3: Break up the continuity of the fuel by creating large islands of sage with treated vegetation strips in between

These are just general guidelines. Landowners are encouraged to contact their local Colorado State Forest Service office (970)641-6852 for guidance with a handout called “Creating Wildfire Defensible Zones” (603.2) The Colorado State Forest Service can also assist landowners in finding a contractor that does fuels mitigation work.

C. Other Areas of Consideration

1. To prevent sparks from entering your home through vents; cover attics, soffit and floor vents with wire mesh no larger than 1/8 of an inch.
2. Prevent combustible materials and debris from accumulating beneath patio deck or elevated porches: screen under or box in areas below ground level.
3. Landscape with fire resistive plants
4. Incorporate walkways and retaining walls as man made fuel breaks
5. Clean gutters, eaves and roofs regularly.
6. Stack firewood and place propane tank at least 30 feet from structure and on uphill side on the contour of the structure.

## VI. Community Preparedness

This section of the CWPP addresses what the subdivision residents and emergency response crews can do before and during a wildfire emergency situation. It will be broken up into two sections, **before** and **during**. The “**before**” section will explain what residents, HOA, local fire and sheriffs departments can do to lessen the danger of a wildfire emergency. The “**during**” section addresses what these same people can do in the event of a wildfire emergency. A response plan is found in this section that lays out the predetermined logistical planning.

### A. Before a Wildfire Emergency

Wildfire awareness has been increasing over the years in Gold Basin subdivision. The HOA has hosted the Colorado State Forest Service at annual meeting to discuss wildfire prevention and safety. Many residents have done fuel reduction projects on their properties. These types of collaborative efforts and the ones listed below are essential to a wildfire safe community. Residents are encouraged to continue working with their government agencies in making their community a safer one.

The items below are things individual landowners, the entire HOA, the volunteer fire department, and the sheriff’s office can do to help prevent and prepare for wildfire situations. People involved should use this section as a check off list for their own residences and agencies.

#### 1. Individual Homeowner Actions

- a. **Create** a defensible space around your home and other outbuildings. Dimensions vary depending upon the degree of slope of your property. Defensible space means providing room for firefighters to protect a building (See defensible space sec. pg 13.)
- b. **Remove** trash and other combustible material (ie. hay, lawn furniture, etc,) from the defensible space.
- c. **Mow** grass and weeds to less than 4 inches in height within 10 feet of structures, propane tanks, and utility service boxes.
- d. **Stack** firewood a minimum of 30 feet uphill from structure or on an even contour with structure.
- e. **Remove** trees growing through roof or porch.
- f. **Use** non-combustible roofing material.
- g. **Clean** roof and rain gutters of all debris.
- h. **Remove** any branches within 15 feet of the chimney.
- i. **Utilize** a spark arrester on the chimney.



- j. **Place** screens on foundation and vent eaves.
  - k. **Post** name/address signs which are clearly visible from the road.
  - l. **Widen** driveway and provide a turn-around space for emergency vehicles.
  - m. **Develop** outdoor water supply.
  - n. **Practice** a family fire drill and evacuation plan.
  - o. **Make** a list of items to take should evacuation be required.
2. Subdivision/Homeowner Actions
- a. In conjunction with the Gunnison Basin Wildfire Council, **place** and maintain Fire Danger Sign(s) at all Subdivision entrances.
  - b. **Develop** and maintain Defensible Space around the following:
    - 1) All community-held facilities
    - 2) Propane and gasoline tanks
    - 3) Electrical Transformer boxes
    - 4) Telephone Service boxes
    - 5) All utility poles
  - c. **Encourage** homeowners to develop Defensible Space around individual homes.
  - d. **Maintain** a well thinned forest on all Open Space lands.
  - e. **Sign** all roads. (Letters should be reflective and a minimum of four inches high.)
  - f. **Encourage** homeowners to sign their driveway with their name/address.
  - g. **Widen** roads and improve height clearance to facilitate easy access of emergency vehicles.
  - h. **Maintain** dry-hydrant in main lake.
  - i. **Notify** all new residents of wildfire hazard and supply each with appropriate hazard mitigation material available through the Gunnison Basin Wildfire Council.

3. Fire Department Actions

- a. **Obtain** enough copies of the Wildfire Hazard Evaluation Map to place one in each piece of equipment and in each station.
- b. **Conduct** "familiarization" drills within the subdivision once per year.
- c. **Ensure** that wildland fire tools are maintained on each piece of equipment.
- d. **Develop** and maintain a 10-person wildland fire cache, in addition to the tools on each piece of equipment.
- e. **Formalize** agreements for water use with the appropriate owner.
- f. **Ensure** on a regular basis that each firefighter has wildland Personal Protective Equipment and has received proper and appropriate training.
- g. **Familiarize** yourself with the County Wildfire Annual Operating Plan.
- h. **Host** periodic "Wildfire Awareness/Hazard Mitigation" meetings within the subdivision.
- i. **Encourage** development of alternative water sources and Defensible Space.

4. Sheriff's Department Actions

- a. **Obtain** enough copies of the Wildfire Hazard Evaluation Map to place one in each vehicle and in each station.
- b. **Conduct** "familiarization" drills within the subdivision once per year.
- c. **Formalize** agreements for water use from the appropriate owner.
- d. **Facilitate** acceptance/use of the County Wildfire Annual Operating Plan.
- e. With CSFS, **host** periodic "Wildfire Awareness/Hazard Mitigation" meetings within the subdivision in cooperation with the local Fire Department.
- f. **Develop/practice** evacuation techniques.

B. During a Wildfire Emergency

This section addresses what residents and emergency response crews should do in the event of a wildfire emergency. The intent is to make an emergency situation operate efficiently and with minimal surprises. By having specific areas and responsibilities



delegated an offensive plan can be put into action rapidly. A response plan has been developed to facilitate this rapid and efficient response.

## RESPONSE PLAN

### 1. Fire Protection Responsibility

- a. Agency
  - 1) Structural: Gunnison Fire Protection District
  - 2) Wildland
    - a) Private land: Gunnison County.  
By and through the County Sheriff.
    - b) Federal land: Bureau of Land Management.
- b. Command - The first initial attack Incident Commander (IC) on the scene shall serve as IC until properly relieved.

### 2. Alarm Response: These are equipment that are likely to respond. Actual response will depend on nature of situation and current commitments.

Response Agency	Station	Description Of Equipment	Response Time
GCFPD	Gunnison	2000 Gal. Tanker	25 minutes
GCFPD	Gunnison	Class one pumper	25 minutes
GCFPD	Gunnison	Brush fire unit	25 minutes
GCFPD	Gunnison	Brush fire unit	25 minutes
BLM	Montrose	Type 5 or 6 Engine	125 minutes
USFS	Gunnison	Type 6 Engine	25 minutes
USFS	Gunnison	Type 6 Engine	25 minutes

### 3. Access

- a. Road System
  - 1) Most are constructed of gravel.
  - 2) Some will support two lanes of traffic.
  - 3) Some are loop roads.
  - 4) Some are dead-end roads.
  - 5) Road signs are not present. **Gold basin is encouraged to get road signs. In the event of an emergency time is critical and an error in direction can delay response.**
- b. Driveways:
  - 1) Individual home driveway width and height clearance is inadequate for emergency equipment.
  - 2) Some individual homeowners have posted their name and address.

4. Water Supply (Water supply map appendix # 6 pg 55)

a. Ponds/Creeks/Lakes/Rivers

Type P/C	#/Name	Status P/I	Helicopter Accessible Y/N	Pump Required Y/N	Water Capacity When Full (1,000 GALS.)
P	Gold Basin Ponds	I	Y	Y	Seasonally Full

Key: Type: P = Pond, C = Creek  
 Status: P = Permanent, I = Intermittent  
 Helicopter/Pump: Y = Yes, N = No  
 # (Ponds) = measure in 1000's of gal.

\* Gunnison river is approx. 13 miles NW of the subdivision.

5. Locations: (logistics map appendix # 4 pg 53)

- a. Command Post - The following location(s) are recommended Incident Command Post (ICP) location(s):
- 3<sup>rd</sup> Cattle Guard from Hwy 50 .25 miles north of GB on CR 38  
 Vegetation: This area is a mixture of grass and sage. A large portion of the area is void of vegetation. Maintenance will require periodic sage work every 10 years. The entire location is owned by the BLM
- b. Staging Area(s) - The recommended staging area for operations within the subdivision is/are designated as:
- 3<sup>rd</sup> Cattle Guard from Hwy 50 .25 miles north of GB  
 Vegetation: This area is a mixture of grass and sage. A large portion of the area is void of vegetation. Maintenance will require periodic sage work every 10 years. The entire location is owned by the BLM
- c. Safety Zone(s) - The recommended safety zone(s) for operations within the subdivision is/are designated as:
- 3<sup>rd</sup> Cattle Guard from Hwy 50 .25 miles north of GB on CR 38  
 Vegetation: This area is a mixture of grass and sage. A large portion of the area is void of vegetation. Maintenance will require periodic sage work every 10 years. The entire location is owned by the BLM
  - Intersection CR 6 YY and High Country Road  
 Vegetation: This area is a mixture of grass and sage. A large portion of the area is void of vegetation. Maintenance will require periodic sage work every 10 years. The road is owned by the county and several private lots are adjacent to the area. Mowing was done in 2007 and should be retreated every 10 years.

:



- d. Helispot(s) - The recommended helispot(s) for operations within the subdivision is/are designated as:
  - 1) 3<sup>rd</sup> Cattle Guard from Hwy 50 .25 miles north of GB on CR 38
  - 2) Intersection CR 6YY and High Country Road
- 6. Evacuation (Gold Basin road maps pgs 6-8)
  - a. Procedure
    - 1) The Incident Commander or Incident Command Team in coordination with local authorities is responsible for initiating evacuation planning.
    - 2) Local government is responsible for assisting in the dissemination of information to local residents.
    - 3) All public information including that given door to door will be approved by the Incident Commander.
    - 4) Reoccupation of homes will occur only after the Incident Commander determines it to be reasonable
    - 5) The decision to initiate actual evacuation will come at the order of the Incident Commander in coordination with the appropriate jurisdiction/authority required by law to participate/order the evacuation process.
  - b. Escape Route during Emergency (refer to Gold Basin Road Maps on Pg 8-9)
    - 1) Evacuations will use County Road 38 to Gunnison
    - 2) Iris Lane to town of Iris and on to Saguache
- 7. Radio Frequencies
  - a. Tactical Frequency - Each agency's normal operational frequency. It shall be used for communications on scene within the response agency.
  - b. Operational Frequency - 154.280 (FERN); to be used in passing tactical orders from the Operations Chief or Incident Commander. A second channel may be operated on 154.145 (GCFPD).
  - c. Command Frequency - 155.475 (NLEC); to be used to coordinate activities; pass data to ICP, as a back-up for the operational frequency, and for entry communications between ICP and responding agencies.
  - d. Interagency radio cache may be requested through the local Interagency Dispatch Center.

9. Adjacent Property:

Ownership	Phone
BLM	(970) 641-0471
USFS	(970) 641-0471
Hollenbeck Inc	

10. General Goals/Objectives:

a. Strategic

- 1) Ensure the safety of all firefighters, residents and bystanders.
- 2) Conservation of property by minimizing damage and protecting all structures and improvements within the fire perimeter.
- 3) Stabilize incident and contain fire to specific geographic areas.
- 4) Protect exposures threatened by the fire but outside current fire perimeter.
- 5) Extinguish fire.
- 6) Perform necessary rehabilitation work.

b. Tactical

- 1) Evacuation or in-place shelter of residents.
- 2) Establish traffic control within affected area.
- 3) Briefing of personnel on safety and hazards.
- 4) Determine Operational Mode --
  - a) Offensive Mode
  - b) Defensive Mode
  - c) Combination
- 5) Determine resource needs and assignments
  - a) Type and #
    - (1) Aircraft
      - (a) Rotor wing
      - (b) Fixed wing
    - (2) Mechanized
      - (a) Dozer
      - (b) Road Grader
      - (c) Other
    - (3) Hand Crews
    - (4) Water/Chemical Delivery Systems
      - (a) Engines
      - (b) Tenders
      - (c) Portable pumps
      - (d) Other
  - b) Assignment
    - (1) Reconnaissance
    - (2) Medical
    - (3) Suppression
      - (a) Line construction



- (b) Prepare structures (See Section H)
    - (c) Burn out
    - (d) Other
  - (4) Rehabilitation
- 6) Manage utilities
  - a) Water Supplies
  - b) Electrical
  - c) Natural Gas & Propane
  - d) Telephone

11. Anticipated Problems:

- a. Firefighter Safety -
  - 1) Inexperience of crews with Extreme wildfire behavior.
  - 2) Narrow roads and private drives.
  - 3) Confusion and panic associated with evacuation.
  - 4) Limited availability of personnel and resources.
  - 5) Overhead power lines and utility service boxes.
  - 6) Septic systems.
  - 7) Frightened and confused pets.
  - 8) Hazardous materials, including propane and gasoline tanks.
- b. Wildland Fire WATCH OUT Situations
  - 1) Failure to adequately scout and size up fire.
  - 2) Personnel are not familiar enough with terrain to work after dark.
  - 3) Safety zones and escape routes not identified.
  - 4) Individuals are unfamiliar with weather and local factors that affect fire behavior.
  - 5) Personnel are uninformed on strategy, tactics, and hazards of the fire.
  - 6) Personnel are unclear on instructions or assignments.
  - 7) Personnel are out of communication with crew members or supervisor.
  - 8) Line construction is occurring without a safe anchor point.
  - 9) Line construction is occurring downhill towards the fire.
  - 10) Resources are attempting a frontal assault on the fire.
  - 11) There is unburned fuel between firefighters and the fire.
  - 12) Personnel cannot see the main fire and are not in contact with someone who can.
  - 13) Personnel are on a hillside where rolling material can ignite fuel below.
  - 14) The weather is getting hotter and drier.
  - 15) The wind is increasing and/or changing direction.
  - 16) Personnel are reporting frequent spot fires across line.
  - 17) Terrain and fuels make escape to safety zones difficult.
  - 18) Personnel feel like taking naps near the fire-line.
- c. Structural Fire WATCH OUT situations
  - 1) Poor access to the fire.
  - 2) Inadequate bridge load limits.

- 3) Garages with closed, locked doors.
  - 4) Inadequate water supply.
  - 5) Windows are black or smoked over.
  - 6) There are septic tanks and leech lines present.
  - 7) Structure is burning with puffing rather than steady smoke.
  - 8) Construction is wood with shake shingle roof.
  - 9) Natural fuels within 30 feet of the structure.
  - 10) Known or suspected panicked residents or visitors are in the vicinity.
  - 11) Windows are bulging and the roof hasn't been vented.
  - 12) Additional fuels can be found in open crawl spaces beneath the structure.
  - 13) Structure is in or near a chimney or canyon.
  - 14) Elevated fuel or propane tanks are present.
- d. LCES
- 1) Place lookouts around the fire area to observe fire behavior and warn resources of potential hazards.
  - 2) Make sure suppression resources have adequate communication.
  - 3) Identify escape routes and assure all resources can identify these routes at all times.
  - 4) Identify safety zones and assure resources know where they are located.

## VII. Vegetation Management

### A. Tree Species Overview

Douglas fir is a prevalent species in Gold Basin subdivision. This species has an elevation range of 6,000-9,000 feet. Douglas fir is a wind-firm species due to its deep root system. This species has a high wildlife food value. Small animals rely upon this species nut crop for food. Deer have been known to browse this species in harsh times.

Many of the Douglas fir stands in Gold Basin are over mature. Over mature trees are highly susceptible to Douglas fir bark beetles due to their low vigor. Bark beetles can build up population in weaker trees and then move onto healthier ones. Many of these stands and others are overstocked as well and contain an abundance of ladder fuels. This makes these particular stands susceptible to crown fires. In both cases of proper management is the solution. Dead, dying, diseased and over mature trees should be removed in order to promote a vigorous stand. In the case of an overstocked forest a thinning from below of the smaller trees is warranted. This will allow the residual stand of trees to be vigorous through increased sunlight, nutrients, and water.

A small amount of Blue Spruce is found in Gold Basin subdivision. This species has a high wildlife food value for small rodent. Small animals rely upon this species' nut crop for food. Deer and elk have been known to browse this species in harsh times. Blue Spruce tends to be found in lower elevation draws and riparian areas. Spruce prefers wetter areas than Douglas fir and north facing slopes. Its elevation range is



8,000 to 11,000. This species is generally not wind firm and is subject to blow over if thinned too heavily. Close attention to thinning prescriptions should be paid while thinning on ridge tops.

Aspen is the final majority tree species found in the Gold Basin subdivision. The leaves of aspen do not contain the volatile chemicals found in conifers. The lack of volatile chemicals makes them less likely to form crown fires. This makes aspen a very desirable species in a WUI setting. Wildfire mitigation in this species requires mowing the vegetation in the understory to a height of 6-8 inches near homes. However if conifer have begun to heavily invade the stand, thinning of the understory trees might be necessary. In order to protect the integrity of the moderate wildfire risk trait of the species.

The aspen of the Gold Basin area can be categorized into two sub- categories, High country Aspen (+9,000), Low country Aspen (-9,000). Each sub category occupies sites that differ ecologically from one another. The sites have different amounts of water, nutrients and sun exposure. These factors make each stand grow uniquely.

The high country Aspen (9,000'+ elevation) in Gold Basin are present because there was a disturbance in the forest, probably wildfire. These aspen occupy sites that are productive and have adequate amounts of precipitation. Aspen in these sites achieve large diameters. Many of these stands are however over mature and show signs of decline. They are in need of regenerating management.

The low country Aspen, occupy sites below 9,000'. These aspen mainly grow in the low lying areas of the sage. These areas collect additional moisture allowing the aspen to survive. Aspen stands of this type are regionally showing signs of decline (fungus, low crown ratios). Several factors are believed to be the cause. The region has been in a drought trend. This has put increased pressure on the minimal amounts of water available in these delicate ecosystems. Sage is out competing aspen and grasses for water and is dominating sites. This has put a even greater constraint on the dwindling water supply. Sage is able to utilize its tap root and drought resistance traits to have an advantage over other plants. It has moved into areas that have historically been aspen and grass dominated. This encroachment has put an in-balance in the regular processes of these ecosystems. Many of these aspen stands are also in need of regeneration due to age. Aspen live 80-100 years and then begin to decline. When stands are not regenerated through disturbance the central root system begins to die. Once the central root system dies the aspen stand will not regenerate.

In a WUI setting aspen becomes a valuable part of a communities overall wildfire defensiveness. This is due to its moderate wildfire risk rating. Aspen forests like the rest of the Gold Basin ecosystems are constantly changing. As aspen matures it requires change or disturbance in order to survive. Many of the aspen stands in Gold Basin are in a stage of over maturity and decline. The best way to ensure the survival and long term health of aspen in Gold Basin is through management. A mosaic across the landscape which incorporates regenerating patch cuts.

Sage with a grass component is the final vegetative cover found in Gold Basin. This vegetative type is found on sunny, semi-dry and desert like areas. It grows in dense

groups. Both sage and grass respond rapidly to changes in relative humidity. Sage leaves contain volatile chemicals. The chemicals combust very easy and increase its wildfire danger. The continuity of this fuel should be broken up. The goal is to create islands of fuel with breaks of treated fuel in between.

The Gold Basin area has been in a drought pattern for several years. This lack of precipitation coupled with years of wildfire suppression has allowed the sage to dominate many sites and shade out native grasses. Wildlife depends on these grasses in order to survive. In the past frequent low intensity wildfires would thin out the sage in a mosaic pattern of burned and unburned areas. This same pattern can be mimicked with the use of machinery and achieve the same goals. This type of treatment has been used successfully by both Gold Basin residents and BLM, on lands adjacent to Gold Basin.

## B. Prescriptions

The forests in Gold Basin subdivision are in declining health. This is due to lack of fire and management, which has created overstocking, over mature timber that is insect and disease susceptible. Below is a general overview of the management prescriptions for vegetative cover types found in Gold Basin. The objective is to reduce fuel and prevent crown fires. Thinning will be from below with an average spacing of 10-12 feet between stems. Variability is based upon species traits and slope position. Selection criterion for removal is listed in descending order: dead, diseased, and poor form. All residual trees with in defensible space and fuel breaks are to be pruned up ten feet from ground level to prevent ladder fuel issues.

In pre-settlement times, low intensity ground fires would periodically burn through the area. The low intensity ground fires thinned the forest by scorching and killing seedlings and saplings. These forests had significantly lower stocking than the current forests. Correctly stocked forests are better able to defend themselves from wildfire and insect and disease. When too many trees compete for the same limited amount of nutrients and sunlight, an unnatural weak forest grows. Overstocked forests are also highly susceptible to crown fires, due to the ladder fuel effect. The ladder fuel effect is created when large amounts of trees are allowed to grow in the understory of a forest. The understory trees allow a ground fire to climb up low lying branches and into the crowns of big trees. Forest management is the solution to better forest health and reduced fuels.

Age is a second factor in the declining health of Gold Basin's trees. Each specific species of tree has a biological maturity that plays a major role in a forest's health. Once trees meet their biological age of maturity they begin to decline. Over mature trees are more susceptible to insects and diseases due to their low vigor. By removing over mature trees a younger and more vigorous stand of trees can replace them.

Most of the high to extreme wildfire risk areas in the subdivision can be described as dense conifer stands (Douglas fir) with young conifers growing in the shade of mature trees. These conditions are due to the succession of forests in the Rocky Mountains. Succession is a term used to describe how an ecosystem is forever changing. The ecosystem in Gold Basin has relied upon fire to implement change.



Since the settlement of the area regular fires have been excluded from this ecosystem. This has caused a stagnation of the ecosystem. A forest ecosystem like the one in Gold Basin is continually changing. The change is not sudden but spread out over decades and perhaps centuries. The change involves stand composition, structure and biomass.

The BLM has incorporated conifer management into their plan of work for Gold Basin WUI. The plan addresses the following issues: wildfire, stand composition and forest health. The general prescription is a thinning from below. This type of prescription concentrates on the smaller trees in the under story (>8inches dbh). The prescription is designed to leave the biggest and most fire resilient trees. The understory trees are the target due to the ladder fuel effects. The ladder fuels allow ground fuels to get into crowns of trees. Crown fires are very destructive and hard to control. The prescription calls for removal of 90% of conifer trees 8 inches (dbh) or less growing under or within 20 feet of larger trees. Remove 20% of conifers that are 8-10 inch (dbh) with the same spacing guidelines. In areas that are dominated by trees in the 8-10 inch (dbh) class a 20 foot spacing guideline should be followed. All branches of residual trees should be limbed up 6 feet. Again this will decrease the ladder fuel effect. In conifer stands with aspen, conifer will be thinned to 20 foot spacing between stems. The aspen will not be cut in these areas due its low wildfire hazard rating.

The BLM thinning prescriptions is adequate for specific project areas. It was designed for fuel break and insect/disease susceptibility reduction purposes. It is appropriate to use it in zone 3 of defensible space (refer to d-space section Pg 13). It is not an adequate amount of fuel reductions for defensible space zones 1 and 2.

The BLM has already begun work on the 190 acre project and will continue through October of next year. A private contractor is performing the work. Landowners can receive a discounted price on their own projects by utilizing the BLM contractor at this time. Once a contractor is set up in an area his mobilization costs are reduced when moving to a new project in the general area. This can reduce the cost of getting projects complete. This is especially true if your property joins the BLM thinning project area.(BLM Treatment Map Pg 47) Gold Basin is also a secluded subdivision. It is hard to get contractors out to these types of secluded communities, especially for small acreage. The BLM treats large acreages which entices contractors. Landowners are encouraged to utilize the BLM contractors.

Aspen should be promoted in WUI areas due to its low wildfire risk. Promoting and preserving aspen stands requires management. Many of the aspen stands in Gold Basin subdivision have reached or surpassed their biological maturity. Aspen live 80-100 years and then the stand begins to show signs of decay. (fungus, low crown ratios) Aspen stands exist through a network of stems connected by an extensive root system. Once aspen stands reach their biological maturity and are not regenerated through disturbance, the central root system begins to die and the potential to loose the species from the site increases. Conifer begins to invade the understory of the maturing aspen and eventually the aspen is shaded out or dies from old age and the conifer takes over the site. This increases the wildfire potential of a once moderate risk.

The BLM has aspen regeneration/management in their overall mitigation/management plan for the Gold Basin WUI. They are using a Fecon Bull Hog grinder mounted on a large skid loader for the low country Aspen (-9,000' elevation). The machine masticates the sage and declining aspen, while leaving the slash in place. This type of management promotes longevity of aspen stands by reducing competition for water, and regenerating cuts. Regeneration can only occur if the root system is still viable. If the root system is dead because of lack of disturbance, then the regeneration will not occur. If regeneration does occur then fencing may be required to reduce over browsing. The cuts also improve the grass component by reducing the sage encroachment and dominance. Regardless of the outcome these projects reduce fuel. This type of management creates a mosaic of diverse wildlife cover types across the landscape. The prescription was for all brush (sage, snow berry, creeping juniper) to be masticated with in the stands. All live aspen 2 inches or greater was masticated. Snags greater than 8 inches were saved for cavity nesting birds. A buffer was also masticated around the stand to reduce encroachment. The BLM treated a total of 82 acres in this manner. Residents are encouraged to look over their stands of aspen for signs of decline. If aspen decline is a concern, residents should contact the Colorado State Forest Service for a site visit to determine management plan.

The BLM is also regenerating 21 acres of high country Aspen stands (+9,000 feet elevation). Many of these stands are also in a state of decline (fungus, low crown ratios). The prescription is to clear cut all aspen greater than 2 inches dbh. The prescription also calls for thinning of conifer encroachment to 20 foot spacing. This treatment will encourage re-sprouting and longevity of the stands.

The remaining vegetative cover is grass and sage brush. This cover type has a moderate to high wildfire risk. It is referred to as a "flashy fuel" and can combust rapidly. Grass and sage respond drastically to fluctuations in humidity, making their fuel moisture dangerously sporadic. These cover types can be managed as safe, healthy, and attractive landscapes, but if not managed, they become dense and fire receptive. This is what is happening at Gold Basin. Like the forest cover type the sage/grass is also fire dependent. Without regular fire in the ecosystem to thin the sage, grass cannot compete and is shaded out. The grass provides a needed source of food for local wildlife. Natural fires especially in range land tend to burn in a mosaic pattern. Some areas are burned more often than others. The use of machinery to masticate the sage can mimic this pattern. The recommendation is to mow 80% of the sage in a given area and leave islands of untreated to cover the remaining balance. This type of treatment leaves a more natural and aesthetically pleasing look while still covering multiple objectives. The fuel continuity is broken up and the wildfire risk is reduced. The mowed areas will produce more grass to benefit the wildlife. These types of treatments need to be repeated every 15-20 years, depending upon the productivity of the land.

The best long term protection to the threats of insects, disease, and wildfire is for Gold Basin to manage their forests. Homeowners should begin management by thinning trees around their homes. This will provide "Defensible Space" for fire



fighters to protect structures. It will also increase the health of the forest on individual properties. Defensible space guidelines can be found on [pg 13](#).

C. Fuel Breaks (Fuel Break Map [PG 33](#))

A fuel break is a strip of land in which the fuels have been modified in order to slow the spread of a wildfire. They are most effective when anchored. Examples of fuel break anchor points are rivers, creeks, rock outcrops or less flammable vegetation. It is of varying widths based upon fuel and % slope. Several factors determine the need for a subdivision to install fuel breaks. They are high/extreme wildfire hazard areas, steep slopes, crowning potential, heavy continuous fuels and ignition sources. Gold Basin subdivision has all of the above factors throughout most of the subdivision.

Fuel breaks that are installed in Gold Basin subdivision will cover private lots, and public lands. A collaborative effort is needed in order to have a fuel break that a wildfire will respect. Gold Basin subdivision is approximately 35 minutes away from any emergency crew response. In the event of a wildfire threatening the subdivision, a fuel break can reduce the spread of the fire by returning a crown fire to the ground. This essentially can turn an uncontrollable crown fire into a controllable ground fire.

The stand is thinned and remaining trees are pruned to remove ladder fuels. Brush, heavy ground fuels, snags, and dead trees are disposed of and an open park like appearance is established. The idea is to separate the crowns in order to stop a crown fire. The ground fuels and ladder fuels are mitigated to keep the fire on the ground and prevent it from returning to the crowns. Crown fires consume fuels rapidly and pose the greatest threat of life and property loss.

Sage dominated sites can be treated with various sage reduction machines examples: Fecon Bullhog, brush hog. The equipment depends upon the topography and size of vegetation. Sites with ground in excess of 30% slope generally cannot be treated with a brush hog or other similar machines that are pulled behind a tractor.. Sites with vegetation in excess of +4" dbh will require a Fecon Bullhog or similar machine. The sage is treated to a maximum height of 6 inches. These areas need to be retreated every 10 years.

1. Fuel Break Project Descriptions

This section will give a description of each fuel break project illustrated on the Fuel Break map. The projects are listed according to their implementation priority. Each project will be unique and require specific onsite prescription adjustments in order to achieve the objective. The approximate size of the fuel break is based fuel type.

*Note: refer to the following: CSFS Handout [Fuel Break Guidelines for Forested Subdivisions and Communities](#); the fuel break map on page # 36;*

- a. Fuel Break #1  
Approximate size: 32ac  
Average % Slope: 10-30+  
Vegetative Cover Types: Timber 18ac (Douglas fir) Sage 14ac  
Width: 150' (sage) 300'-350' (timber) (% slope dependent)

Description: This fuel break is located in the central part of the subdivision. This fuel break is important for several reasons: fuel is dense and continuous, steep topography and location to structures. The timber is heavily inundated with ladder fuels. This makes the stand of trees more susceptible to destructive wildfires. The area is also frequented by ingress/egress traffic which could be a potential ignition source. This fuel break will require the collaboration between the BLM and several private landowners. It covers both types of ownership. The fuel break will be anchored into CR 6VV. It will be anchored in the south to Quartz Hill Rd.

The following private tracts of land will have to be involved in order for the fuel break to achieve its greatest potential: **Tracts 31, 30, 4, BLM**

\* Residents are encouraged to contact neighbors and remind them of the importance of these treatments for the overall safety of the community

Prescription according to fuel type

- 1) Douglas fir: Minimum crown spacing of 12 feet, Reduce stocking to 80 BAF/ac, Target is understory stock <12 inches however larger trees may be taken in order to achieve desired BAF/ac, Prune residual stand up 10 feet, Remove/chip/pile burn all slash and heavy downed fuels.
- 2) Sage and Grass: Mow all vegetation to a maximum height of 6 inches

Cost

Timber thinning 18 acres \* \$1500.00 = \$27,000.00

Sage Mastication with tracked machine due to 30% slope 14 acres \* \$200.00 = \$2,800.00

Approx. Total Estimated Cost: \$29,800.00

\* Grants can be applied for to cover 50% of the costs, if funds are available

HOA and landowners should work with CSFS in applying. **(Review grant section on page 44)**

- b. Fuel Break # 2  
Approximate size: 43 ac  
Average % Slope: 10-20  
Vegetative Cover type: Timber: 25 ac Sage 31 ac  
Width: 150' (sage) 300'-350' (timber) (% slope dependent)



Description: this fuel break is located in the North East corner of the subdivision. It is important for several reasons: Dense continuous fuels and location to structures. The area is dominated by sage with a small amount of timber in the south portion. The fuel break will be anchored in the north to subdivision road Iris Lane. It will be connected in the south to the 2004 BLM forest thinning project just south of tract 1.

The following tracts will have to be involved in order for the fuel break to achieve its full potential. **1, 3, 5, 7, BLM**

\* Residents are encouraged to contact neighbors and remind them of the importance of these treatments for the overall safety of the community

Prescription according to fuel type

- 1) Douglas fir and Ponderosa Pine: Minimum crown spacing of 12 feet, Reduce stocking to 80 BAF/ac, Target is understory stock <12 inches however larger trees may be taken in order to achieve desired BAF/ac, Prune residual stand up 10 feet, Remove/chip/pile burn all slash and heavy downed fuels.
- 2) Sage and Grass: Mow all vegetation to a maximum height of 6 inches using brush hog type machinery.

Cost

Timber Thinning: 25 acres \* \$1,500.00 = \$37,500

Sage Mowing with a Brush Hog: 31 acres \* \$60.00 = 1,860

Approx. Total Cost: \$39,360.00

\* Grants can be applied for to cover 50% of the cost, HOA and

c. Fuel Break # 3

Approximate size: 111 ac

Average % Slope: 10-35

Vegetative Cover type: Timber: 73 ac Sage 38 ac

Width: 150' (sage) 300'-350' (timber) (% slope dependent)

Description: this fuel break is located in the southern region of the subdivision and follows the southern border. It is important for several reasons: Dense continuous fuels and location to structures. The prevailing winds for the area are out of the south west. In the event of a landscape scale fire this fuel break will be an important piece of defense for the subdivision. Landscape scale fires burn until a change in weather, fuel or topography. They are generally wind driven and can consume several acres in a short period of time.

The following tracts will have to be involved in order for the fuel break to achieve its full potential. **Hollenbeck Inc., BLM**

\* Residents are encouraged to contact neighbors and remind them of the importance of these treatments for the overall safety of the community

Prescription according to fuel type

- 1) Douglas fir and Ponderosa Pine: Minimum crown spacing of 12 feet, Reduce stocking to 80 BAF/ac, Target is understory stock <12 inches however larger trees may be taken in order to achieve desired BAF/ac, Prune residual stand up 10 feet, Remove/chip/pile burn all slash and heavy downed fuels.
- 2) Sage and Grass: Mow all vegetation to a maximum height of 6 inches using brush hog type machinery.

Cost

Timber Thinning: 73 acres \* \$1,500.00 = \$109,500

Sage Mowing with a Brush Hog: 38 acres \* \$60.00 = \$2,280

Approx. Total Cost: \$111,780.00

\* Grants can be applied for to cover 50% of the costs, if funds are available

HOA and landowners should work with CSFS in applying. (Review grant section on page 44)

d. Fuel Break # 4

Approximate size: 26 ac

Average % Slope: 10-20

Vegetative Cover type: Sage 26 ac

Width: 150' (sage) 300'-350' (timber) (% slope dependent)

Description: this fuel break is located in the North West corner of the subdivision. It is important for several reasons: Dense continuous fuels and location to structures. The area is dominated by sage with a small amount of timber in the south portion. The fuel break will be anchored in the north to subdivision road Deer Play Run. It will be connected in the south to Fuel Break # 2.

The following tracts will have to be involved in order for the fuel break to achieve its full potential. 22, 8, 7, 5 \* Residents are encouraged to contact neighbors and remind them of the importance of these treatments for the overall safety of the community

Prescription according to fuel type

- 1) Douglas fir and Ponderosa Pine: Minimum crown spacing of 12 feet, Reduce stocking to 80 BAF/ac, Target is understory stock <12 inches however larger trees may be taken in order to achieve desired BAF/ac, Prune residual stand up 10 feet, Remove/chip/pile burn all slash and heavy downed fuels.
- 2) Sage and Grass: Mow all vegetation to a maximum height of 6 inches using brush hog type machinery.

Cost

Sage Mowing with a Brush Hog: 26 acres \* \$60.00 = 1,560

Approx. Total Cost: \$1560.00



\* Grants can be applied for to cover 50% of the costs, if funds are available

HOA and landowners should work with CSFS in applying. (Review grant section on page 44)

e. Fuel Break # 5

Approximate size: 36 ac

Average % Slope: 10-20

Vegetative Cover type: Timber: 8 ac Sage 28 ac

Width: 150' (sage) 300'-350' (timber) (% slope dependent)

Description: this fuel break is located in the North West corner of the subdivision. It is important for several reasons: Dense continuous fuels and location to structures. The area is dominated by sage with a small amount of timber in the south portion. The fuel break will be anchored in the north to subdivision road Lick Creek Lane. It will be connected in the south to the 2004 BLM forest thinning project just south CR # 38.

The following tracts will have to be involved in order for the fuel break to achieve its full potential. **BLM.**

\* Residents are encouraged to contact neighbors and remind them of the importance of these treatments for the overall safety of the community

Prescription according to fuel type

- 1) Douglas fir and Ponderosa Pine: Minimum crown spacing of 12 feet, Reduce stocking to 80 BAF/ac, Target is understory stock <12 inches however larger trees may be taken in order to achieve desired BAF/ac, Prune residual stand up 10 feet, Remove/chip/pile burn all slash and heavy downed fuels.
- 2) Sage and Grass: Mow all vegetation to a maximum height of 6 inches using brush hog type machinery.

Cost

Timber Thinning: 8 acres \* \$1,500.00 = \$12,000

Sage Mowing with a Brush Hog: 28 acres \* \$60.00 = \$1,680

Approx. Total Cost: \$13,680.00

\* Grants can be applied for to cover 50% of the costs, if funds are available

HOA and landowners should work with CSFS in applying. (Review grant section on page 44)

f. Fuel Break # 6

Approximate size: 20 ac

Average % Slope: 10-20

Vegetative Cover type: Sage 20 ac

Width: 150' (sage) 300'-350' (timber) (% slope dependent)

Description: this fuel break is located in the far North of the subdivision. It is important for several reasons: Dense continuous fuels and location to structures. The area is dominated by sage with a small amount of timber in the south portion. The fuel break will be anchored in the north west to a BLM service road. It will be anchored in the North East to BLM service road.

The following tracts will have to be involved in order for the fuel break to achieve its full potential. **BLM** .

\* Residents are encouraged to contact neighbors and remind them of the importance of these treatments for the overall safety of the community

Prescription according to fuel type

- 1) Douglas fir and Ponderosa Pine: Minimum crown spacing of 12 feet, Reduce stocking to 80 BAF/ac, Target is understory stock <12 inches however larger trees may be taken in order to achieve desired BAF/ac, Prune residual stand up 10 feet, Remove/chip/pile burn all slash and heavy downed fuels.
- 2) Sage and Grass: Mow all vegetation to a maximum height of 6 inches using brush hog type machinery.

Cost

Sage Mowing with a Brush Hog: 20 acres \* \$60.00 = \$2,060

Approx. Total Cost: \$2,060

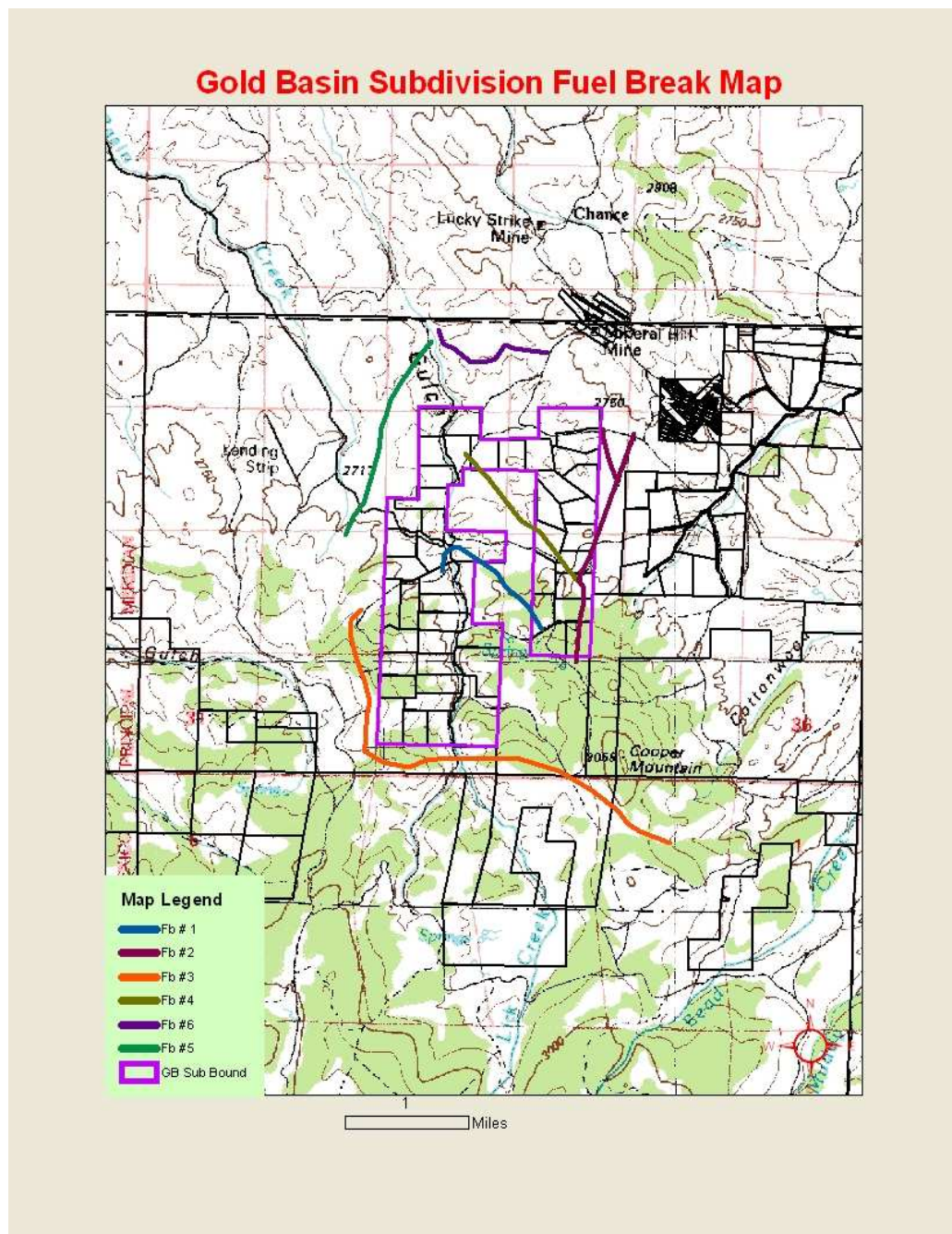
\* Grants can be applied for to cover 50% of the costs, if funds are available

HOA and landowners should work with CSFS in applying. (Review grant section on page 44)



#### D. Fuel Break Map

The Fuel Break map shows where fuels treatment is needed due to extreme wildfire danger. The breaks are all color coded and in order of priority. The map illustrates approximate locations of fuel breaks. Actual on the ground treatments will be similar but not as uniform. Treatment might not be possible in all areas designated on the map due to the extreme topography.



## E. General Fuel Break Prescription according to vegetative type

The table below shows the recommended size of a mixed conifer fuel break according to % slope. The section also gives specific prescriptions according to vegetative type.

### 1. Fuel Break Size for Mixed Conifer Fuel Break

% slope	Uphill distance	Downhill distance	Total width
10	140	165	303
30	120	195	315
60	100	240	340

#### a. Prescriptions

Note: CSFS has a list of contractors available for projects. Subdivisions are encouraged to work with CSFS in designing projects and obtain a copy of the CSFS handout Fuel Break Guidelines for Forested Subdivisions and Communities.

Crown separation is the key factor in a successful fuel break. A **minimum** of 10 feet between the edges of tree crowns is recommended. As slope increases crown spacing should also increase. All residual trees should be pruned up 10 feet from ground level. Slash should be removed or lopped and scattered evenly throughout the area.

Precaution: If your trees are susceptible to wind throw and the trees have never been thinned, reduce the amount of trees removed in the first year. Start with a spacing of diameter plus five between stems. Some good indicators of wind sensitive areas: 1) blown down trees 2) large root ball holes 3) ridge tops. If you have a wind sensitive area gradually remove the trees over a 6 year period. Remove more trees every 3 years until you have reached the recommended spacing. Follow the diameter plus five spacing recommendation each year for wind sensitive areas.

### 2. Fuel Break for Sage

#### a. Prescription

Mow vegetation to a maximum height of 8 inches. This type of vegetation is best mitigated with a Fecon Bullhog or similar brush mower. Follow size recommendations in the below table

% Slope	Width (feet)
10	100
20	150
30	200



F. Escape Routes/ Safety Zone (ER and SZ map PG 43)

An escape route is a preplanned and understood route that emergency officials have determined to be the best way to a safety zone or a low fire risk area. The escape routes can be broken up into two categories: primary and secondary. The primary escape routes utilize county maintained road. These roads are passable to any vehicle. Secondary escape routes are generally BLM service roads. These roads are rarely maintained and may not be passable without a high clearance four wheel drive vehicle.

The safety zone is a preplanned area of sufficient size and suitable location that is expected to protect residents from wildfire without using fire shelters. These areas are used as a safe place to gather people and take account for all residents. Primary safety zones need to be at least 1 acre in size in order to accommodate all Gold Basin residents and vehicles. The secondary safety zones are smaller and will not accommodate the entire subdivision.

This document identifies primary and secondary escape routes and safety zones. The primaries should be utilized first. If these routes are blocked by fire then secondary routes should be utilized. Current condition of all of the escape routes in Gold Basin is poor. The fuels in these areas are dense and continuous. During a wildfire a fast, clear and safe escape route is essential. When fuel is untreated along escape routes, it could make the route impassable. This section addresses location, escape plans, initial fuel reduction prescriptions, cost, grants, lots involved and maintenance.

The treatment prescriptions identified below are general recommendations. All areas identified will not require treatment. The idea of these prescriptions is to make the road passable in a variety of emergency situations. On the ground adaptations will need to be made.

1. Escape Route Treatments (listed in priority order)

- a. Escape Route (CR 6 V V)  
Approximate size: 30ac  
Average % Slope: 10-40  
Vegetative Cover type: Sage 100%  
Width: 150'

Description: This escape route is CR 6 V V and is located in the North West corner of the subdivision. It is important for several reasons: Dense continuous fuels and location to structures. The area is dominated by sage with a grass under story. In the event of a wildfire on the back side of Mud Gulch this break will serve as an evacuation route. The road starts down in Lick Creek Canyon and continues uphill. It then follows along a ridge line with a saddle at the top of the hill. Wildfires burn faster uphill and saddles funnel air and cause extreme fire behavior. With out sage reduction this escape route could become impassable during a wildfire emergency.

The following tracts will have to be involved in order for the escape route to achieve its full potential. 17, 14, 11, 9, 7, 5, 3, 1.

\* Residents are encouraged to contact neighbors and remind them of the importance of these treatments for the overall safety of the community

Prescription according to fuel type

- 1) Sage and Grass: Mow all vegetation to a maximum height of 6 inches using brush hog type machinery.

Cost

Sage Mowing with a Brush Hog: 16.5 acres \* \$60.00 = \$990.00

Approx. Total Cost: \$990.00

\* Grants can be applied for to cover 50% of the cost, HOA and landowners should work with CSFS in applying. (Review grant section on page 44)

- b. Escape route (CR 6 Y Y)  
Approximate size: 74 acres  
Average % slope: 5-30+  
Vegetative cover types: Timber 5 % ( DF) Sage 95%  
Width: 150' (sage) 300'-350' (timber) (% slope dependent)

Description: this escape route is located in the South West corner of the subdivision. The route utilizes CR 6YY to CR 38. It is important for the following reasons: prevailing winds are out of South West, dense continuous fuels, location to structures, and canyon like topography. The last two reasons are the most important. The area has a high concentration of structures. In many areas the drainage walls are steep on both sides with dense continuous vegetation. In the event of a fire getting into this valley it could move rapidly and send fire up both sides of the valley walls. Fire burns up hill rapidly, due to preheating of fuels and fire brands. A fire in this valley could spread rapidly with little warning. An adequate escape route is essential for the safety of the residents in this area.

The following tracts of land need to be involved in order for the fuel break to be fully successful. Tracts: 32,33,35,38,40,41,42,46,48,52,54.

The following tracts have already done their part of the project: 46, 54,55,40,31.

\* Residents are encouraged to contact neighbors and remind them of the importance of these treatments for the overall safety of the community

Prescription according to fuel type

- 1) Douglas fir: Minimum crown spacing of 12 feet, Reduce stocking to 80 BAF/ac, Target is understory stock <12 inches however larger trees may be taken in order to achieve desired BAF/ac, Prune

residual stand up 10 feet, Remove/chip/pile burn all slash and heavy downed fuels.

- 2) Sage and Grass: Mow all vegetation to a maximum height of 6 inches

Cost

Timber Thinning: 10 acres \* \$1,500 = \$15,000

Sage Mastication with Tracked Machine (due to slope =30%) 20acres \* \$125.00 = \$2,500

Sage Mowing with Brush Hog: 44 acres \* \$60.00 = \$2,200.00

Approx. Total Cost: \$ 20,140

Grants can be applied for to cover 50% of the costs, HOA and landowners should work with CSFS in applying. (Review grant section on pg 44)

- c. Escape route (High Country Rd, Ponderosa Trail, Quartz Hill Rd)  
Approximate Size: 29 ac  
Average % slope: 5-15  
Vegetative Cover Type 100% sage  
Width: 150'

Description: This escape route is located in the central south east area of the subdivision. The escape route will be utilized by multiple residents. The fuels in the area are dense and continuous sage with grass understory. The route covers High Country Rd, Ponderosa trail, and ending at CR 6 Y Y and onto CR # 38. It winds through several small drainages. Wildfires can be funneled up these drainages with extreme fire behavior. In the event of a wildfire this treated escape route will be essential to the residents in this area.

The following tracts will have to be involved in order for the fuel break to achieve its full potential. 3, 5, 7, 9, 30, BLM

\* Residents are encouraged to contact neighbors and remind them of the importance of these treatments for the overall safety of the community

Prescription according to fuel type

- 1) Sage and Grass: Mow all vegetation to a maximum height of 6 inches using brush hog type machinery.

Cost

Sage Mowing with a Brush Hog: 29 acres \* \$60.00 = \$1,740.00

Approx. Total Cost: \$1,740.00

\* Grants can be applied for to cover 50% of the cost, HOA and landowners should work with CSFS in applying. (Review grant section on page 44)



d. Escape route (Iris lane, Aspen Glen lane, Deer Play run)

Approximate Size: 32 ac

Average % slope: 5-15

Vegetative Cover Type 100% sage

Width: 150'

Description: This escape route runs along the most eastern lots of the subdivision. The road is at the top of a slightly graded hill (5% slope). In the event of a fire if this road has not treated. It will not be a safe place to travel during a wildfire emergency. The escape route will be utilized by multiple residents. The fuels in the area are dense and continuous sage with a grass understory. In the event of a wildfire this escape route will be essential to the residents in this area.

The following tracts will have to be involved in order for the fuel break to achieve its full potential. 17, 10, 15, 16, 21, 22, 24, 25

\* Residents are encouraged to contact neighbors and remind them of the importance of these treatments for the overall safety of the community

Prescription according to fuel type

- 1) Sage and Grass: Mow all vegetation to a maximum height of 6 inches using brush hog type machinery.

Cost

Sage Mowing with a Brush Hog: 32 acres \* \$60.00 = \$1,920.00

Approx. Total Cost: \$1,920.00

\* Grants can be applied for to cover 50% of the cost, HOA and landowners should work with CSFS in applying. (Review grant section on page 44)

\*\* Note: These escape route prescriptions are general and must be adapted to on the ground fuels and topography. Some areas might not need the entire recommended treatment size, while other may require increased fuel reduction. When ever possible treatments should follow the contour of the land in order to blend into the landscape, small islands of untreated vegetation can be left for aesthetics.

G. Safety Zone Locations (refer to ER/SZ map on pg 43)

1. Primary

Location: .25 miles north of subdivision on CR # 38

Vegetation: Sage w/grass understory

Maintenance: Sage reduction required every 10 years (Next maintenance due 2018)

Ownership: BLM

2. Secondary 1

Location: Junction of High Country Rd and CR 6 Y Y

Vegetation: Sage with grass understory and riparian species (willow, service berry)

Maintenance: Sage reduction required every 10 years (next maintenance 2018)

Ownership: Saguache County, Private

Capacity: 100 people w/ vehicles (est.)

3. Secondary 2

Location: Ponderosa Trail (1mile south of Gold Basin)

Vegetation: Sage with grass understory

Maintenance: Sage reduction required every 10 years. Currently this sight is in need of more sage reduction.

Ownership: Saguache county and BLM

Capacity: Currently 100 people with vehicles (est.)

4. Secondary 3

Location: Town of Iris

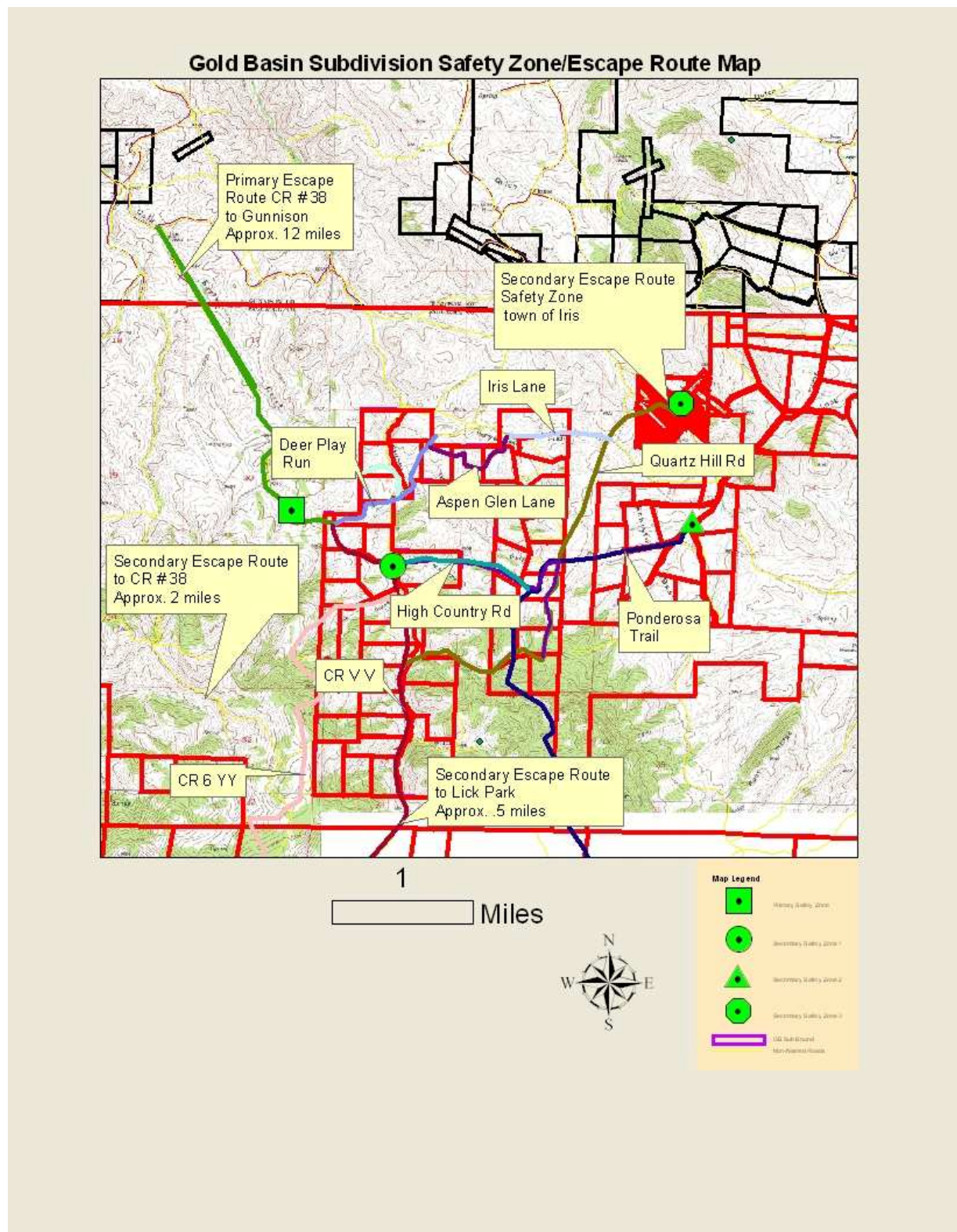
Vegetation: Sage with grass

Maintenance: Mowing required every 10 years

Ownership: Private and BLM

Capacity: 100 people and vehicles

## H. Gold Basin Subdivision Safety Zone/Escape Route Map





## I. Cost/Grants

Vegetation management is a costly procedure in the Gold Basin subdivision area. The average cost of small acreage timber fuels mitigation in the Gold Basin subdivision has been \$1500/acre. There are cost saving using a mechanized equipment verses a hand crew. However, steep slopes (40+% slope) can limit the use of heavy machinery. Most material removed from fuels mitigation projects is less than marketable, due to the small diameter of the wood removed. Generally during a fuels mitigation project the larger trees are not taken. The smaller diameter and suppressed understory trees are removed. Industries are not in place to utilize small diameter material. Most material is masticated on site or piled and burned.

Due to the high cost associated with fuels mitigation, funding for Gold Basin's large acreage mitigation projects needs to come from multiple sources. The first two sources are from within the subdivision, homeowner dues and volunteer hours. The third source of funding is grants. The main program that Gold Basin should try to take advantage of is the Western States Wildland Urban Interface Competitive grant (WSWUICG). The WSWUICG is a 50/50 type grant that comes from federal appropriations and is distributed through the state and private forestry branch of the USFS. These programs can be applied for through the local Colorado State Forest Service office. Competition is high and funds are not guaranteed for every applicant.

## J. Bureau of Land Management Land Prioritized Fuel Treatments (**BLM Treatment Map Pg 47**)

The Bureau of Land Management (BLM), Gunnison Field Office, has identified the Gold Basin Subdivision as a high priority for fuels reduction and forest restoration projects. Under the National Fire Plan, the BLM has developed a long term plan to treat hazardous fuels and restore the health of aspen and conifer stands near Gold Basin Subdivision. Not all of the future specific projects have been laid out or identified, an Environmental Assessment (#CO-160-2004-006EA) has been written for the Gold Basin CWPP area. The assessment has treatments or prescriptions written according to vegetative types.

The Gold Basin Fuel Reduction and Timber Stand Improvement Project attempts to address fire hazard and forest stand conditions on BLM lands that are directly adjacent to the Gold Basin subdivision. Treatments considered in this plan include brush removal, prescribed fire understory thinning of conifer stands and aspen regeneration cuts. Treatments will be implemented annually and will be dependent upon annual funding levels.

The prescription for sagebrush areas is a combination of mowing and prescribed fire. These brush treatments have a goal of creating patchy fuel breaks or a mosaic landscape. This type of treatment addresses both aesthetics concerns and safety. The patchy treatment gives the appearance of an untreated area, while still breaking up the continuity of the fuels. In the event of a wildfire, the treated areas will slow the spread of fire by reducing the fuel. The BLM has treated 288 acres of sage with in the Gold Basin WUI area.

Aspen are a very desirable species in a WUI setting. They have a moderate wildfire hazard when compared to conifer. Conifer needles contain volatile chemicals in its needles that ignite easily. This allows conifer trees to readily burn and spread rapidly. Because of their low tendency to burn, aspen are often used as anchor points for fuel breaks. Both prescriptions were designed to promote the longevity, health and low wildfire risk of the Aspen in the Gold Basin.

Aspen stands are a network of stems interconnected by a common root system. Generally they have a biological maturity age of 80-100 years. Once this age is reached the stand begins to show signs of decay (fungus, loss of crown density) and begins to decline. Once the stand is in a state of decline the central root system also begins to die. If the central root system dies the stand is lost and will never grow back. Because of the central root system aspen can be rapidly regenerated. Patch cuts will enable the root system to quickly re-sprout and regenerate the stand. This is the treatment that the BLM has prescribed for many of the Gold Basin WUI pure aspen stands that are in decline.

Over maturing stands of aspen are often susceptible to conifer invasion. This is when shade tolerant conifers grow in the understory of aspen. This vegetative mix is referred to as an aspen conifer mix. This mix can give a false sense of safety. As the conifer grows in the understory it makes dense and continuous fuels. Although the stand appears to be a moderate wildfire risk it is in fact a high to extreme risk. This is due to the crowning potential of conifer. The trees in the understory will carry fire which could spread to a more dangerous and receptive fuel. The BLM prescription for this fuel type will break up the continuity of the conifer component. It also addresses the general regeneration needs of the stands, referred to in the previous paragraph. The BLM is using a Fecon Bull hog grinding machine to regenerate 82 acres of the low country aspen (-9,000) stands. This is a more economical way of treating these stands than a hand crew.

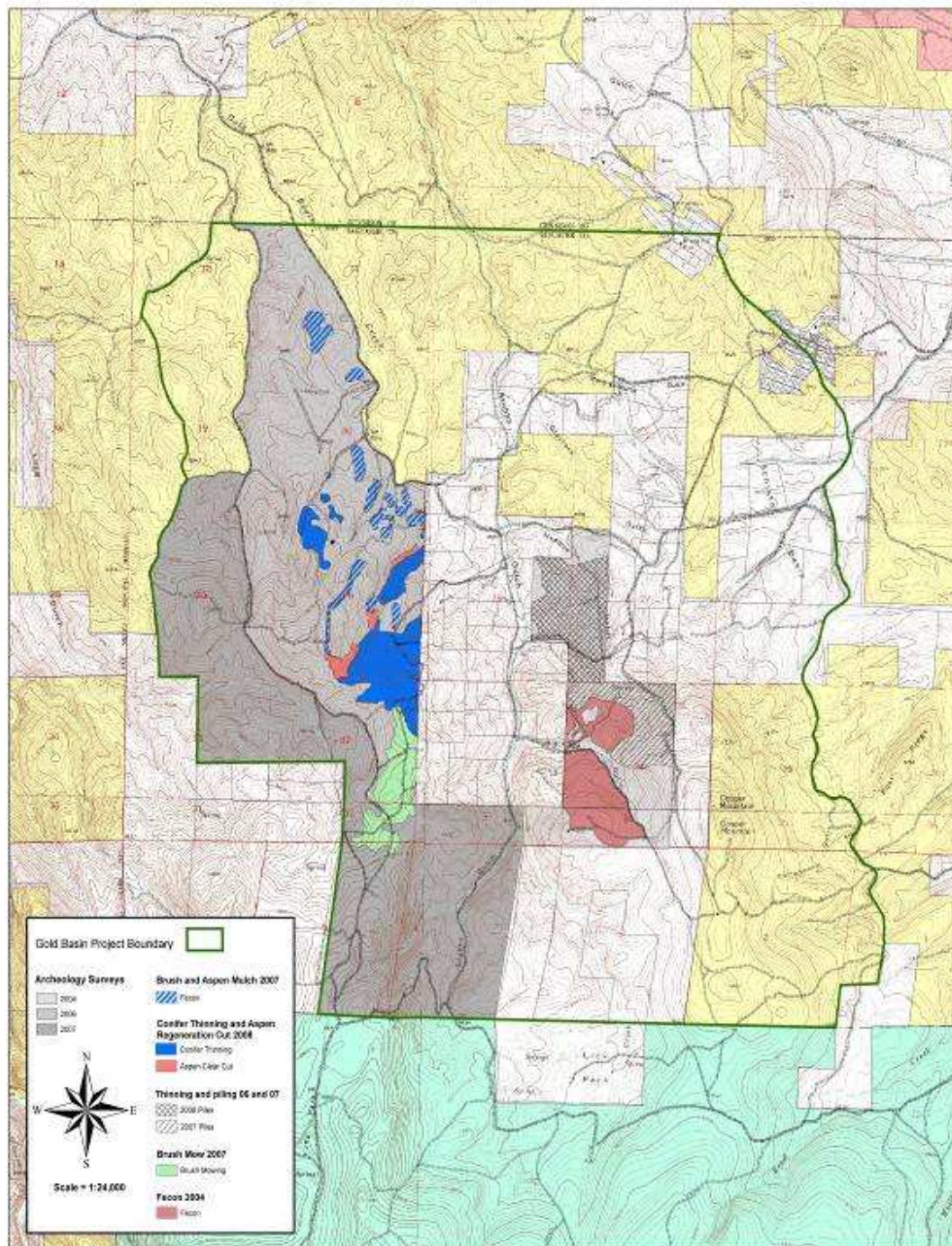
Douglas fir stands would be thinned from below, removing many of the small diameter trees (ladder fuels). This particular type of fuel predisposes the stand to crown fires. The small trees can allow a controllable ground fire to climb up into the crowns of trees. Reducing the contain ability of the fire, using conventional fire fighting methods. The residual stand will be thinned in order to break up the continuity of the fuels. The prescription calls for removal of 90% of conifer trees 8 inches or less growing under or within 20 feet of larger trees. Remove 20% of conifers that are 8-10 inch with the same spacing guidelines. In areas that are dominated by trees in the 8-10 inch class a 20 foot spacing guideline should be followed. All branches of residual trees should be limbed up 6 feet. Again this will decrease the ladder fuel effect. In conifer stands with aspen, conifer will be thinned to 20 foot spacing between stems. The BLM is treating 185 acres of Douglas fir in this manner. The project will be complete in the fall of 2008.

Fire is capricious and will always find the weakest link in your and the subdivisions' defenses. One of the ways that these breaches in wildfire defense can be avoided is through cross boundary treatments. This is where treatments are extended beyond the federal land boundaries and onto private ground. Mitigation treatments are most effective when anchored into less flammable areas (natural fire barriers, less

flammable vegetation or roads). Many times these are not always found on public property and the fuel breaks never achieve their full potential. It is then the duty of the adjacent landowner to step up and take an active roll in the safety of both themselves and the subdivision. Wildfire safety has to be a collaborative effort in order to have an end product that a fire will respect. The effort must be equally both on the public and private side. Refer to the fuel break map on [page 35](#) if your property is located with in one of the recommended fuel break areas then you are encouraged to contact the Colorado State Forest Service or your HOA in order to see how you can improve the safety of your subdivision.



## K. BLM Treatment Map



## APPENDIX 1

### DEFINITIONS

**Basil Area Factor (BAF)** is a method used to take a sampling of the volume in a given area. A prism is used that bends the light displacing portions of the tree bole. Each specific prism has a factor amount (10, 20, 40 ect.) which limits the amount of light bent. By looking at trees in a given area the prism show which trees to tally for a given sampling rate.

**CRITICAL FIRE WEATHER** is a set of weather conditions (usually a combination of low relative humidity and wind) whose effects on fire behavior make control difficult and threaten fire fighter safety.

**DEFENSIBLE SPACE** is an area either natural or human-made, where material capable of allowing a fire to spread unchecked has been treated, cleared or modified to slow the rate and intensity of an advancing wildfire and to create an area for fire suppression operations to occur.

**FIRE CHIEF** is the chief officer or the chief officer=s authorized representative of the fire department serving the jurisdiction.

**FIRE HAZARD** is a fuel complex defined by kind, arrangement, volume, condition and location that determines the degree of both ease and suppression difficulty.

**FIRE RESISTIVE CONSTRUCTION** is construction to resist the spread of fire. For descriptions , see the Building Code.

**FIRE WEATHER** is weather conditions favorable to the ignition and rapid spread of fire. In wildfires, this generally includes high temperatures combined with strong winds and low humidity. See ACritical fire weather.@

**FUEL BREAK** is an area, strategically located for fighting anticipated fires, where the native vegetation has been permanently modified or replaced so that fires burning into it can be more easily controlled. Fuel beaks divide fire-prone areas into smaller areas for easier fire control and to provide access for fire fighting.

**FUEL, HEAVY**, is fuel consisting of round wood 3-to 8 inches (76 to 203mm) in diameter.

**FUEL, LIGHT**, is fuel consisting of herbaceous plants and round wood less than 1/4 inch (6.4mm) in diameter.

**FUEL-LOADING** is the oven dry weight of fuels in a given area, usually expressed in tons per acre (T/A) (tons/ha) or in pounds per acre (lb/a) (kg/ha). Fuel loading may be referenced to fuel size or timelag categories, and may include surface fuels or total fuels.

**FUEL, MEDIUM** is fuel consisting of round wood 1/4 to 3 inches(6.4 to 76mm) in diameter.

**FUEL MODIFICATION** is a method of modifying fuel load by reducing the amount of nonfire-resistive vegetation or altering the type of vegetation to reduce the fuel load.

**FUEL MOSAIC** is a fuel modification system that provides for the creation of islands and irregular boundaries to reduce the visual and ecological impact of fuel modification.

**GREENBELT** is a fuel break designated for use other than fire protection.

**SLOPE** is the variation of terrain from the horizontal; the number of feet (meters) rise or fall per 100 feet (30 480 mm) measured horizontally, expressed as a percentage.

**URBAN-WILDLAND INTERFACE AREA** is that geographical area where structures and other human development meets or intermingles with wildland or vegetative fuels.

**WILDFIRE** is an uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures.

**WILDLAND** is an area in which development is essentially nonexistent, except for roads, railroads, power lines and similar facilities.



## APPENDIX 2

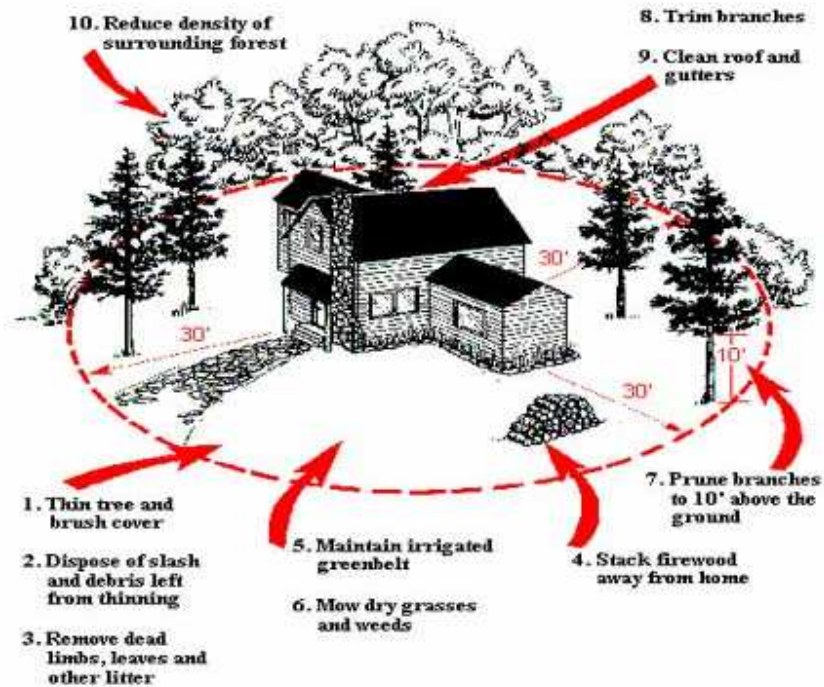
### DEFENSIBLE SPACE GUIDELINES

Definition: An area either natural or human-made, where material capable of allowing a fire to spread unchecked has been treated, cleared or modified to slow the rate and intensity of an advancing wildfire and to create an area for fire suppression operations to occur.

Goal : To provide an area from which fire suppression personnel can effectively operate during a wildfire.

- Action :
- a. Thin conifer trees so there is a minimum distance of 10 feet between tree foliage
  - b. Separate brush clumps from each other by a minimum of 10 feet.
  - c. Prune all tree limbs to a minimum height of 10 feet (pine, fir, spruce) or 4 feet (pinon, juniper), and remove all ground fuel below them.
  - d. Remove dead/downed wood and mow grass/weeds to a height of less than 4 inches.
  - e. Incorporate entire property, subdivision, and adjacent ownerships.

## 2A - Additional Defensible Space Information

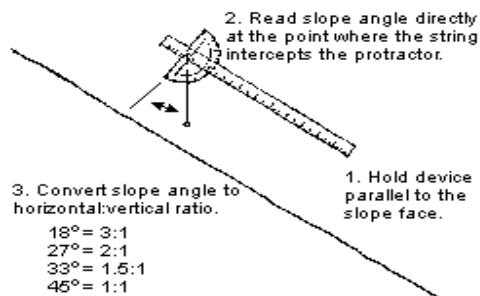


2B - You can create a simple tool out of household materials to help you determine your slope.

Materials:

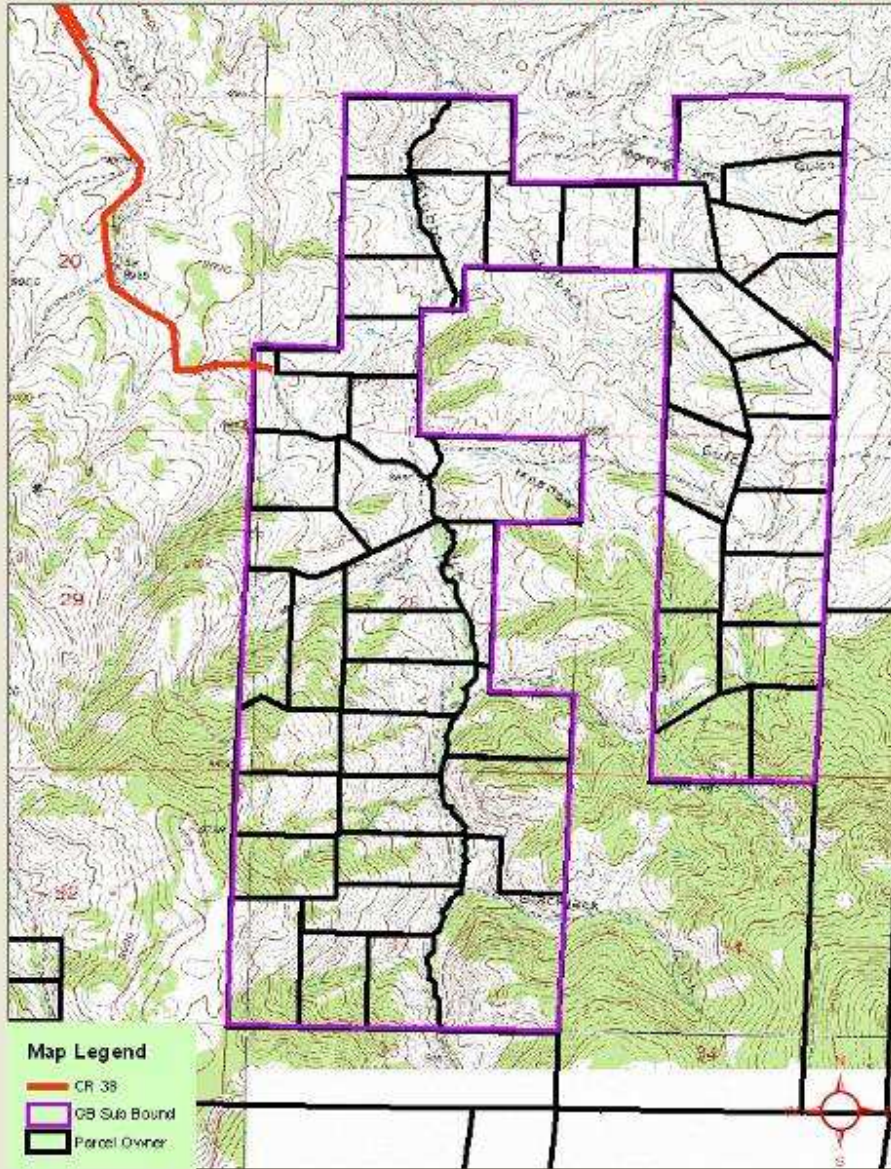
- Protractor
- String
- Weight (heavy washer or something similar)
- Yard or meter stick
- Scientific calculator

Tie the weight to one end of the string. Use the other end of the string to secure the protractor to the yardstick as the diagram indicates. Disregard step 3, instead take the slope angle in degrees and multiply it by tangent (using a scientific calculator), then multiply that number by 100 to get % slope.



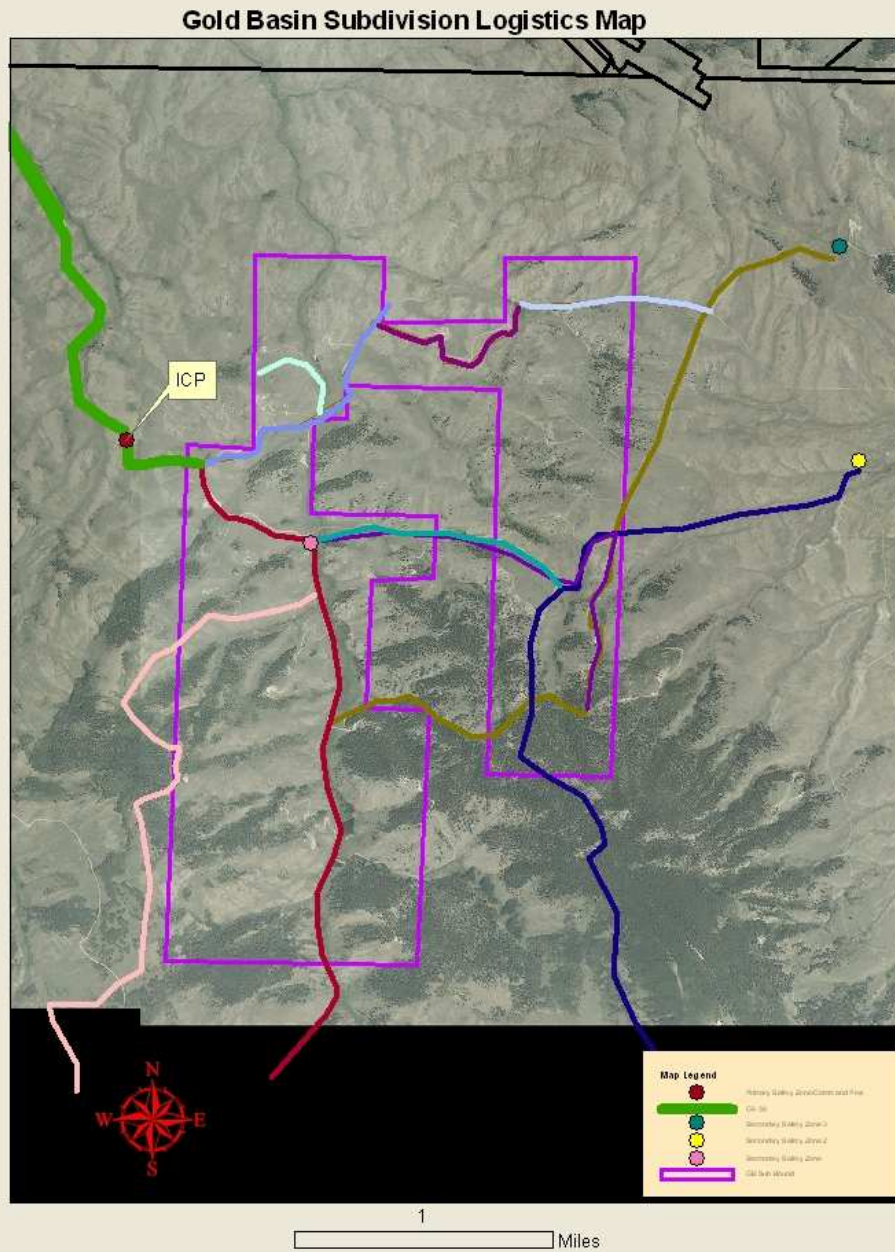
### APPENDIX 3

#### Gold Basin Subdivision 24K Topographic Map

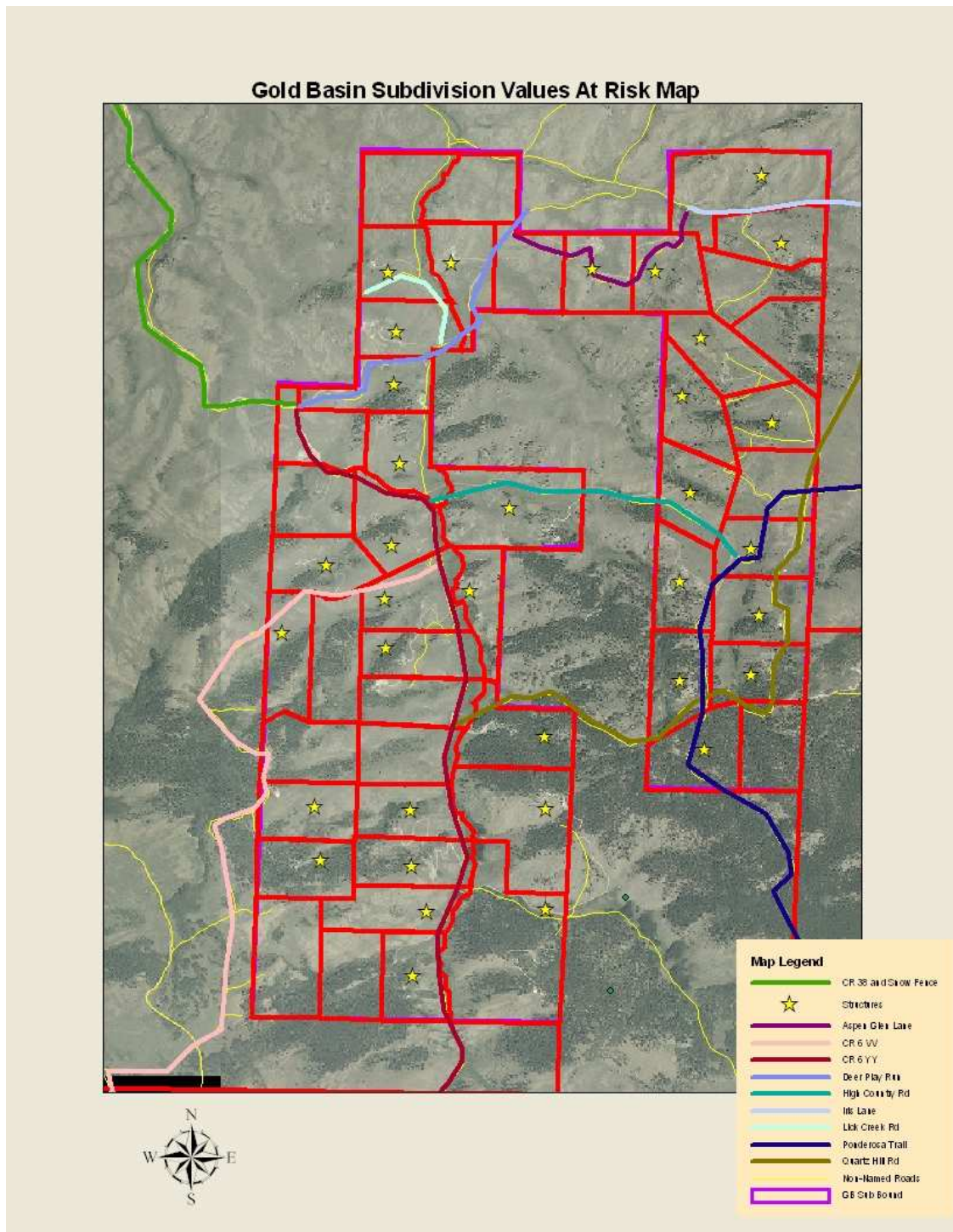




## APPENDIX 4

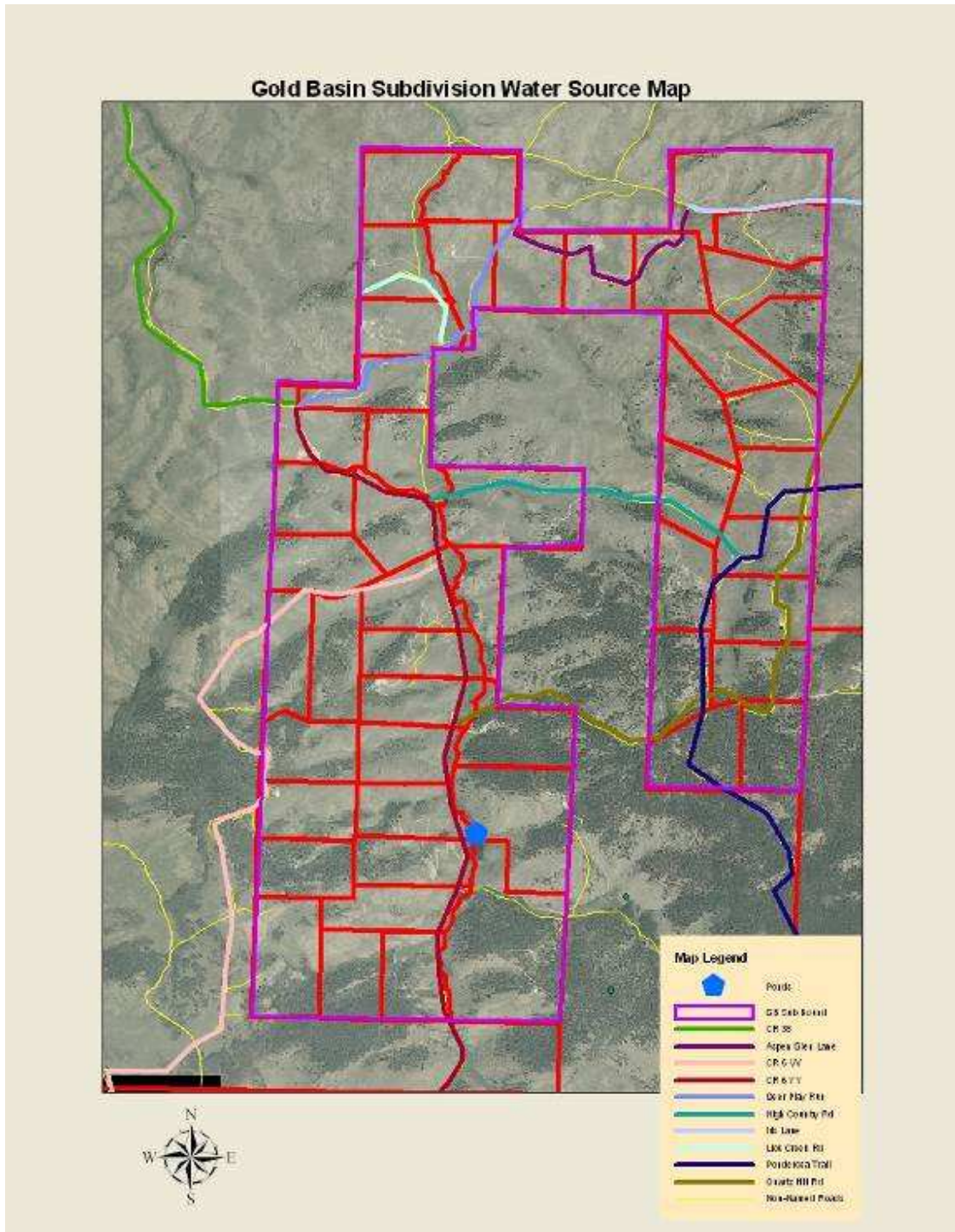


## APPENDIX 5





## APPENDIX 6





## APPENDIX 7

### Common Aspen Disease found in the Gold Basin Subdivision area

#### Cankers

Canker diseases are among the primary agents in Aspen mortality. The canker is a symptom of fungus. Generally it is an area of dark black discoloration with irregular folds of growth or areas of orange ooze. The fungus enters the tree through a wound and invades the inner bark and cambium. This is very important to remember when working around Aspen trees.

1. Sooty-bark canker: Description: Considered the most serious, for it tends to occur on larger trees (100+ yrs) and kills with in 3-10 years. Young cankers first appear on the bark as sunken oval areas. The bark killed each year by the fungus is readily apparent and begins to slough after 2-3 years. The dead inner bark crumbles to soot like residue. The outer bark sloughs faster in the central portion giving the tree a barber pole appearance.

2. Cryptosphaeria canker: Description: This fungus causes branch, sprout, and sapling mortality; trunk cankers; and discoloration. The cankers are long and narrow, spiraling around the tree like a snake, hence the common name "snake canker. Small trees may be killed within a year after infection. Large trees may have cankers that girdle branches and enlarge onto trunk. Bark near edges usually becomes discolored light brown to orange. The dead, black, stringy, soot like bark adheres tightly to the sapwood and contains scattered lens shaped, light colored areas.

3. Cytospora canker: Description: This fungus is weakly parasitic and normally attacks stressed trees. This canker is the most common one found. It is generally found with other more aggressive fungus. Small branches and twigs can be killed with out the formation of a distinct canker. Trunk cankers usually have an irregular outline, with sunken, orange discolored areas with orange ooze. The first indication of infection is the orange discoloration of the bark caused by wounds. After infection the inner bark turns dark brown and the sapwood underneath light brown. The dead bark falls off of the tree in large pieces after 2-3 years.

#### Aspen Heart Rot

This fungus produces a fruiting body called conks at branch stubs or wounds on the bole of the tree. Sporulation begins in late winter or early spring and can continue throughout the summer and fall when moist weather prevails. Airborne spores typically infect dead branch stubs and fresh wounds. This is again important to remember when working around aspen especially in damp weather. Fungal growth results in a yellow-white rot with brown or black zone lines traversing decayed wood. The fruiting body or conks are hoofed shaped with gray, or brown upper surface and tan to white lower pore. The presence of conks is indicative of significant stem decay.

1. *Phellinus tremulae*: Description: Produces perennial fruiting bodies or conk. The conk is a hoofed shaped fungus with orange and black coloration. The presence of the conk is indicative of significant stem decay. Trees with fruiting bodies should be monitored closely especially around structures, due to there unsoundness.

APPENDIX 8  
Common conifer insects found in Gold Basin Subdivision area

## Bark Beetle

Bark beetles are the most destructive insects in the western coniferous forest. Adult bark beetles bore through the outer bark to the inner cambial layer, where they channel out galleries in which to lay eggs. Larvae hatch in these galleries and may excavate additional channels as they feed. As bark beetles carve out galleries they introduce blue-stain fungi. This fungus grows in the wood interfering with the tree's water transport system. Tree deterioration and eventual mortality result from two factors. 1) tree girdling caused by gallery excavation 2) spread of blue stain fungi. Infested trees can be recognized at a distance by fading foliage high in the tree, initially a light green, changing to a light straw color in a few weeks, and eventually to a yellowish brown. Close inspection may show a fine red-brown dust in the bark crevices and at the base of the tree trunk. Cream to dark red pitch tubes, resin mixed with boring dust, 1/4-1/2 inches in diameter, are an indication of a successful bark beetle attack. In some cases where the number of attacking beetles is low, the tree may have sufficient resin available to eject the attacking beetle by extruding resin at the attack site (pitching out). Pitch tubes of whitish resin 3/4" long. The "pitching out tube" is void of boring dust, because the beetle was unsuccessful.

Bark beetles are a natural part of the ecosystem. In Gold Basin subdivision the beetles are found in endemic levels. The beetles attack weak and suppressed trees. The best preventative approach is a proactive one. This involves managing the forest through thinning. Thinning improves the vigor of the residual stand. Vigorous trees have a better chance of not attracting beetles and also defending themselves during attacks.

### Common Bark Beetles found in the Gold Basin Subdivision Area

#### 1. Douglas fir bark beetle (*Dendroctonus pseudotsugae*)

Description: Adult beetles are 1/4 inch long. Some individuals are all black; others have black head and thorax with reddish brown wing covers. The beetle prefers two situations: large diameter over mature trees and stressed suppressed trees. Douglas fir bark beetles prefer trees >8 inches diameter. The beetles spend winter as either large larvae or adults under the bark. Adults typically begin emerging in late April and May but over 75% of the population emerges the last three weeks of June.

Management: On a small scale (5-10 trees) preventative spraying can be effective. The spray should be applied in late April in order to accommodate for any early developers. On a large scale the best approach is a proactive one. This involves managing the forest for a vigorous stand. Thinning the forest to the correct stocking will increase the chances of not attracting the beetle (low stressed/suppressed tree amounts). It will also increase the chances of your forest defending itself against an attack.