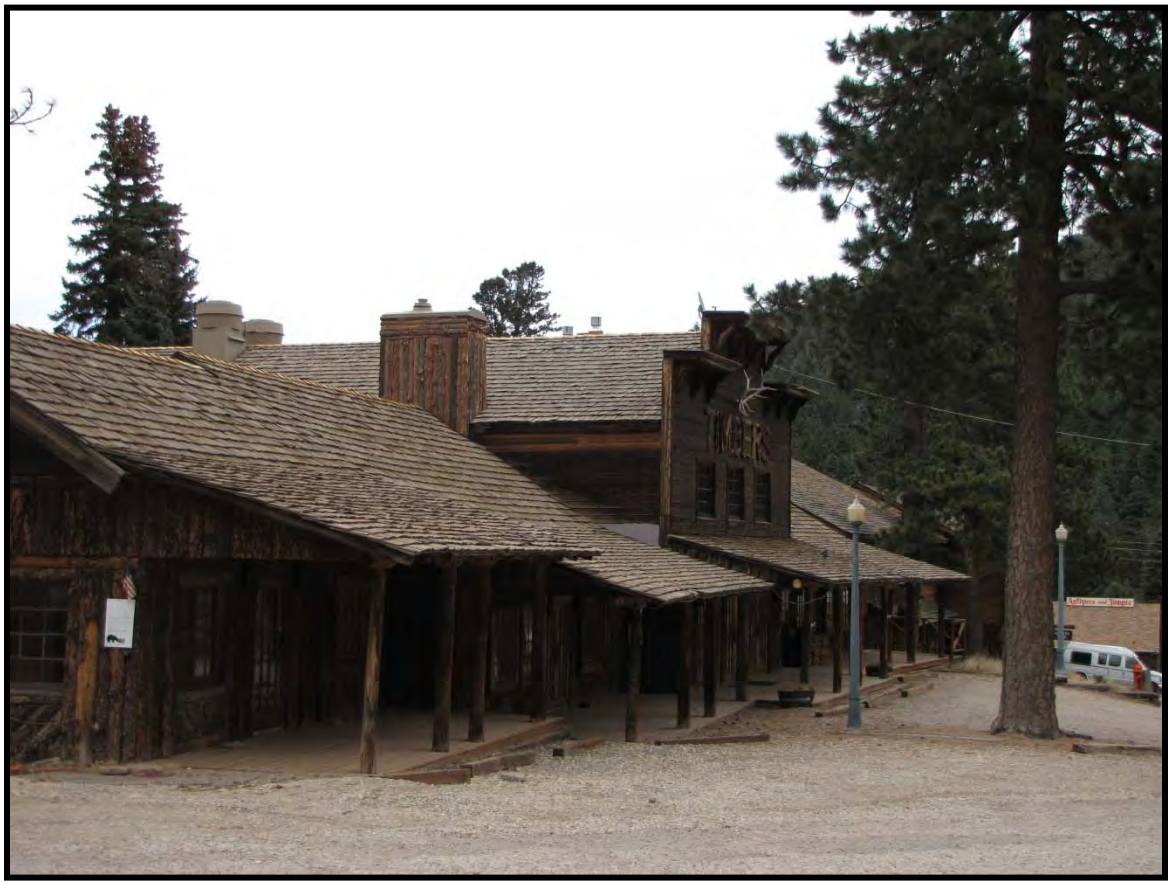
La Veta Fire Protection District

(LVFPD)

Community Wildfire Protection Plan



FOREST STEWARDSHIP CONCEPTS, LTD.

Signature Page:

_____	_____
LVFPD Chief	Date
_____	_____
LVFPD Board President	Date
_____	_____
CSFS District Forester	Date
_____	_____
BLM Fire Mitigation & Education Specialist	Date
_____	_____
San Isabel NF, District Ranger ~San Carlos RD	Date
_____	_____
Huerfano County Sheriff	Date
_____	_____
Huerfano County Commissioner	Date

Community Wildfire Protection Plan
LVFPD

Table of Contents:

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:

LVFPD lies in south central Colorado and contains the headwaters of Cucharas River. On average it is twelve miles wide and twenty one miles long covering 227square miles or roughly 145,000 acres.

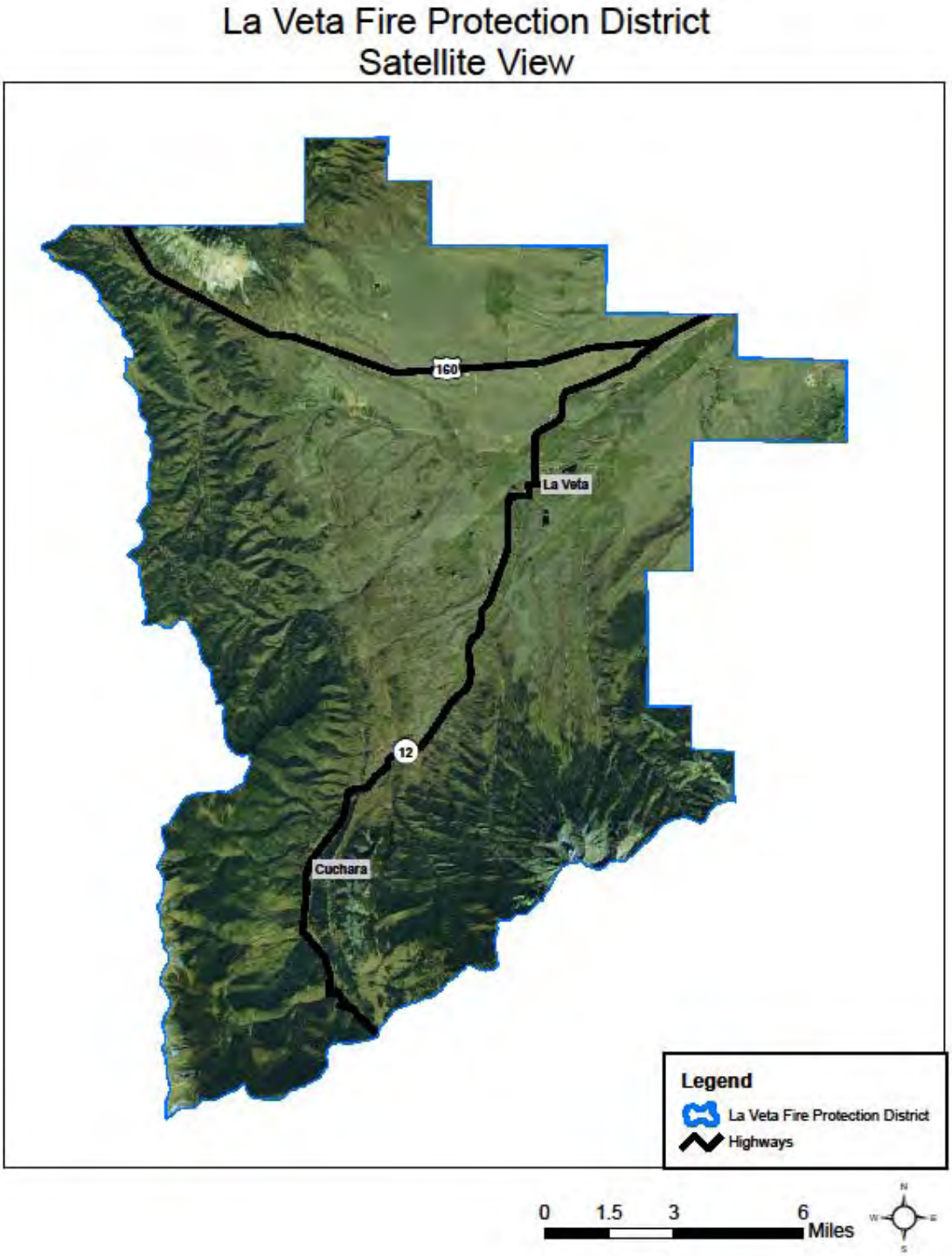
There is an average of 300 days of sunshine with 16 inches of precipitation per year. Mean temperatures range from 15° F in January to 65° F in July. Elevations run from 13,626 feet at the West Spanish Peak to 6600 at the Cucharas River on the eastern District boundary.

The La Veta Fire Protection District is 35% public land with 65% in private ownership. Most of the private land is associated with lower elevation rangeland within the Cucharas River watershed, as well as, developments adjacent to US HWY 160 & HWY 12. Public lands in the area consist primarily of rugged higher elevation forest lands.

Table 1: LVFPD Landownership

Ownership	**Acres**	**%**
Private	93,669	65
Bureau of Land Management	6,160	4
US Forest Service	42,177	29
Colorado State Land Board	3,247	2
Total	**145,253**	**100**

LVFPD Vicinity Map



US Hwy. 160 and State Hwy 12 provides primary paved access with numerous high quality County gravel roads providing access to the various neighborhoods. Road quality within subdivisions ranges from good to poor. Driveway quality varies dramatically.

The initial CWPP Core Team meeting was held on April 21, 2011. Participants included the Chief and personnel from La Veta Fire Protection District, and representatives from, Colorado State Forest Service, Bureau of Land Management, and US Forest Service.

The Core Team reviewed the overall wildland fire protection situation in LVFPD and discussed issues, concerns and opportunities. WUI boundaries were delineated on a map. (Table 2 lists the WUIs and acreage for LVFPD.) Wildland resource inventories were discussed. The Core Team met again on August 15th to refine the draft CWPP and assure universal support and commitment to the actions outline in the plan.

Table 2: Wildland Urban Interface Communities - LVFPD

WUI Name	Acres
Cuchara	744
Cuchara Pass Ranches	449
Hwy 12 Corridor	8,891
Hwy 160 Corridor	8,393
Indian Creek	5,501
Little Kansas	352
Middle Creek	10,594
Panadero	957
Pine Haven	181
Raspberry Mountain	3,173
Spanish Peaks	957
Tres Valles	1,206
Wahatoya/School Creek	6,596
Total Acres	**50,320**

Stakeholders Meetings & Questionnaires

Interested parties meetings were held in Cuchara on August 15th and in La Veta September 22nd 2011. Participants discussed community wildfire planning issues and reviewed maps of the WUIs showing triaged structures and fire control features in each area. Participants were encouraged to complete a survey on wildfire hazards and mitigation opportunities. Table 3 displays survey results.

Table 3: CWPP Survey Summary

14 Surveys turned in.

How many acres is your property?

Under 1 acre = **10** 1-20 acres = **2** 21-40 acres = **2** 41-100 acres = 0

Over 100 acres = 0

1. How would you describe the type of land that you live on/own? *(Please check all that apply)*
   - ☐ The majority of my property is in forested land. = **10**
   - ☐ My property has lots of oak and/or brush fields. = **2**
   - ☐ The majority of my land is open, with irrigated pastures. = **1**
   - ☐ My property abuts or includes a river or creek. = **0**
   - ☐ My property abuts federal lands (BLM ,US Forest Service) = **3**
   - ☐ I live on/own a small lot in a fairly populated neighborhood. = **5**

2. If your property abuts federally managed lands, please answer the following questions:

Has this federal property been thinned of hazardous fuels?	Yes **= 0**	No **= 7**	DK **= 2**
Has the condition of this federal land influence your decision to thin or not thin overgrown hazardous fuels on your property?	Yes **= 5**	No **= 1**	DK **2**

3. I am personally worried that my property faces serious risks from wildfires.
   Strongly Agree = **9** Somewhat Agree = **5**

4. Do you feel private landowners have a responsibility to reduce fire hazards on their land?
   YES = **14**

5. Which of the following statements ***comes closest*** to your views? *(Please check one below)*

   Forest fires are part of nature. We need to protect communities from fires, but in remote areas we should let fires burn and let nature take its course. = **12**

   Forest fires are unpredictable and dangerous, We need to contain and extinguish fires as soon as they are discovered. = **1**

6. Have you created a "defensible space" around your home? (A defensible space is an area around a home where combustible vegetation that can spread has been cleared, reduced, or replaced.)

   Yes, I have created a "defensible space" or am in process of doing so = **10** No = **4**

7. If you have created a "defensible space" please indicate the importance of the following factors were in motivating you to do this work:

	Very Important	Moderately Important	Slightly Important	Not Important	NA
Personal Safety	**9**	**2**			
Home or property protection	**8**	**3**			
Responsibility as a property owner	**9**	**2**			
HB1110 Income Tax Deduction for wildfire mitigation	**1**	**1**	**1**	**5**	**2**
Aesthetics	**2**	**7**	**1**	**1**	
Example of neighbors	**1**	**3**	**3**	**3**	**1**
Restoration of forest health	**6**	**3**	**2**		
Recent fire events	**3**	**3**	**3**		

8. Have you maintained your "defensible space" over time by doing annual thinning or clean up?
   YES = **7** NO = **2** Not applicable = **2**

9. If you *have not* created a "defensible space" or fuel reduction treatments around your home, please indicate which of the following feelings or reasons influenced this decision:

	Yes	No	NA
Personal safety is not at risk			**2**
Personal property not at risk			**2**
Neighbors/adjacent landowners not doing work	**1**		**2**
Visual impact of treatments	**1**		**2**
Concern for wildlife			**2**
Unsure of how to complete the work	**2**		**2**
Unable to find people to do the work	**1**		**2**
Work was unaffordable	**1**		**2**
Insufficient time to complete work			**2**
No home on property			**2**

10. Have you had a "home assessment" of your property for wildfire risk? YES = **4**
    NO = **10**

11. If you have had a "home assessment", who completed the assessment? *(Please check one below)*
    Local Fire District = **4**

12. Did you find this "home assessment" helpful and informative? YES = **3** NO = 0 NA= **2**

13. Please indicate any other types of fire protection measures you have taken for your home or on your property:

	Yes	No	NA
Pruned or removed trees beyond my defensible space zone	**11**	**2**	
Relocated wood pile	**7**	**6**	
Cleaned leaves, pine needles, debris from roof, gutters or yard	**7**	**2**	**2**
Regularly mowed grass or cut weeds	**11**	**2**	**1**
Used fire-resistant plants for landscaping	**2**	**6**	**4**
Used, or installed, fire-resistant building materials	**11**	**1**	**1**
Created and maintained a fire fuel break	**3**	**8**	
Provided additional water supply	**2**	**9**	
Other:			

14. Please indicate how serious a problem you think each of the following in your area:

	Extremely Serious	Very Serious	Somewhat Serious	Not Serious	NA
Smoke from wildfires	**5**	**4**		**3**	
Fire management in forest and public lands	**5**	**3**	**4**		
Too much logging in forests				**6**	**5**
Poorly planned rural growth/development	**3**	**2**	**3**	**2**	**1**
Destruction by uncontrollable wild fires	**7**	**3**		**1**	**1**
Smoke from prescribed fire treatments		**1**	**5**	**2**	**3**
Loss of forest land	**3**	**4**	**1**	**2**	**1**
Climate change	**1**	**5**	**3**		**2**
Loss of habitat for fish and wildlife	**3**	**2**	**6**		
Insects and diseases that kill trees	**4**	**6**	**2**		
Decreasing supply of clean water	**4**	**4**	**3**	**1**	
Invasive weeds	**1**	**6**	**4**	**1**	

15. Have you ever been evacuated due to a wildfire? YES = **1** NO = **13**

16. Does your family have an evacuation plan? YES = **7** NO = **7**

17. If you do have an evacuation plan, does it include your pets and/or livestock? YES = **4** NO = **1** NA = **7**

18. Please indicate whether you agree or disagree with the following statements:

	Strongly Agree	Somewhat Agree	Somewhat Disagree	Strongly Disagree	NA
During large, severe fires near homes, there are times when a firefighter may have to let a home burn if no lives are at stake.	**11**	**2**		**1**	
During large, severe fires near homes, firefighters should do everything they can to try and save all properties.	**1**	**1**	**5**	**7**	

19. Please indicate your top 3 sources of information about forest conditions and/or wildfires:

	Rank only 1, 2, and 3
Newspaper	1=**1**, 2=**2**, 3=**2** Total = **5**
Radio	1=**1**, 2=**1**, 3=**1**, Total = **3**
TV	1=**2**, 2=**4**, Total = **6**
Internet	1=**4**, 2=**1**, 3=**1**, Total = **6**
Newsletter received in mail	2=**1**, 3=**1**, Total = **2**
Brochure or pamphlet	3=**3**, Total = **3**
Booth at event or market	3=**3**, Total = **3**
Neighbors	1=**1**, 2=**1**, 3=**1**, Total = **3**
Home Owners Association	1=**1**, 2=**3**, 3=**2**, Total = **6**
State or federal agencies	1=**3**, 3=**1**, Total = **4**
Public meetings	1=**4**, 2=**3**, 3=**1**, Total = **8**
Classes and/or seminars	1=**1**, 3=**1**, Total = **2**

20. Please indicate the top 3 needs in Southern Colorado:

	Rank only 1, 2, and 3
Public safety-traffic	**0**
Public safety-other	**0**
Transportation	**0**
Environmental protection	1=**4**, 2=**2**, 3=**2**, Total = **8**
Limits for land development	2=**1**, 3=**2**, Total = **3**
Increase in land development	3=**1**, Total = **1**
Sustainable water supply	1=**4**, 2=**6**, 3=**1**, Total = **11**
Jobs/economic development	1=**5**, 2=**3**, 3=**1**, Total = **9**
Biomass utilization	2=**1**, Total = **1**
Education	1=**1**, 2=**2**, 3=**2**, Total = **5**
Medical services	3=**5**, Total = **5**
Other:	**0**

COMMUNITY ASSESSMENT:

The overall wildfire risk within LVFPD varies from high to extreme depending upon a wide variety of factors. This section will discuss the facets considered that led to the overall ratings.

Risk of Ignition and Wildfire Occurrence

Eight wildland fires have burned on federal lands within the LVFPD since 1994. Of those five were 0.1 acres in size, one was 0.2 acres, one was 3.5 acres and one 10 acre fire are found in the reports. There have been several large fires in close proximity to the district in the past ten years, most notably Mauricio Canyon 3,850 acres, Mato Vega 13,937, and the Bear, Track and Purgatoire fires this year.

This small snapshot of wildfire activity is deceiving. Fires have been a part of the landscape of LVFPD since lightning and dry biomass have 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 lightning combined with drought to create the vegetative mosaic we enjoy today.

The San Luis and Rio Grande Railroad traverses the LVFPD on its way over La Veta Pass. The steep grade of the railroad and lush vegetation along the grade makes it a very likely source of ignitions.

Fire Regime & Condition Class

The natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human intervention, but includes the influence of aboriginal burning. The five natural (historical) fire frequency regimes are classified based on average number years between fires (fire frequency) combined with the severity (amount of replacement) of the fire on the dominant overstory vegetation. These five regimes include:

FIRE REGIME GROUP	FREQUENCY (FIRE RETURN INTERVAL)	SEVERITY
I	0 – 35 years	Low severity
II	0 – 35 years	Stand replacement severity
III	35 – 100 + years	Mixed severity
IV	35 – 100 + years	Stand replacement severity
V	>200 years	Stand replacement severity

A fire regime condition class (FRCC) is a classification of the amount of departure from the natural regime. The classification is based on a relative measure describing the degree of departure from the historical natural fire regime. This departure results in changes to one (or more) of the following ecological components: vegetation characteristics (species composition, structural stages, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity, and pattern; and other associated disturbances (e.g. insect and disease mortality, grazing and drought). There are no wildland vegetation and fuel conditions or wildland fire situations that do not fit within one of the three classes.

The three condition classes are based on low (FRCC 1), moderate (FRCC 2), and high (FRCC 3) departure from the central tendency of the natural (historical) regime. Low departure is considered to be within the natural range of variability, while moderate and high departures are outside. Features of each condition class are defined through a qualitative description of the current state of five key ecosystem attributes: (1) disturbance regime; (2) effects of disturbance regime; (3) potential production of smoke emissions; (4) hydrologic function; and (5) vegetative composition, structure and resilience.

Condition Class 1

The historic disturbance regime is largely intact and functioning as defined by the historic natural fire regime. The effects of insects and disease as well as the potential intensity and severity of the fire are within historic ranges, but are increasing with the length of current fire return interval. Smoke production is relatively frequent, but is low in volume and short in duration. The hydrologic functions are within normal historic range. Vegetative composition and structures are resilient to disturbances from wind, insects, disease, or fire and do not predispose the stand or its key components to a high risk of loss.

Condition Class 2

Moderate alterations to the historic disturbance are clearly evident, such as one or more missed fire return intervals. The effects of insects and disease as well as the potential intensity and severity of fire pose an increased threat to key components that define the ecosystem. Smoke production has increased both in volume and in duration and has increased potential to affect health and visibility values. Riparian areas and their associated hydrologic functions show measurable signs of adverse departure from historic conditions. Both the composition and structure of vegetation has shifted towards conditions that are less resilient and are therefore more at risk to loss from wind, insects, disease, or fire.

Condition Class 3

The disturbance regime has been significantly altered and historic disturbance processes and effects may be precluded. The effects of insects, disease, or fire may cause significant or complete loss of one or more defining ecosystem components. Episodic smoke production is unpredictable and of high volume and long duration, posing significant impacts to human health, safety and societal values. Hydrologic functions

may be adversely altered, with significant increases in sedimentation potential and measurable reductions in stream flows.
The highly altered composition and structure of the vegetation predispose the stand or ecosystem to disturbance events well outside the range of historic variability, potentially producing changed environments never before measured.

As described above, fire frequency or intervals between fires on a landscape play an important role in determining what vegetation will be in place and what condition it will be in. LVFPD has a significant range in elevation, aspect and hence a wide variety of fire regimes and condition classes. Overall their fire frequency has been altered significantly since European settlement. Ponderosa pine forests have experienced the most alteration of fire regime and condition class and are most prone to burn intensely. Many mixed conifer stands are similarly out of sequence. Pine and mixed conifer stands are in Condition Class 3. Spruce stands have been less impacted due primarily to the less frequent fire occurrence at higher elevations. Spruce stands are in Condition Class 1.

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. For instance; white fir seedlings and saplings are much more abundant in the understory of the pine and mixed conifer forests found in the LVFPD. They create a fuel ladder that easily moves fire from the ground into the crowns of the larger overstory trees. Similarly oak is much thicker and taller creating similar fuel continuity issues.

Examples include:

Large wildfires are not unusual in the area. The 2011 Track fire in Las Animas County burned 27,800 acres while this CWPP was being developed. The Mauricio Canyon Fire burned 4,500 acres. The Morley fire burned 300 acres and was followed by Morley fires 2 & 3. The fire season of 2002 provided a serious wake up call to Colorado residents living in forested/wooded landscapes. The Crazy French (300 acres), Spring (33,000 acres) and James John (6,800 acres) fires were all in the vicinity. These fires increased awareness of the hazards of living in a wildland setting.

The Million Fire of 2002 burned over 11,000 acres in Rio Grande County and destroyed 33% of the structures in Willow Park subdivision. The Missionary Ridge fire burned 70,480 acres and destroyed 83 structures. The Sand Dunes Fire of 2000 burned over 8,500 acres in one burning period and destroyed one structure in Great Sand Dunes National Park & Preserve (GSDNPP). The 2006 Mato Vega fire burned 13,900 acres just west of the LVFPD. The 2010 Medano wildfire in the Great Sand Dunes National Park & Preserve burned over 6,200 acres. These fires are instructive for LVFPD due to their

steep terrain and dense forest cover. Many of these fires perimeters were dangerous due to rolling rocks and the lack of safety zones.

Fuel Hazards

Low fuel moistures and low relative humidity are common in the area, as are periods of high winds. When dry and 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 areas 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 under extreme drought conditions.

Areas classified as high to moderate fuel loading are the most worrisome. Table 4 provides fire behavior predictions for several fuel models under representative weather conditions common during fire season in the LVFPD.

Table 4: LVFPD Fire Behavior Predictions

FUEL MODEL	**RATE of SPREAD** (ft/hr)	**FLAME LENGTH** (Feet)	**SIZE @ 1 HOUR*** (Acres)	**PERIMETER @ 1 HR. (Miles)**	**SPOTTING DISTANCE** (Miles)	**RESISTANCE TO CONTROL**
1	12,630	7	1200	5.7	0.6	Low
2	5,106	10	190	2.3	0.6	Moderate
4	8,897	27	590	4	0.6	High
5	2,864	8	61	1.3	0.6	High
6	4,210	9	132	1.9	0.6	High
8	257	2	.5	0.1	0.6	Low
9	1,148	4	10	0.5	0.6	Moderate
10	1,010	7	8	0.4	0.6	Moderate
11	712	5	4	0.3	0.6	High

*Note: Flame lengths shaded in orange exceed the 4 foot hand crew control threshold. Crown fires are likely when canopy closure exceeds 40%. *Assumes little, if any, effective suppression action occurs within the first hour.*

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. Mixes of oak brush and various conifers are represented by fuel models 4, 5 & 6. Short needled stands of piñon, Douglas fir, and spruce 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. Fuel model 9 also represents aspen, oak and cottonwood stands in the fall while the fresh leaf litter layer is fluffy. Conifer stands with dead/down stems are usually classified as fuel models 10 and 11. Fuel model 11 will have more loading of the dead material on the ground.

Dense oak, fir and spruce stands cover mountainous portions of the planning area while grass and shrub types are found at lower elevations. WUI areas cover the full spectrum of fuel hazards.

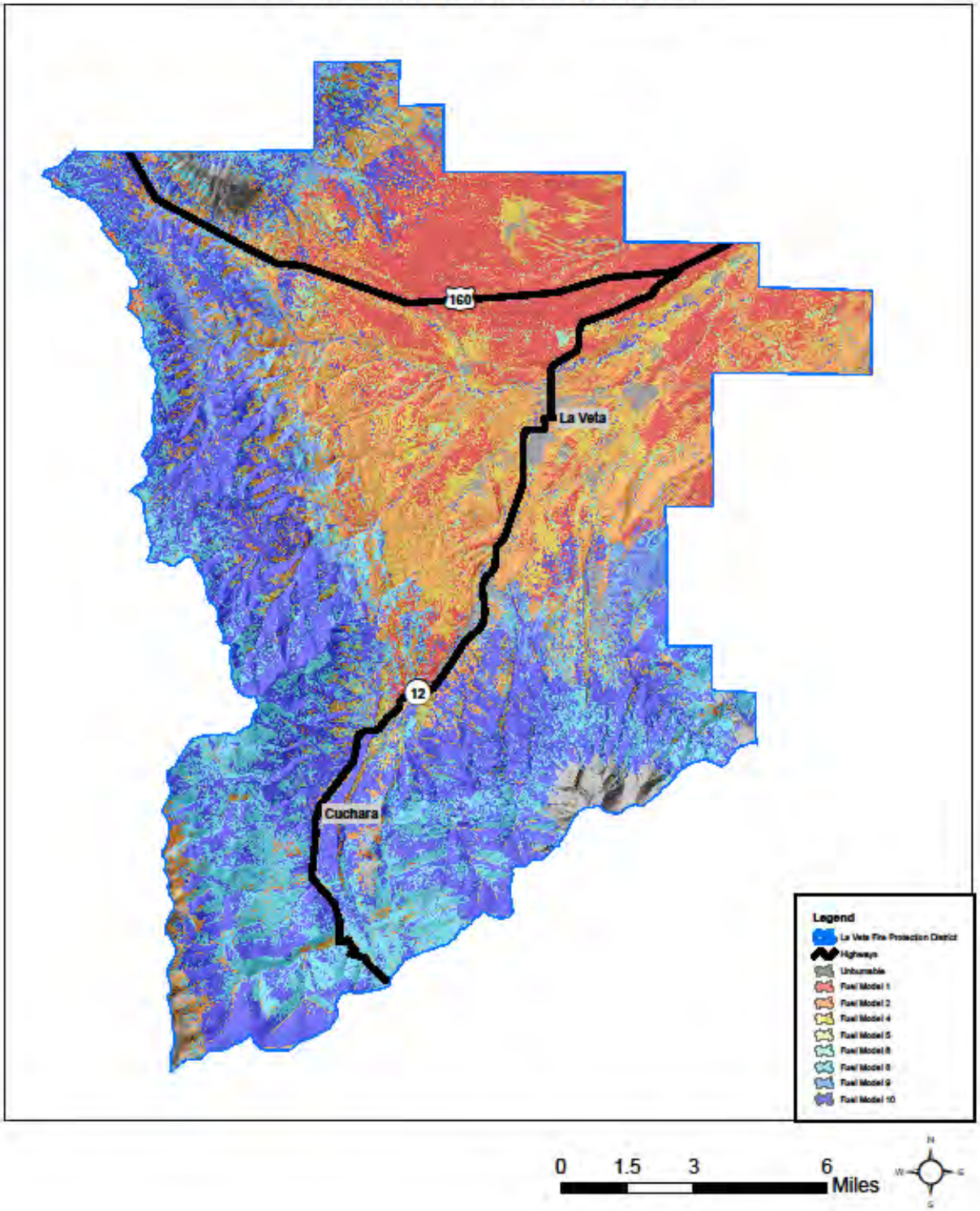
Foothills grass and shrub fuel loadings are best represented by fuel models 1, 2, 4, 5, and 6. Fires in the denser grass and shrub types can be very difficult to control on the typical dry, windy afternoon common in the region. (See Appendix B for a full discussion of Fuel Models.) Fuel models associated with high elevation WUIs include 1, 2, 8, 9, 10 and 11.

All forest stands adjacent to structures with crown densities greater than forty percent are problematic. Continuous surface and crown fuel arrangement, both horizontally and vertically, render this area susceptible to torching, crown fire, and ignition by embers, even under moderate weather conditions.

The maps showing LVFPD WUIs, Wildfire Hazards and Fuel Models indicate the majority of the WUIs have a fuel hazard assessment of high to extreme. Local topography and poor vehicle access further aggravates fire behavior and control.

Steep slopes and shrub ground cover means rapid fire spread and high fire intensities in many WUIs.

La Veta Fire Protection District
Fire Behavior Fuel Models



Community Values at Risk

Values – There are thirteen communities, "neighborhoods", or subdivisions with concentrated home sites that make up the Wildland Urban Interface areas in LVFPD. Table 5 gives a summary of the WUI wildfire hazard evaluations. Many have heavy fuels nearby and within them. Others have rather light fuels in their vicinity.

Eighty six percent of the structures in these WUIs are not expected to survive a wildfire in their vicinity. Many have flammable material nearby, 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 I: Subdivision Hazard Evaluation Form.)

Table 5: WUI & Priority for Mitigation

High	Extreme
Hwy 12 Corridor = 11	Cuchara = 2
Hwy 160 Corridor = 12	Cuchara Pass = 9
Tres Valles = 10	Indian Creek = 4
Wahatoya/School Creek = 13	Little Kansas = 3
	Middle Creek = 6
	Panadero = 7
	Pine Haven = 1
	Raspberry Mtn. = 8
	Spanish Peaks = 5

Watershed Values – Most domestic water in LVFPD comes from the Cucharas River, which provides municipal water for Cuchara, La Veta and Walsenberg. Watershed issues following a large wildfire manifest themselves in stream sedimentation with attendant fisheries problems or reservoir capacity reduction and flooding which may impact individual residences, businesses, roads, bridges and culverts. Given the rocky, heavily forested, narrow drainages common to several of the WUIs significant flooding can be expected following any large wildfires in the fire protection district.

Access – The primary and secondary road access within LVFPD is good. Driveway 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. There are many dead end roads that are very hazardous during wildfire operations and evacuations.

Risk – Because survivable space is lacking around most home sites it will be very difficult to protect them from wildfire during periods of high to extreme fire danger. Risk to firefighters trumps structure protection every time.

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. Appendix D Evacuation Planning Guidelines provides location of evacuation routes and other fire control features including safety zones, and guidelines for developing an evacuation plan. The Huerfano County Office of Emergency Management is presently formulating a county wide notification and evacuation system. LVFPD is participating fully in this endeavor.

In many cases sheltering in place may be a better option than attempting to notify and evacuate the occupants of sparsely developed areas with only one way in or out.

Once a family realizes their best option for surviving a wildfire is staying home they look at their property differently. To shelter in place one must have a good safety zone around their home and a very fire resistant structure. Fire shutters and cisterns are the norm. Once the flaming front passes, the occupants can go outside and take action on any smoldering embers near the structure.

Local safety zones are an alternative to evacuation that needs to be considered for areas where notification of occupants is time consuming and fire spread rates are high. We recommend the creation of at least one safety zone per WUI, including the HWY 12 and HWY 160 Corridors. We further recommend hazardous fuel treatments along all "Evacuation Routes" for a minimum distance of thirty meters on both sides of the roadway.

Heavy dead-down fuels along evacuation routes pose serious threats during periods of high fire danger.

Local Preparedness and Protection Capability

LVFPD has one fire station in La Veta and one in Cuchara. The District has thirty five volunteer firefighters residing primarily within La Veta. Twenty two of them have been through basic wildland firefighter training. All WUIs spoken to in this CWPP are within the fire protection district.

Table 6: LVFPD Wildland Fire Suppression Resources

TYPE RESOURCE	TYPE	# ON HAND	# DESIRED
LVFPD			
Personnel		35	
Wildland firefighters (Carded)	9 Ard./ 3 Mod.	12	12 Arduous
Brush trucks 150-250 gallons	6	4	5 or upgrade
Squad truck 500 gal 500 gpm	3	1	2
Engine 500 gal 1000 gpm	1	2	upgrade
Tender 3,000 gal 250 gpm		1	2
Tender 1,000 gal 150gpm		1	2
Portable holding tanks	1500-2000 gal	3	4
Power saw kit		2	4
Personnel & Equipment Transport		1	2 or upgrade
Wildland fire tool cache	20 person	1	1
Colorado State Forest Service			
Wildland Firefighters (Carded)		2	2
Power saw kit		1	3
Wildland fire tool cache	Mop up kits	2	3
Bendix/King handheld radios		2	2
Drip Torches		2	6
BLM/USFS Pike/San Isabel NF (1)			
Wildland Firefighters (Carded)		10	10
Engine	6	3	3
Power saw kit		15	15
Portable pump kits	Mark 3	3	3
Portable holding tanks	1500-2000 gal	4	6
Wildland fire tool cache	100 person	1	1

(1) Structure protection is the responsibility of fire protection districts and state. Federal partners provide assistance upon request and are most likely to do more wildland type suppression work, hence there isn't a need for heavy structure protection apparatus or resources.

Table 7: Anticipated Wildfire Response Times:

Wildland Urban Interface Area	**Response Time** (Minutes)
Cuchara	18
Cuchara Pass	25
Hwy 12 Corridor	14
Hwy 160 Corridor	14
Indian Creek	12
Little Kansas	16
Middle Creek	15
Panadero	20
Pine Haven	16
Raspberry Mtn.	14
Spanish Peaks	16
Tres Valles	14
Wahatoya/School Creek	12

Water Supply: The Cucharas River is a reliable source of water year round except during dry or drought years. During dry spells other creeks in the area also have reduced flows to the point that they are also difficult to draft out of. There are numerous springs and ponds throughout the area. Reaching them to draft water is problematic with large fire apparatus. Improving access for fire apparatus is important.

Fire wells are another option for providing water for wildfire suppression. They are reliable sources of water in the winter when rivers, creeks and ponds are frozen in the winter. Currently LVFPD does not have any fire wells.

Dry hydrants are also good sources of water in the winter as long as they have inlets below ice level. Location and maintenance of dry hydrants is critical to their long term usefulness. Dry hydrants installed in rivers often get rocks and sediment deposited over the inlet pipe which significantly impacts maximum flows of the hydrants. They can become plugged over a short period of time if not installed properly. All dry hydrants should be maintained by landowners or neighborhood associations.

COMMUNITY MITIGATION PLAN:

The Core Team developed the following mitigation plan based on their knowledge of the wildland fire issues in LVFPD. The strategy basically addresses survivable space needs with some fuel treatments on public lands.

Essential to the success of the plan is the involvement of the private landowners. Implicit in the plan is "ownership of the fire problem" by private landowners. While LVFPD, CSFS, BLM & USFS have promoted survivable space and land management, private landowners must 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 buildings.

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 wildland urban interface will decline as long as property owners have the right to live in forested areas without land use codes that require wildfire mitigation measures.

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 developed parcels are scattered across forested lands the question becomes how culpable are State and County governments for developments placed in naturally hazardous vegetation.

In the past, private land owners have expected someone else to do most of the fire hazard reduction on lands immediately adjacent to subdivisions. This convenient transfer of responsibility to someone else saved developer's and individual homeowner's 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 developed and undeveloped land. 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 structure's survivability. Placing firefighters in the path 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 preventing structure loss. The Colorado State Forest Service and FireWise program have excellent brochures on all facets of structure fire hazard mitigation.

LVFPD is actively promoting FireWise Communities membership and activity within the area.

Home Ignition Zone

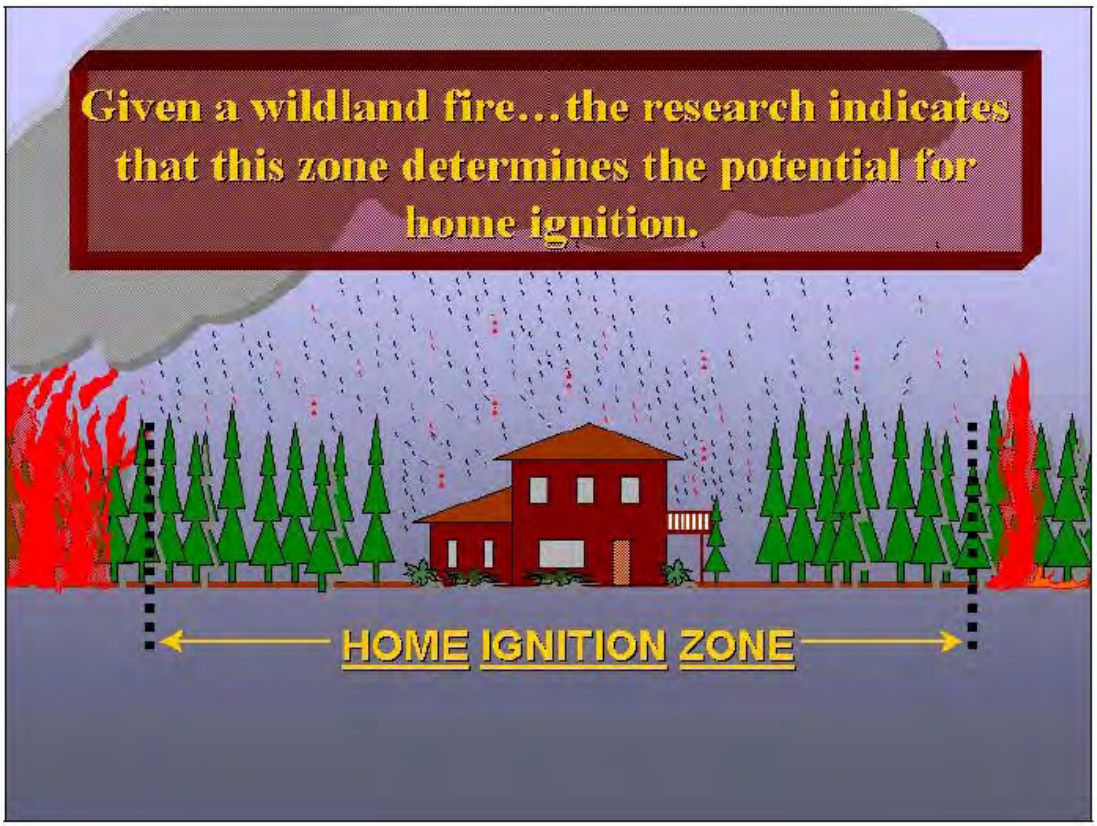


*Figure 3—The **home ignition zone** includes the home and an area surrounding the home within 100 to 200 feet. The potential for ignition depends on the home's exterior materials and design and the amount of heat to the home from the flames within the home ignition zone. Firebrand ignitions also depend on the home ignition zone either by igniting the home directly or igniting adjacent materials that heat the home to ignition.*

Recent research into the cause for loss of homes during wildfires indicates that home ignitability and immediately adjacent wildland fuels, are the principal causes 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 200 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 generally does not transfer enough energy directly to ignite a wooden structure.

Fuels surrounding a home within the home ignition zone principally determine the potential for directly igniting the home. Firebrands lofted from extreme wildfires must land 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 how far firebrands travel, a home's exterior materials, design 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. 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 ignition zone. Some homes burned as long as 8 hours after the fire front passed.

Structural modifications can lower a home's vulnerability to wildfire. Metal roofing, stucco, cement siding, screens over vents and under decks are all likely to dramatically improve its chances for survival.

Structure Triage

Triage in the community wildfire protection plan context is the determination of priorities for action during a wildfire. The process historically has rated the likelihood that wildfire personnel can safely and successfully defend a structure while it is being threatened by a wildfire.

There is one serious flaw in this approach; it assumes that there will be adequate resources available to take some form of meaningful fire suppression action to defend the structure. When more than one structure is imperiled by a wildfire in a rural setting it is highly unlikely a local volunteer fire department will have sufficient apparatus and personnel to "protect" multiple structures simultaneously. Mutual aid in rural Colorado may take several hours to get to the fire ground.

Assigning a defensible rating to a structure can also lull homeowners into complacency if they think the local fire department will make Herculean efforts to save their home. In most instances the structure will have to survive on its own.

To avoid creating any false impressions about the ability of wildfire suppression personnel to protect every structure regardless the magnitude of the incident in LVFPD, a structure's chance of surviving a wildfire were rated as probable or not probable. This approach is much more realistic and should encourage property owners to look at their homes in a new light.

Many factors are considered when assigning a survivability rating to a structure. The triage process is highly subjective. Wildfire behavior and structure interactions are not well suited to a clear cut "yes" or "no" analysis. The table below describes criteria used to determine structure survivability. The factors have been extracted from the Wildfire Hazard & Risk Assessment score sheet found in "Living on the Edge" (Troy & Kennedy 2007) and is based on NFPA 1144 standards.

It is important to understand that there are no guarantees a structure with a "probable" survival rating will be standing after an intense wildfire occurs. Similarly occasionally structures with a "not probable" survival assessment may endure a wildfire in spite of all rational analysis.

The survival rating is simply a reliable indicator of a probable outcome following a very dynamic, chaotic, unpredictable event. Personnel from the LVFPD conducted the triage and Fire Control Features mapping during the spring of 2011. They considered the following criteria while making their judgments during structure triage.

Table 8: Survivability Criteria and Code

CODE	PROBABLE	NOT PROBABLE	CODE
P1	Vegetation light ~ Anderson fuel models 1 & 2	Vegetation medium to heavy &/or slash. Anderson fuel models 8, 10, 11, 9	N1
P2	Defensible space >70 feet	Defensible space <71 feet	F1
P3	Slope <20%	Slope >21%	N2
P4	Topographic features minimize fire behavior	Topographic features adversely affect fire behavior	N3
P5	Area not exposed to unusually severe fire weather or strong dry winds	Areas exposed to unusually severe fire weather or strong dry winds	N4
P6	Separated from adjacent structures that can contribute to fire spread	In close proximity to structures that can contribute to fire spread	F2
P7	Class A & B roofing	Class C or non-rated roofing	F3
P8	Non-combustible/fire resistive siding, eaves & deck or combustible deck with no debris underneath	Combustible siding and deck	N5
P9	Building set back from slope appropriate distance	Building close to or overhanging slope	F4
P10	No fire wood and other combustible human plunder in close proximity to structure	Fire wood and other combustible human plunder on deck or within close proximity to structure	F5
P11	Hazardous materials appropriate distance away	Hazardous materials close to structure	F6

Criteria shaded in light yellow automatically drop survivability to Not Probable. Non shaded criteria often influence survivability and cumulatively may predispose a structure to Not Probable survivability status.

NOTE: You will find that access, escape routes, turnarounds, safety zones and water supply are not factored into the survivability rating. These items are important for firefighter safety but do not influence structure survivability. Remember fire control personnel will most likely not be defending the structure; it will have to go it alone. Safety concerns and limited availability of firefighting resources preclude active intervention to protect structures.

Individual WUI Summaries

The following individual WUI summaries speak to issues within the various wildland urban interface areas in LVFPD.

Universal Mitigation Actions for all WUIs

1 = Survivable space needs to be developed around every structure landowners want to have standing following a wildfire in the neighborhood.

2 = Fuel reduction treatments for 90 feet on each side of any evacuation route.

3 = Designate, sign and maintain at least one Safety Zone within each WUI.

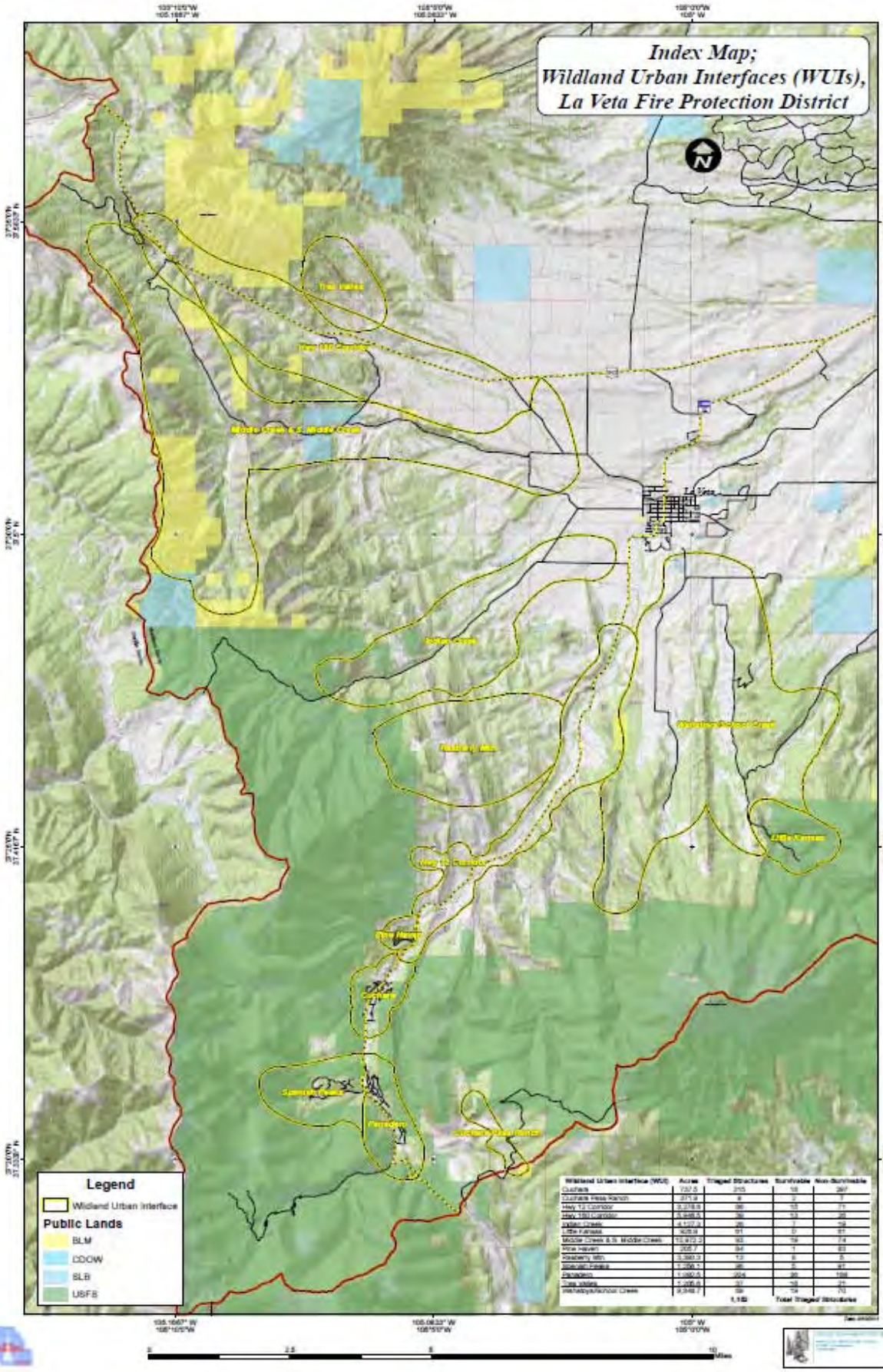
4 = Identify, develop and maintain an alternate evacuation route for each WUI.

5 = Identify, develop and maintain additional water sources as appropriate.

6 = Maintain power line corridors to prevent wildfires.

7 = Identify local firewood concentration and slash burning sites to service hazardous fuels reduction efforts within or nearby each WUI.

All maps are available on the LVFPD website: lavetafire.org and on the Colorado State Forest Service CWPP website. They can be downloaded at your convenience. A complete set of WUI maps has also been provided in a legal size binder marked as Appendix A.


Index Map;
Wildland Urban Interfaces (WUIs),
La Veta Fire Protection District
Legend
Wildland Urban Interface
Public Lands
BLM
CDOW
SLB
USFS
Miles

Cuchara ~ WUI Summary

Size: 744 acres# Structures: 315 Overall Fire Hazard: Extreme

Eighteen of the 315 structures triaged in Cuchara are expected to survive a wildfire in the vicinity. The remaining 287 structures are likely to be destroyed by a wildfire that threatens the town. 91% of the structures in Cuchara are vulnerable to wildfire.

Grass, willow, oak/pine and mixed conifer are the dominant vegetative types in the WUI. Flame lengths are expected to be from seven to twenty seven feet for surface fires with crown fire flame lengths ranging from twenty to fifty five feet for crown fires. Fires are likely to throw spot fires six tenths of a mile.

Many buildings in Cuchara have shake shingles roofs with pine needles in top of them. This creates a very fertile fuel profile for spot fires. Shake shingles are the number one source of structure ignition during wildfires.

Structures are close enough to one another that fire is likely to spread from structure to structure, even in relatively mild fire conditions.

The absolute best way to reduce wildfire hazard within the Cuchara WUI is for every landowner to create survivable space around their property. This includes replacing shake shingle roofs with composition or metal roofing and thinning/pruning trees close to buildings and cleaning up dead, woody debris on the ground.

Roads in the WUI are narrow, steep and have little or no room for fire apparatus to turn around.

Given the present vegetative and structural conditions in Cuchara, evacuation should be the first order of business when a fire is nearby. Wildfire control within the confines of town will be very problematic and hazardous.

State Hwy 12 provides evacuation routes north and south. There are also a two very good safety zones located in the meadows north of town. These meadows should be posted and publicized as the best places to go if access on Hwy 12 is compromised by a wildfire. Permission to designate these sites as Safety Zones is needed prior to designating them for such a use.

There are a few opportunities to do some wildfire hazard reduction thinning on the benches west of town. These units may provide a point to reduce wildfire intensity before a fire hits town. They will not reduce overall threats to any structures with shake shingle roofs. There are no real opportunities to conduct fire hazard reduction projects

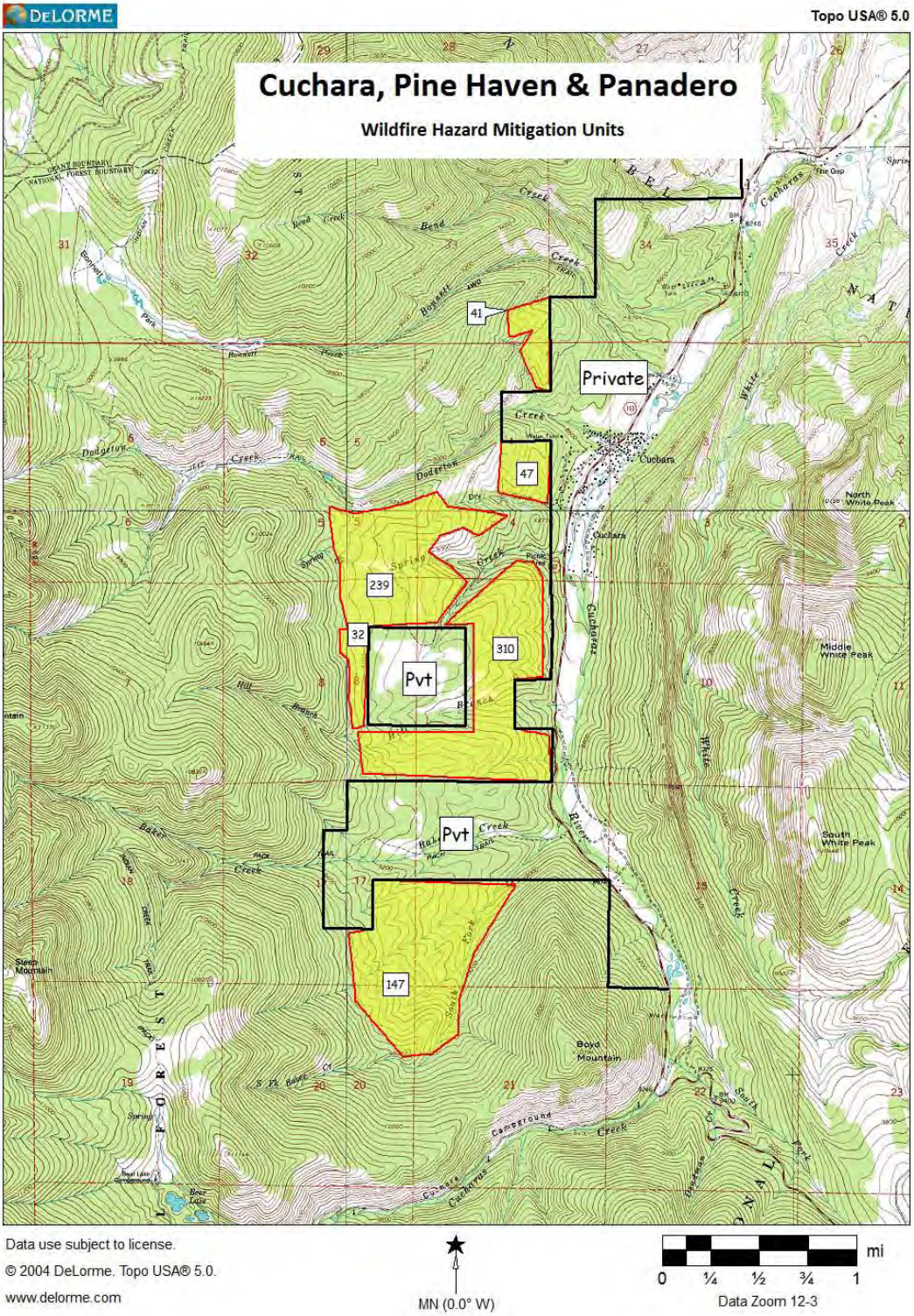
on the east side of town due to steep slopes. See the Cuchara, Pine Haven, Panadero Wildfire Hazard Reduction map.

Cuchara WUI Wildfire Hazard Mitigation Actions

Priority	Action	Responsibility
1	Mitigate wildfire hazards within the structure ignition zone.	Private land owners'
2	Get permission to designate the meadows north of town as Safety Zones and place signs designating them as such?	Fire Chief
3	Conduct 628 acres of wildfire hazard mitigation work on the benches west of town.	USFS

Cuchara is a community that is very vulnerable to wildfire. It will take an extraordinary effort to change the trajectory of destruction.

Cuchara/Pine Haven, Panadero Wildfire Hazard Mitigation Opportunities:



Cuchara Pass ~ WUI Summary

Size: 449 acres # Structures: 9 Overall Fire Hazard: Extreme

Twenty two percent of the structures in Cuchara Pass Ranch are expected to be standing after a wildfire passes through the area. Eighty eight percent will probably be destroyed.

Most structures in the WUI are tucked into the trees and have very little survivable space around them. This neutralizes the advantages of the many meadows in the area that can serve as fuelbreaks. Long distance spotting is likely to simply jump the meadows and kindle fires in the dense forest surrounding the homes.

The absolute best way to reduce wildfire hazard within the Cuchara Pass WUI is for every landowner to create survivable space around their property. This includes replacing shake shingle roofs with composition or metal roofing and thinning/pruning trees close to buildings and cleaning up dead, woody debris on the ground.

Evacuation of the WUI is best served by using the Cordova Pass road (FSR 364) to get residents to State Hwy 12. Once there evacuees will have two choices. They can go north or south depending upon wildfire activity. Several of the meadows in the area are also well suited for Safety Zone use if the need arises.

County Road 460 does have some dense forest immediately adjacent it. Thinning this stretch of road to the highway will improve its utility as an evacuation route.

Cuchara Pass Wildfire Hazard Mitigation Actions

Priority	Action	Responsibility
1	Mitigate wildfire hazards within the structure ignition zone.	Private land owners'
2	Thin and remove flammable debris for 50 feet each side of FSR 364	Huerfano County

Hwy 12 Corridor ~ WUI Summary

Size: 8,891 # Structures: 97 Overall Fire Hazard: High

Sixteen of the ninety seven structures in the Hwy 12 Corridor are expected to survive a wildfire in their neighborhood. The remaining eighty structures aren't likely to be as fortunate.

The absolute best way to reduce wildfire hazard within the Hwy 12 Corridor WUI is for every landowner to create survivable space around their property. This includes replacing shake shingle roofs with composition or metal roofing and thinning/pruning trees close to buildings and cleaning up dead, woody debris on the ground.

This WUI contains a vegetative tapestry of meadows, oak, and willow with an occasional copse of cottonwood. Structures are scattered throughout the area. Water is abundant in ponds and along the Cucharas River.

Evacuation of this WUI is straight forward. Hwy 12 provides good escape routes both north and south. Getting evacuees routed in the right direction will be key to a safe, expedient evacuation. Many of the meadows can also serve as Safety Zones if the need arises.

A shake shingle roof and conifer vegetation next to the house foretell an unfortunate outcome for this structure when a wildfire passes through the neighborhood.

Hwy 12 Corridor Wildfire Hazard Mitigation Actions

Priority	Action	Responsibility
1	Mitigate wildfire hazards within the structure ignition zone.	Private land owners'.

Hwy 160 Corridor ~ WUI Summary

Size: 8,393 acres # Structures: 39 Overall Fire Hazard: High

Thirteen structures are likely to be standing following a wildfire in this WUI. The remaining twenty six will likely perish.

The absolute best way to reduce wildfire hazard within the Hwy 160 Corridor WUI is for every landowner to create survivable space around their property. This includes replacing shake shingle roofs with composition or metal roofing and thinning/pruning trees close to buildings and cleaning up dead, woody debris on the ground.

Grass, Piñon, Piñon/Grass, Oak and Mixed conifer are the principle vegetative types in this WUI. Hwy 160 provides good evacuation alternatives both east and west out of the WUI. There are some long driveways that could be problematic if the fire crossed them while residents were still at home.

The gas compressor station is of special concern due to the flammability of its contents and the depth of the compressed gas pipeline that flows east from the plant. LVFPD will work with the gas company to assure wildfires are included in their emergency response plan.

The high voltage electrical line that supplies the compressor plant with power is also a concern. It runs along Hwy 160 and then drops southwest to the plant. It is tall enough to be a hazard for fire related air operations.

Hwy 160 Corridor Wildfire Hazard Mitigation Actions

Priority	Action	Responsibility
1	Mitigate wildfire hazards within the structure ignition zone.	Private land owners.
2	Make sure the gas compressor station has addressed wildfires in its emergency response plan.	LVFPD personnel

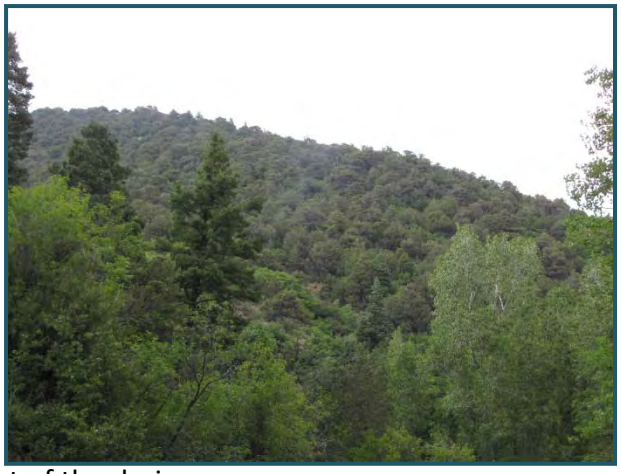
Indian Creek ~ WUI Summary

Size: 5,501 acres # Structures: 25 Overall Fire Hazard: Extreme

Six of the structures in the Indian Creek WUI are expected to survive a wildfire in the vicinity. The remaining 19 will probably not be as fortunate.

The absolute best way to reduce wildfire hazard within the Indian Creek WUI is for every landowner to create survivable space around their property. This includes replacing shake shingle roofs with composition or metal roofing and thinning/pruning trees close to buildings and cleaning up dead, woody debris on the ground.

Vegetation found in the WUI includes grass, oak, piñon, oak/pine, and a riparian/wetland vegetation composed of willow, alder and cottonwood along Indian Creek.



Terrain along the upper end of Indian Creek is steep, rocky and covered with dense piñon and oak/pine mix. There only one way out of most of the WUI and only one way out of the Piney Ridge development.

Evacuation is straight forward down the Indian Creek road. Several good sized meadows provide adequate Safety Zones if residents egress is compromised by a wildfire in the lower part of the drainage.

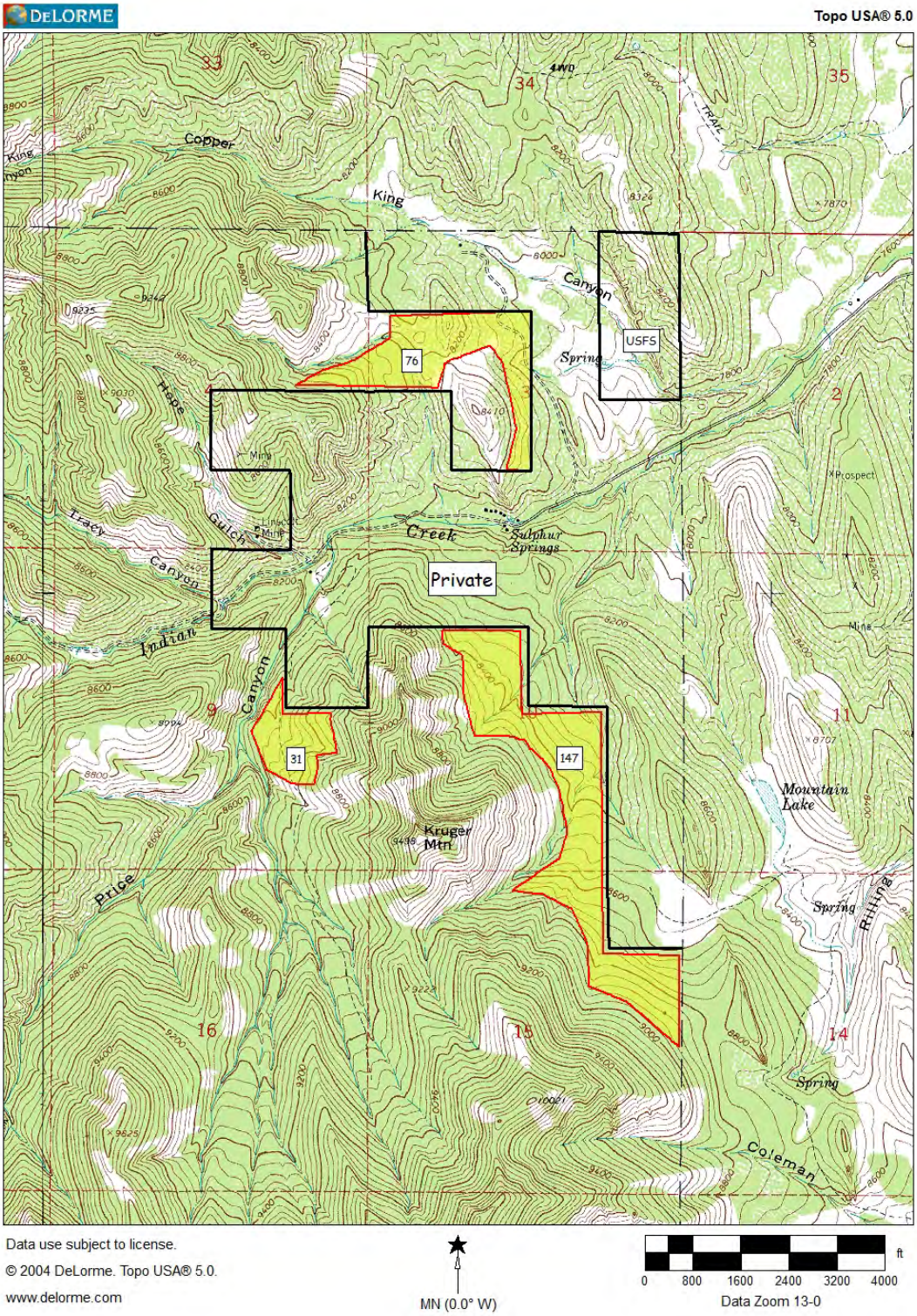
Indian Creek provides reliable water for suppression activities.

There are some options to reduce the intensity of wildfire threatening the Indian Creek WUI. They are not a replacement for good survivable space around every structure but can assist wildfire control efforts in the event of a fire spreading toward the WUI. See the map on the next page for specifics.

Indian Creek Wildfire Hazard Mitigation Actions

Priority	Action	Responsibility
1	Mitigate wildfire hazards within the structure ignition zone.	Private land owners.
2	Complete 254 acres of wildfire hazard mitigation.	USFS

Indian Creek/Raspberry Wildfire Hazard Mitigation Opportunities

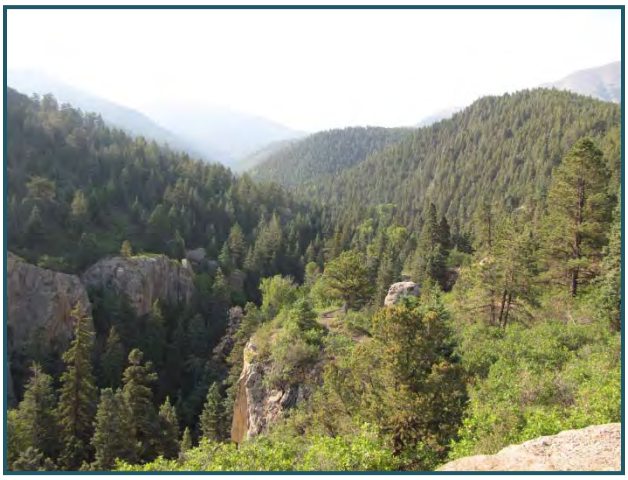


Little Kansas ~ WUI Summary

Size: 352 acres# Structures: 58 Overall Fire Hazard: Extreme

Little Kansas is undoubtedly one of the most hazardous Wildland Urban Interface areas in the state of Colorado. None of the 58 structures in the area are survivable under even relatively mild wildfire behavior. The structures are also close enough to each other to propagate fire from one building to another. The structures are located in a tight canyon with only one way in or out. The road is very narrow. Turning around fire apparatus will be very difficult.

It is not clear that all the survivable space work possible can appreciably improve survival of structures in such a tight dead-end canyon. Creating survivable space within the canyon will be difficult if not impossible.



The safest and best approach to wildfire operations in Little Kansas is to evacuate the area and let nature take its course.

Fifty eight structures are nestled in this steep, narrow canyon. It is only a matter of time before they are seriously threatened by the inevitable wildfire.

Partially mitigating wildfire hazard on site will be a difficult challenge. The ladder fuels that feed fires voracious appetite provide the vegetative screening for the cabins.

Some wildfire operational advantage can be gained by developing a shaded fuelbreak in the forested area at the mouth of Wahatoya Canyon. This treatment will provide fire personnel with a safe place to make a stand on a wildfire threatening to go up canyon. It covers fifty acres, most of which is private property. See the map on the next page for treatment unit locations.

There is also a good ridgeline on the west side of the canyon that would make a good shaded fuelbreak. Again it would create a place for fire personnel to make a stand before a fire dropped into the canyon.

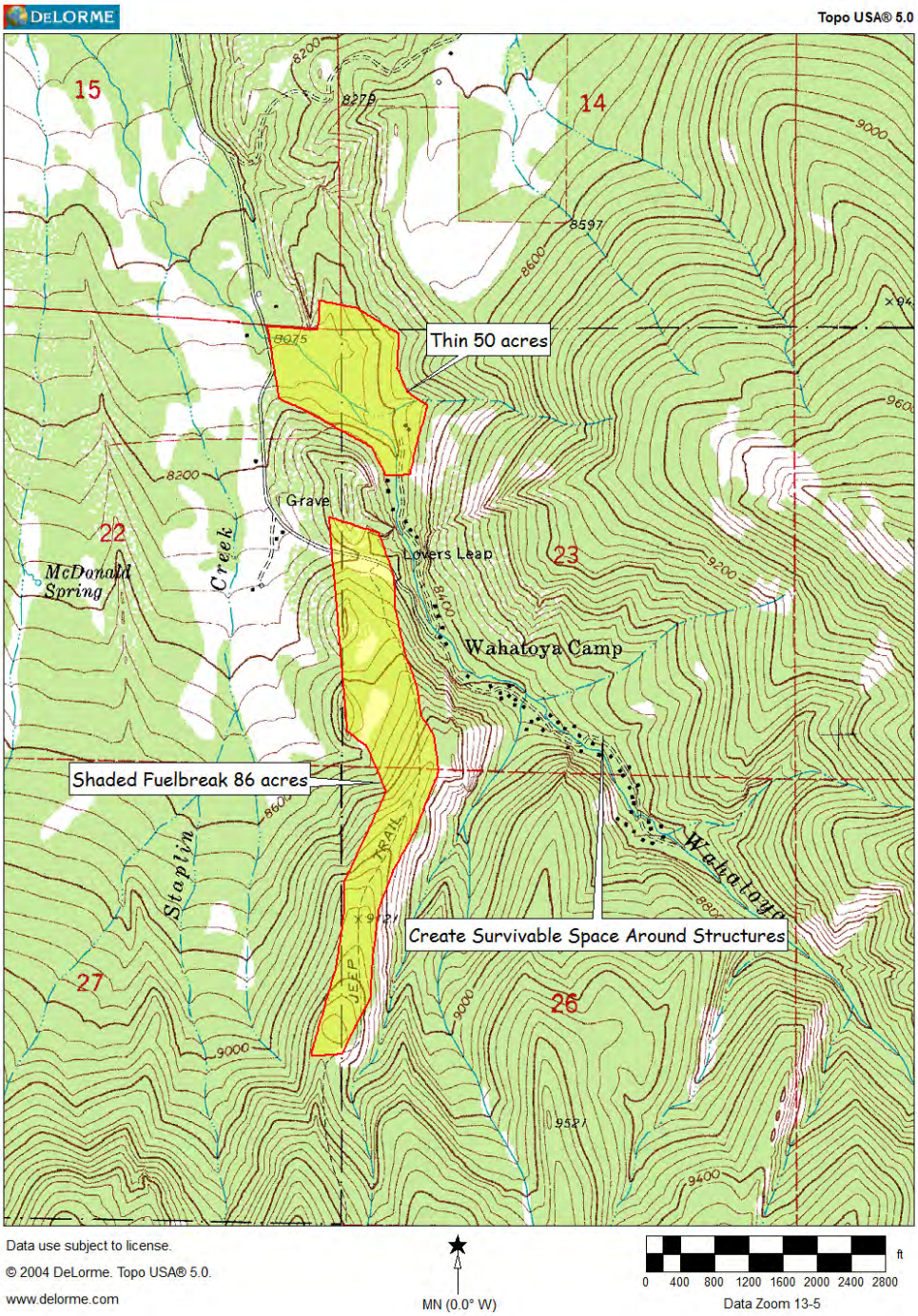
Neither of the recommended fuelbreaks will guarantee the survival of the structures in the canyon bottom. Blowing embers can spark spot fires as much six tenths of mile ahead of the main fire. Dead woody fuel, in the canyon in close proximity to structures, creates a fertile substrate for spot fires. The canyon is so dangerous that firefighters will be reluctant to drop into it to fight spot fires.

Another option that should be considered by the residents is to install a sprinkler system that draws water out of Wahatoya Creek and sprinkles a large area down the center of the canyon. If activated well ahead of a threat this system may create a moist enough environment to reduce spot fire probability. The system will not be cheap and will have to be maintained.

Little Kansas Wildfire Hazard Mitigation Actions

Priority	Action	Responsibility
1	Mitigate wildfire hazards within the structure ignition zone.	Private land owners'.
2	Create shaded fuelbreaks at the mouth of Wahatoya Canyon and along the ridge west of the canyon to provide safe locations for wildfire personnel to attempt to stop fires threatening the WUI from outside 136 acres total.	USFS and Huerfano County
3	Explore feasibility of installing a fire sprinkler system to protect cabins in the drainage.	WUI Landowners

Little Kansas Shaded Fuelbreaks:



Middle Creek ~ WUI Summary

Size: 10,594 acres # Structures: 93 Overall Fire Hazard: Extreme

Twenty percent of the 93 structures in the Middle Creek WUI are expected to survive a wildfire the other 80 percent have a more worrisome destiny.

The absolute best way to reduce wildfire hazard within the Middle Creek WUI is for every landowner to create survivable space around their property. This includes replacing shake shingle roofs with composition or metal roofing and thinning/pruning trees close to buildings and cleaning up dead, woody debris on the ground.

A vegetative mosaic of grass, oak, oak/pine and mixed conifer covers this WUI. The terrain is very steep. Under dry conditions, wildfires will be very intense and spread rapidly. The railroad over La Veta Pass into the San Luis Valley spends a lot of time in this WUI. Vegetation along the RR right of way and steep grades heighten risk of ignition and large fire occurrence. The LVFPD will work with the SL&RG RR to develop an emergency response plan for wildfires within the railroads ROW.

The lower portion of Middle Creek WUI has several feasible evacuation routes following County Roads 440, 441 & 442. The South Middle Creek residents have a one way in and out challenge for evacuation. The one Safety Zone is marginal for the number of people that may need to use it.

Middle Creek Wildfire Hazard Mitigation Actions

Priority	Action	Responsibility
1	Mitigate wildfire hazards within the structure ignition zone.	Private land owners'.
2	Negotiate the designation of the Safety Zone in South Middle Creek, Post it as such and notify residents of its existence.	Huerfano County Fire Marshall.
3	Work with the SL&RG RR to develop an emergency response plan for wildfires within the railroads ROW.	LVFPD personnel

Panadero ~ WUI Summary

Size: 957 acres # Structures: 96 Overall Fire Hazard: Extreme

Five of the ninety six structures in Panadero WUI are likely to survive a wildfire. Ninety one probably will not. Shake shingle structures are abundant in the WUI. They are very fire prone.

The absolute best way to reduce wildfire hazard within the Panadero WUI is for every landowner to create survivable space around their property. This includes replacing shake shingle roofs with composition or metal roofing and thinning/pruning trees close to buildings and cleaning up dead, woody debris on the ground.

Panadero has a good system of fire hydrants but they will not make up for the flammability of the fuels and structures in the WUI. Fuel models, 1, 2, 9, 10 & 11 are all found in the area. Aspen is often thought to be a benign fire type. It usually is. But in Panadero and elsewhere in the La Veta Fire Protection District common juniper grows under the aspen and drastically changes how wildfires behave in aspen.

Panadero Avenue provides the only evacuation route out of the WUI. Once evacuees reach Hwy 12 they have two choices they can go up or down Cucharas River to safety. Safety Zones are abundant in the WUI.

There several opportunities for wildfire hazard mitigation around the WUI on USFS ground. These projects will reduce wildfire intensity as the fire bumps into the WUI and provide fire personnel with a safe place to encounter the fire. It is unlikely the mitigation work will have much if any impacts on the outcome of structures constructed using shake shingles.

See the maps in the Cuchara WUI write-up for locations and acreage of recommended units.

Panadero Wildfire Hazard Mitigation Actions

Priority	Action	Responsibility
1	Mitigate wildfire hazards within the structure ignition zone.	Private land owners.
2	Create a 147 acre shaded fuelbreak south of the area.	USFS

Pine Haven ~ WUI Summary

Size 181 acres # Structures: 84 Overall Fire Hazard: Extreme

With some luck, one of the eighty four structures in Pine Haven will be standing following a fire in the neighborhood. Pine Haven has the highest hazard rating of any WUI in the LVFPD. The structures are close to one another; sit on steep slopes in a tapestry of flashy fuels. Roads are narrow and some are steep. There is only one reliable way in or out. Another route exists but needs to have a boggy section drained and fill placed in the roadway.

The absolute best way to reduce wildfire hazard within the Pine Haven WUI is for every landowner to create survivable space around their property. This includes replacing shake shingle roofs with composition or metal roofing and thinning/pruning trees close to buildings and cleaning up dead, woody debris on the ground.

Oak, oak/pine, pine and mixed conifer are the prevalent forest types in the WUI.

The closest Safety Zone for Pine Haven is in the clearing south of the entrance to the development. A wildfire at the base of the hill along the highway will cut off the evacuation route and leave residents with nowhere to go to get away from the fire.

There is a good fire hydrant system in Pine Haven but it will be overworked and under pressure during a serious wildfire that threatens more than a few structures. Fire personnel will be ill advised to attempt fire suppression in this WUI under rapidly evolving conditions during fire danger High or greater. Once the fire escapes initial attack all fire personnel should get out of the WUI.

There is a small (41 acres) area on National Forest land that could be treated to reduce wildfire intensity adjacent to Pine Haven. Most meaningful hazard reduction will be done within the development itself. See the Cuchara map for the location of the unit mentioned in this write-up.

Pine Haven Wildfire Hazard Mitigation Actions

Priority	Action	Responsibility
1	Mitigate wildfire hazards within the structure ignition zone.	Private land owners'.
2	Get permission to develop 2nd evacuation route & do it.	Pine Haven POA
3	Install a 41 acre wildfire hazard mitigation treatments as shown on the Cuchara map.	USFS

Raspberry Mtn. ~ WUI Summary

Size: 3,173 acres # Structures: 13 Overall Fire Hazard: Extreme

Sixty two percent of the structures in Raspberry Mtn. WUI will probably withstand the treat from a wildfire. This relatively new development has more survivable space than any other WUI in the La Veta Fire Protection District and only thirty eight percent of the structures are vulnerable to wildfire.

The absolute best way to reduce wildfire hazard within the Raspberry Mtn. WUI is for every landowner to create survivable space around their property. This includes replacing shake shingle roofs with composition or metal roofing and thinning/pruning trees close to buildings and cleaning up dead, woody debris on the ground.

This WUI is dominated by oak, grass and mixed conifer. Terrain and roads are very steep. Fires will spread rapidly and be difficult to combat. Large high intensity wildfires are likely to occur here. There is an opportunity to reduce the intensity of wildfires threatening the developed property by treating approximately 178 acres of National Forest System Lands. The map Indian Creek/Raspberry map shows the location of these areas. (Page 33)

There is only one way in and out of the WUI. Fortunately there are several well located Safety Zones in the area for both residents and fire personnel.

Water is scarce.

Priority	Action	Responsibility
1	Sign Safety Zones at the ATV staging area and landing strip	CWPPPC
2	Mitigate wildfire hazard on 178 acres of federal lands adjacent to the private property.	US Forest Service

Spanish Peaks ~ WUI Summary

Size: 957.5 acres # Structures: 204 Overall Fire Hazard: Extreme

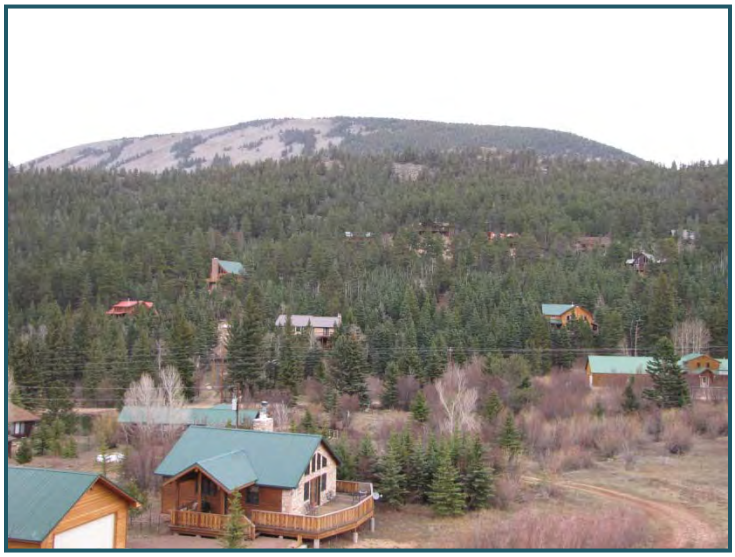
Eighteen percent of the structures in Spanish Peaks WUI are rated as survivable in the event of a wildfire. The remaining one hundred sixty eight structures will most likely be destroyed during the same event.

The absolute best way to reduce wildfire hazard within the Spanish Peaks WUI is for every landowner to create survivable space around their property. This includes replacing shake shingle roofs with composition or metal roofing and thinning/pruning trees close to buildings and cleaning up dead, woody debris on the ground.

Vegetation includes grass, mixed conifer, willows. Fire spread will be fast and receptivity to spots fires is high. Some driveways are steep. There are many "No Outlet" roads with difficult turnaround areas.

Evacuation of Spanish Peaks is straight forward. There are multiple points of access to Hwy 12. Once on Hwy 12 evacuees can go north or south depending upon fire activity.

Fire hydrants are available.



Spanish Peaks Wildfire Hazard Mitigation Actions

Priority	Action	Responsibility
1	Mitigate wildfire hazards within the structure ignition zone.	Private land owners'.

Tres Valles ~ WUI Summary

Size: 1,206 acres # Structures: 37 Overall Fire Hazard: High

Forty three percent of the structures in Tres Valles are expected to be spared by a wildfire in the WUI. Twenty one structures will most likely have problems. This is another relatively new development and follows the trend of having more survivable structures in it than older WUIs.

The absolute best way to reduce wildfire hazard within the Tres Valles WUI is for every landowner to create survivable space around their property. This includes replacing shake shingle roofs with composition or metal roofing and thinning/pruning trees close to buildings and cleaning up dead, woody debris on the ground.

Grass, oak and mixed conifer are the primary vegetation types in the WUI.

One hydrant is located in the lower third of the WUI. It is fed from a 30,000 gallon tank at the top of the development. This large tank is not accessible to fire apparatus. One pond in the area is easily accessible to fire apparatus.

One option to increase access to water is to install a fire hydrant on the clean out line of the water filtration plant.

Officially there is only one way in and out of Tres Valles. There are two other options that can be used in an emergency. Neither of these are posted as evacuation routes. All routes are in the lower portion of the terrain and could be cut off by a rapidly moving fire originating along Hwy 160. Several safety zones are available scattered across the WUI.

Tres Valles Wildfire Hazard Mitigation Actions

Priority	Action	Responsibility
1	Mitigate wildfire hazards within the structure ignition zone.	Private land owners'.
2	Install fire hydrant at water filtration plant.	Property Owners Assoc.

Wahatoya/School Creek~ WUI Summary

Size: 6,596 acres # Structures: 72 Overall Fire Hazard: High

Sixteen of the seventy two structures in the Wahatoya/School Creek WUI are rated as survivable.

The absolute best way to reduce wildfire hazard within the Wahatoya/School Creek WUI is for every landowner to create survivable space around their property. This includes replacing shake shingle roofs with composition or metal roofing and thinning/pruning trees close to buildings and cleaning up dead, woody debris on the ground.

Vegetation found in the WUI includes Grass, oak, Oak/pine and Cottonwood Bosque.

There is only one way in and out of the two major drainages that make up this WUI. Fortunately meadows suitable as Safety Zones are abundant.

This historical structure is located just off of CR 363. The shake roof is a problem if the objective is to retain the structure well into the future.

Protecting historical structures from wildfire adds complexity to any incident.

Wahatoya/School Creek Wildfire Hazard Mitigation Actions

Priority	Action	Responsibility
1	Mitigate wildfire hazards within the structure ignition zone.	Private land owners'.

The Bill Martin place on CR 363 is a good example of how to develop survivable space in an aesthetically pleasing way. It has taken considerable work but will pay big dividends when a wildfire passes through the country.

Historical Buildings

There are many historical buildings scattered throughout the fire protection district. They are a treasured and imperiled resource. Most have shake shingle roofs in keeping with the architectural norm of the times. These roofs predispose the structures to destruction during the next major wildfire in their vicinity. Landowners are reluctant to change the roofing material because it will compromise historical authenticity.

Special efforts will be required to protect any historically significant structures during a wildfire in their neighborhood. Fortunately most such structures are located in openings. There are several techniques to protect them. They can be wrapped in fire shelter material, foamed or a sprinkler system can be set up to shroud them in water. All these approaches take time and preplanning.

Prescribed Burning

One of the most cost effective tools land managers have to treat large expanses of wildland 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 recognizes the value of prescribed burning and supports its use in reducing landscape level wildfire hazards in the district.

Fuel Treatments

Landscape scale fuel treatments to facilitate structure protection are not feasible in most of LVFPD. Steep rocky slopes preclude mechanical and hand crew operations. A fuelbreak on Raspberry Mountain and a few areas near WUIs are recommended.

Wildfire Prevention and Fire Loss Mitigation

Prevention strategies focus on education, burning restrictions and closure orders. 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

Survivable space is the key to structure survival. LVFPD along with CSFS will continue an ongoing program to encourage individual landowners to redeem their responsibility while living in wildfire prone areas. This includes advocating FireWise home construction.

The Fire Protection District will develop a list of local wildfire hazard mitigation contractors for use by landowners seeking such assistance.

The District is also exploring the feasibility of fielding a wildfire mitigation crew to conduct the work if an adequate contractor cadre is not available. They will need to resolve how the District can charge for such services.

They are also analyzing the advantages of having a District owned chipper available for residents to use on a reimbursable basis.

Once the home ignition zone is in good condition it will need occasional maintenance to continue to provide the expected protection.

Firefighter Training

Wildland firefighting training is required for all LVFPD personnel. The training is provided locally or through the Fire Camp in Salida. The district has an active recruitment and retention program.

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. Communication between the lookout and personnel on the fireline is critical. LVFPD recently converted to digital radios as directed by the FCC. They are pleased with the digital radios which seem to work well in their situation.

They need an additional ten hand held and five mobile VHF/800 DTR radios to have adequate radio distribution among the volunteers.

County Wildfire Standards for Subdivisions

Huerfano County does not have any planning or zoning ordinances that speak to wildfire hazard reduction. They also do not have building codes or road and driveway standards that address wildfire hazard mitigation or fire apparatus access. Several rural counties

in the state have excellent codes that speak to wildfire hazard, driveway widths, turn-arounds etc...

Private land development in fire prone areas needs to be sensitive to road and driveway standards that facilitate emergency vehicle access and turnaround. Land development without access for fire apparatus and other emergency vehicles 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 were not in effect when the vast majority of the structures in LVFPD were constructed. Encouraging improvements in older developments and structures is an important function of this plan.

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

- At least two ways into and out of a subdivision
- Adequate driveways with turn-arounds suitable for use by firefighting 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
- Water in ponds, cisterns dry hydrants or hydrants.

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

It is probably time for Huerfano County to consider expanding standards to address access. There are good examples of rural counties in Colorado dealing with the subdivision wildfire interface.

Fire Control Features Maps

The maps included in this CWPP contain information vital to wildland fire operations. They show: triaged structures, water sources, hydrants, safety zones, aviation hazards, staging areas and helispots. When printed on weather proof paper and organized in a booklet format the information is invaluable to wildfire suppression efforts. They can improve communications and planning tasks. They are tough enough to be carried in

first responder vehicles and can be updated or replaced as needed for a reasonable price.

The 13 WUIs are covered by 27 maps 17”x 22” each. Maps will be reproduced on an aerial photo and a topographic base.

CWPP Project Coordinator:

LVFPD 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 for the first few years to jump start implementation of the plan. This individual will work throughout LVFPD to provide onsite FireWise consultations to WUI residents and develop grant proposals for various action items. Title III funds and State Fire Assistance Grants are two viable sources for funding this position. See Appendix: L Potential Funding Sources for more details.

State Tax Incentives for Wildfire Hazard Mitigation:

House Bill 1110 created a five year program from 2009 to 2014 that allows landowners to deduct the actual costs of their wildfire mitigation, up to $2,500 from their state income tax. The program allows each landowner to get credit for fifty percent of the cost of wildfire mitigation up to a total of $2,500. To get the full credit the total mitigation costs must be $5,000 or greater. The work must be done in accord with an existing Community Wildfire Protection Plan to qualify.

Colorado State Forest Service will be administering the program and verifying the actual work completed. This is a good incentive for individual landowners to improve survivable space around their structures. They can get their personal labor recognized at a decent hourly rate.

Slash Disposal Yards

Improving survivable space within the home ignition zone will create significant amounts of slash and combustible residue. Larger materials can always be used as firewood. The Huerfano Landfill is one place the smaller material can be disposed of. It is a long haul from some areas of the County. Placing this biomass in a landfill may be a waste of valuable landfill space. One way to reduce the space the slash occupies is tub grinding the slash at the landfill before the slash is buried. It could then be available for landscaping purposes to those willing to come haul it away. Ground biomass makes good mulch.

Another option is to designate a slash disposal concentration point for wildfire hazard mitigation waste. The large pile will then be burned during the winter following a heavy snow.

Other communities in the State have created locations where wildfire mitigation slash has been concentrated and then chipped for compost or burned during the winter following a snow storm that reduced fire hazard. These options should be considered along with more local site specific opportunities to provide reasonable means for slash disposal following wildfire mitigation work.

Forest Wise, a logging company that uses small sized material for firewood, animal bedding and erosion control waddles, has indicated that they will pick up mitigation slash >3' diameter and at least 8 feet long if it concentrated in a pile some place they can get their trucks into. Prior to selecting this approach it will be important to reach agreement with Forest Wise on the specifics of the operation.

Railroad Wildfire Hazard Reduction

As previously mentioned, the San Luis & Rio Grande railroad over La Veta Pass is a serious concern from a wildfire perspective. A fire near the railroad grade poses special threats to combustible portions of the infrastructure. Railroad safety is regulated by the Interstate Commerce Commission. SL&RG works diligently to comply with all the regulations and feels they take extra precautions to prevent wildfires. This said, there appears to be an opportunity for the railroad and LVFPD to work together in wildfire prevention and control along the ROW. Currently, the LVFPD is formalizing an SOP for effective response to railroad emergencies within their District, however the mitigation of dangerous fuel loads along the ROW needs additional priority.

IMPLEMENTATION & MONITORING:

Implementation:

Table 9: Action Plan for Completing the LVFPD 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 LVFPD to hire a contractor to serve as the CWPP 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 Project Coordinator's roles will be to:

- ✓ Strengthen public understanding, acceptance and participation in projects defined in the CWPP.
- ✓ Promote and facilitate local FireWise Councils.
- ✓ Ensure follow-up to commitments by the community, or within the community, and on behalf of the La Veta Fire Protection District goals.
- ✓ Facilitate Core Team operations. This group will act as an advisory board to represent the community as a whole. This entity will 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 recommendations and/or activities.

Potential Funding Sources

Finding funds to implement CWPPs can be a challenge. There are at least two notable opportunities readily available to LVFPD that should be explored in detail. See Appendix L: Funding Sources for detailed information.

State Fire Assistance funds.

Secure Rural Schools and Community Self-Determination Act (Public Law 110-343).

Title III funds (USFS) may be used to:

(1) Carry out activities under the FireWise Communities Program to provide homeowners in fire sensitive ecosystems education and assistance with implementing, techniques in home siting, home construction, and home landscaping that can increase the protection of people and property from wildfires;

(2) Reimburse the participating county for search and rescue and other emergency services, including firefighting that are performed on Federal land after the date on which the use was approved and paid for by the participating county; and

(3) Develop community wildfire protection plans in coordination with the Secretary of Agriculture.

Table 9: Action Plan for Completing the LVFPD CWPP

PRIORITY	MITIGATION ACTION	TARGET DATE	ASSIGNED TO	ESTIMATED COST	COMPLETED ✓
1	Provide assistance to land and local homeowners in order to: Create a local FireWise council, acquire FireWise communities designations, and increase FireWise awareness.	5/1/12	LVFPD & CWPPPC	$15,000	
2	Hire a contract CWPP Project Coordinator .	4/1/12	LVFPD Board	$35,000/year	
3	Designate and sign Safety Zones for Cuchara & Middle Creek WUIs and others as needed.	7/1/12	CWPPPC POAs	$10,000	
4	Conduct one FireWise workshop for WUI residents.	7/15/12	CWPPPC CSFS BLM USFS	$3,000	
5	Provide interested parties with on site Home Ignition Zone consultations.	Ongoing	CWPPPC CSFS	$150 each	
6	Create slash disposal yards near each WUI.	6/1/12	CWPPPC POAs	$500 each	
7	Update Evacuation Plans	4/15/12	CWPPPC Huerfano County & POAs	$3,000	
8	Print 10 sets of fire control features maps for first responders' vehicles.	9/20/12	CWPPPC	$2,800	
9	Install "No Outlet" signs at the beginning of all dead end roads.	10/1/12	POAs & Huerfano Co. Road-Bridge Dept.	$200 each	
10	Pursue grant to purchase 15 new VHF/800DTR radios	11/1/12	Fire Chief LCFPD	$30,000	
11	Pursue grants to acquire a new type 6 WUI engine & other wildland fire suppression equipment.	12/1/12	Fire Chief LVFPD	$250,000	
12	Explore virtues of hiring a LVFPD Mitigation Crew and resolve issues relative to reimbursement for work	1/15/13	CWPPPC	$2,000	
13	Analyze pros and cons of providing a LVFPD chipper for individual use during structure mitigation	1/15/13	CWPPC	$2,000	
14	Work with the County Commissioners to develop Land Use Codes that address wildfire hazard mitigation and road standards that facilitate fire apparatus access.	3/15/15	CWPPC	$4,000	

Table 9: Action Plan for Completing the LVFPD CWPP (Continued)

PRIORITY	MITIGATION ACTION	TARGET DATE	ASSIGNED TO	ESTIMATED COST	COMPLETED ✓
15	Develop list of reliable mitigation contractors and find markets/outlets for slash created by wildfire mitigation activities.	5/30/12	CWPPC	$3,000	
16	Install cisterns in areas lacking hydrants.	6/15/15	CWPPC & POAs	$7,000 each	
17	Develop Emergency Response Plans for industrial sites in wildland interface zone.	6/15/17	CWPPC & Companies	$5,000 each	
18	Develop Emergency Response Plans for railroad corridor in extreme fire danger areas.	6/15/18	CWPPC & Railroad	$10,000	
20	Develop landscape level Critical Community Watershed Wildfire Protection Plans.	6/15/19	CWPPC, Agencies Landowners Contractor	$25,000 each	

Table 10: La Veta Wildfire Hazard Reduction Projects

PRIORITY	MITIGATION ACTION	TARGET DATE	ASSIGNED TO	ESTIMATED COST	COMPLETED ✓
1*	Develop shaded fuelbreaks on the bench in the area near Pine Haven, Cuchara & Panadero (784 acres)	*	USFS	$784,000	
2*	Construct shaded fuelbreaks in the Little Kansas Vicinity (139 acres)	*	Huerfano County & USFS	$139,000	
3*	Develop shaded fuelbreak in the Indian creek area (254 acres)	*	USFS	$254,000	
5	Thin along FSR 364 to improve evacuation route safety for Cuchara Pass WUI (90 feet each side of road) AND other WUI evacuation routes as needed	8/15/12	Huerfano County POAs	$22,000/mile	
6	Install fire hydrant at the Tres Valles water filtration plant.	10/1/13	Tres Valles POA	$5,000	

* These three projects will not directly impact survivability of structures. They will reduce the intensity of a wildfire that threatens developed areas. Burning embers are still likely to infringe on the Home Ignition Zone. Without individual homeowners' attention to this detail, structures will still be lost in spite of work done adjacent to their subdivision. Wildfire hazard reduction on surrounding wildland can lull landowners into believing their wildfire problems have been solved. In an effort to reinforce the benefit of individual action, federal projects will be contingent upon 55% of the structures in a WUI being survivable before adjacent federal lands are thinned.

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 that execution of actions described in this plan will reduce wildfire damage to structures in LVFPD. The Core Team should revisit the CWPP and associated accomplishments every two years and make adjustments to the plan as needed.

APPENDICIES:

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: Wildfire Hazard and Risk Assessment

Appendix H: Road & Driveway Specifications for Emergency Access

Appendix I: Definition of Terms

Appendix J: Potential Funding Sources

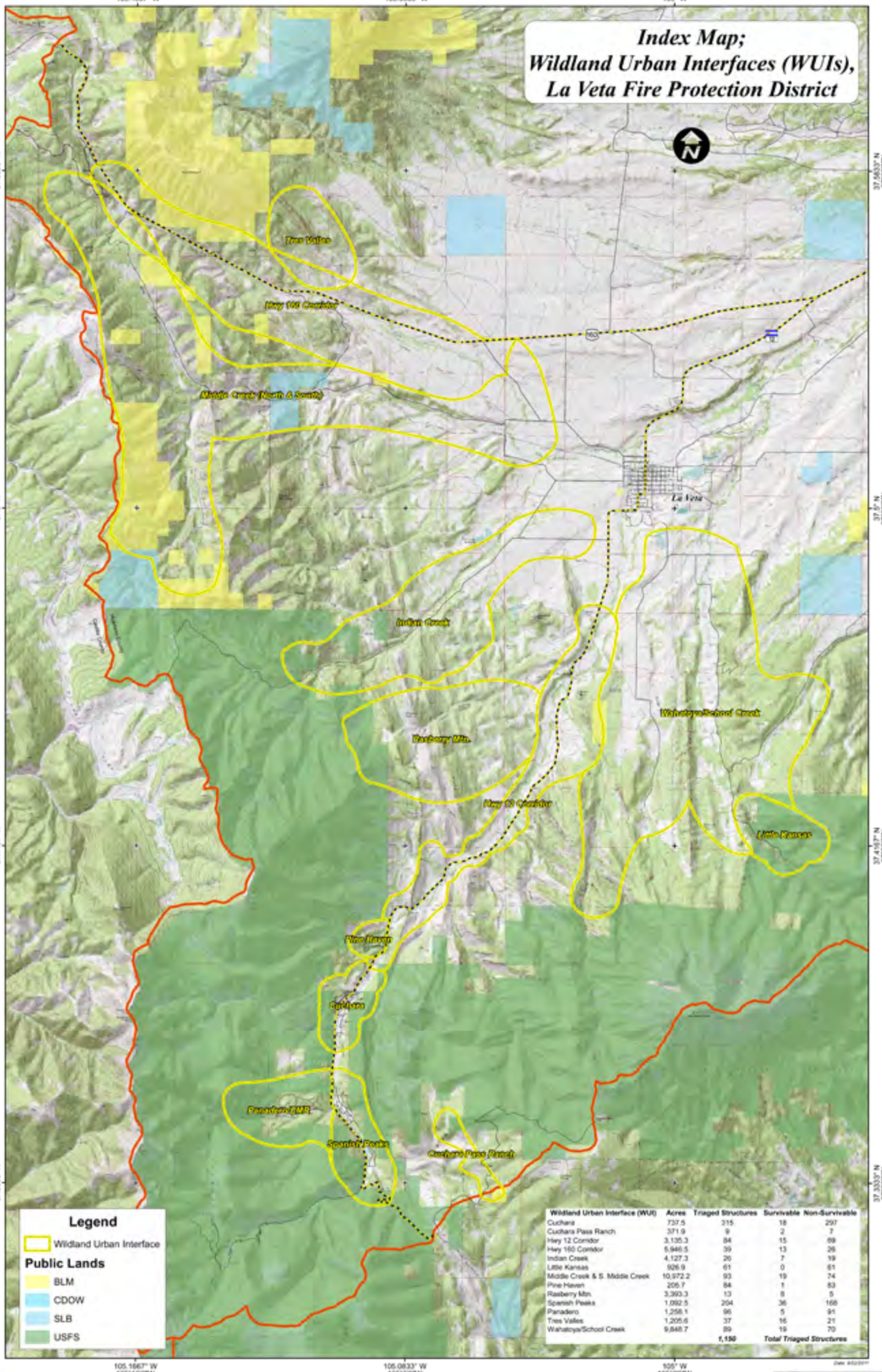
Appendix K: References and Publications

Appendix L: LVFPD Community Wildfire Protection Plan Survey

Signature Page:

LVFPD Chief	11-26-2011 Date
LVFPD Board President	01-25-2012 Date
CSFS District Forester	2/1/12 Date
BLM Fire Mitigation & Education Specialist	11-14-11 Date
San Isabel NF, District Ranger ~San Carlos RD	11/15/2011 Date
Huerfano County Sheriff	01-25-2012 Date
Huerfano County Commissioner	1-25-12 Date

Index Map; Wildland Urban Interfaces (WUIs), La Veta Fire Protection District



Wildland Urban Interface (WUI)	Acres	Triaged Structures	Survivable	Non-Survivable
Cuchara	737.5	315	18	297
Cuchara Pass Ranch	371.9	9	2	7
Hwy 12 Corridor	3,135.3	84	15	69
Hwy 160 Corridor	5,946.5	39	13	26
Indian Creek	4,127.3	26	7	19
Little Kansas	926.9	61	0	61
Middle Creek & S. Middle Creek	10,972.2	93	19	74
Pine Haven	205.7	84	1	83
Raisberry Mtn.	3,393.3	13	8	5
Spanish Peaks	1,092.5	204	36	168
Panadero	1,258.1	96	5	91
Tres Valles	1,205.6	37	16	21
Wahatoya/School Creek	9,848.7	89	19	70
		1,150	Total Triaged Structures	

Cuchara
Wildland Urban Interface

105.1083° W
105.1° W
105.0917° W
37.391° N
37.383° N
37.375° N
37.367° N
37.359° N

Cuchara

Legend

Wildland Urban Interface

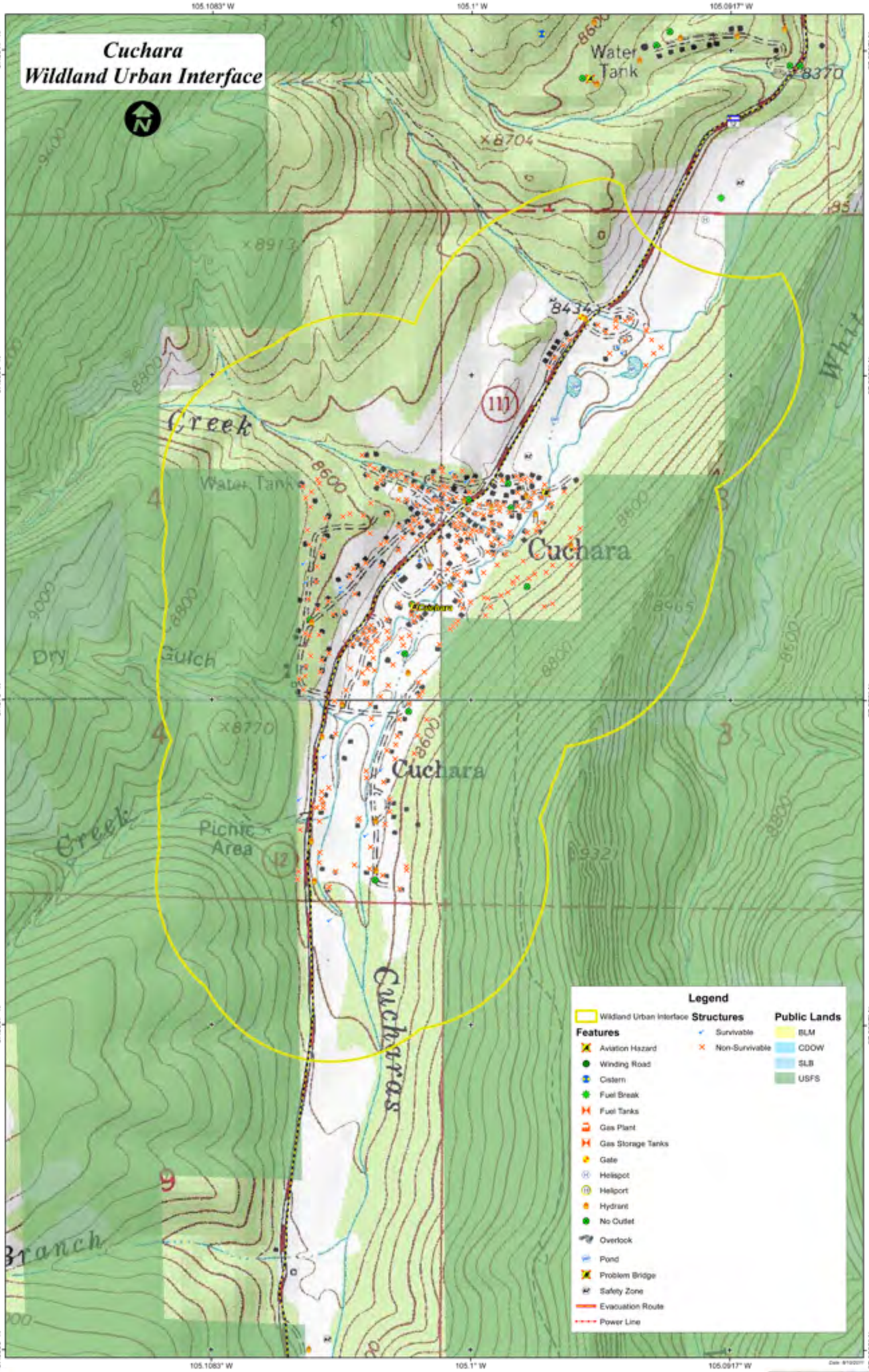
Features
- Aviation Hazard
- Winding Road
- Cistern
- Fuel Break
- Fuel Tanks
- Gas Plant
- Gas Storage Tanks
- Gate
- Helispot
- Heliport
- Hydrant
- No Outlet
- Overlook
- Pond
- Problem Bridge
- Safety Zone
- Evacuation Route
- Power Line

Structures
- Survivable
- Non-Survivable

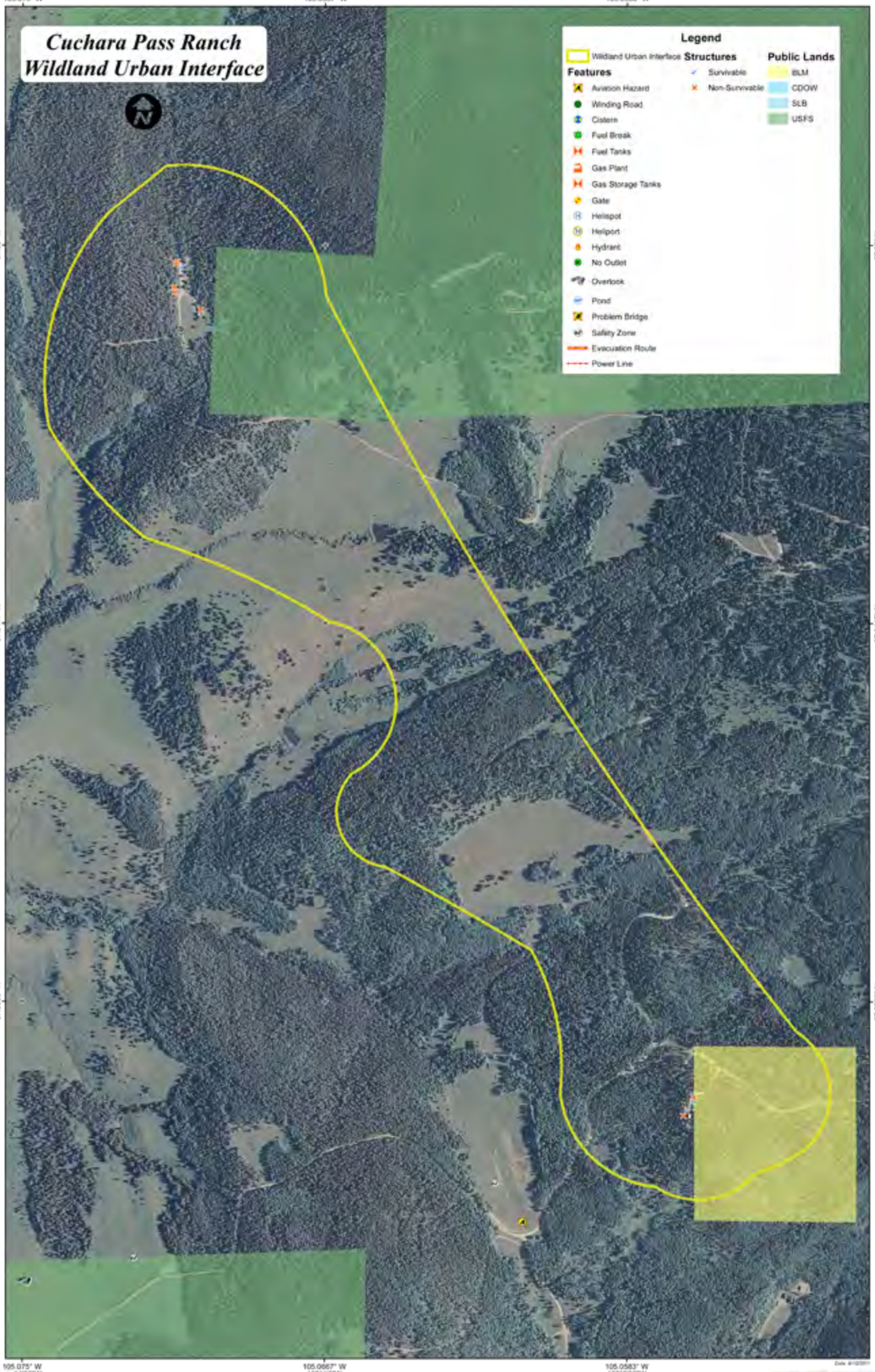
Public Lands
- BLM
- CDOW
- SLB
- USFS

0 0.25 0.5 1 Miles

Cuchara
Wildland Urban Interface

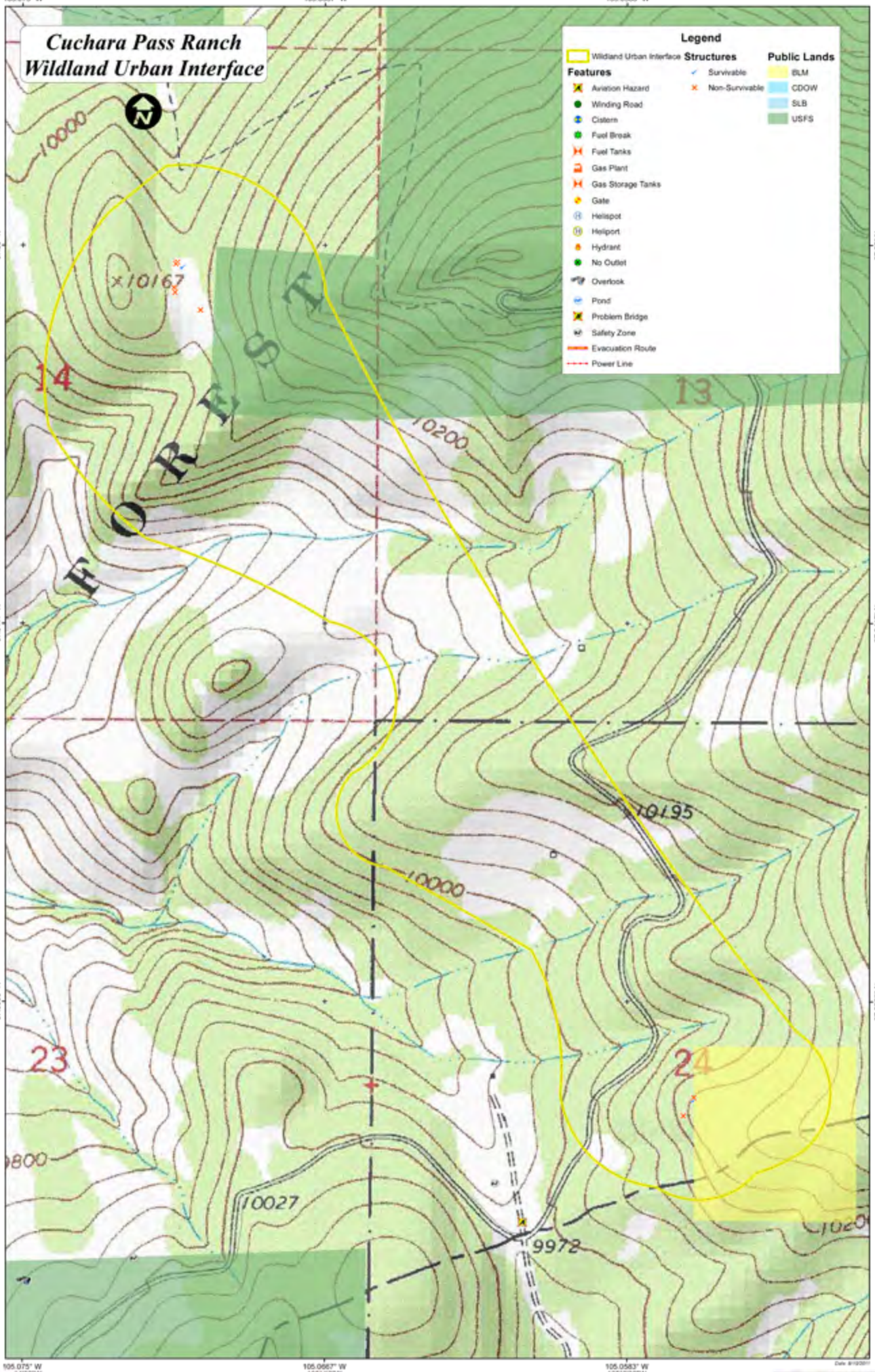


Cuchara Pass Ranch
Wildland Urban Interface

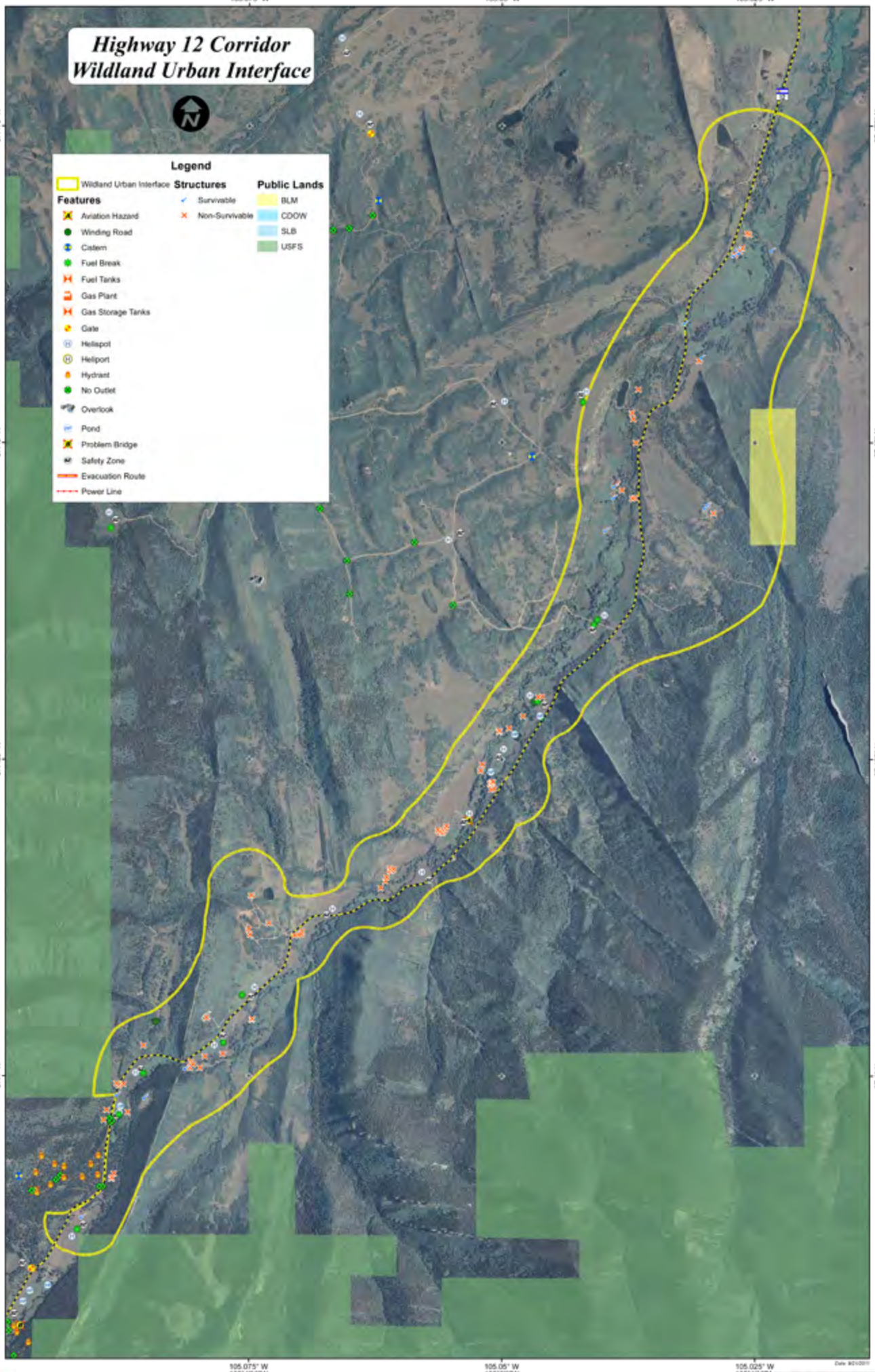


0 0.25 0.5 1 Miles

Cuchara Pass Ranch
Wildland Urban Interface



Highway 12 Corridor Wildland Urban Interface



Highway 12 Corridor Wildland Urban Interface

105°4'30"W 105.075° W
105°3'0"W 105.05° W
105°1'30"W 105.025° W
37°28'30"N 37.475° N
37°27'0"N 37.45° N
37°25'30"N 37.425° N
37°24'0"N 37.4° N

Legend

- Wildland Urban Interface

Features
- Aviation Hazard
- Winding Road
- Cistern
- Fuel Break
- Fuel Tanks
- Gas Plant
- Gas Storage Tanks
- Gate
- Helispot
- Heliport
- Hydrant
- No Outlet
- Overlook
- Pond
- Problem Bridge
- Safety Zone
- Evacuation Route
- Power Line

Structures
- Survivable
- Non-Survivable

Public Lands
- BLM
- CDOW
- SLB
- USFS

0 0.5 1 2 Miles

Date: 9/21/2011

FOREST STEWARDSHIP CONCEPTS, LTD.
0600 CR 27A, MONTE VISTA, CO 81144
E-MAIL fsc@amigo.net
719-852-2690

Highway 160 Corridor Wildland Urban Interface

Legend

Wildland Urban Interface

Features
- Aviation Hazard
- Winding Road
- Cistern
- Fuel Break
- Fuel Tanks
- Gas Plant
- Gas Storage Tanks
- Gate
- Helipad
- Heliport
- Hydrant
- No Outlet
- Overlook
- Pond
- Problem Bridge
- Safety Zone
- Evacuation Route
- Power Line

Structures
- Survivable
- Non-Survivable

Public Lands
- BLM
- CDOW
- SLB
- USFS

Date: 8/10/2011

0 0.5 1 2 3 4 5 Miles

Highway 160 Corridor Wildland Urban Interface

Legend

Wildland Urban Interface

Features
- Aviation Hazard
- Winding Road
- Cistern
- Fuel Break
- Fuel Tanks
- Gas Plant
- Gas Storage Tanks
- Gate
- Heliport
- Helipad
- Hydrant
- No Outlet
- Overlook
- Pond
- Problem Bridge
- Safety Zone
- Evacuation Route
- Power Line

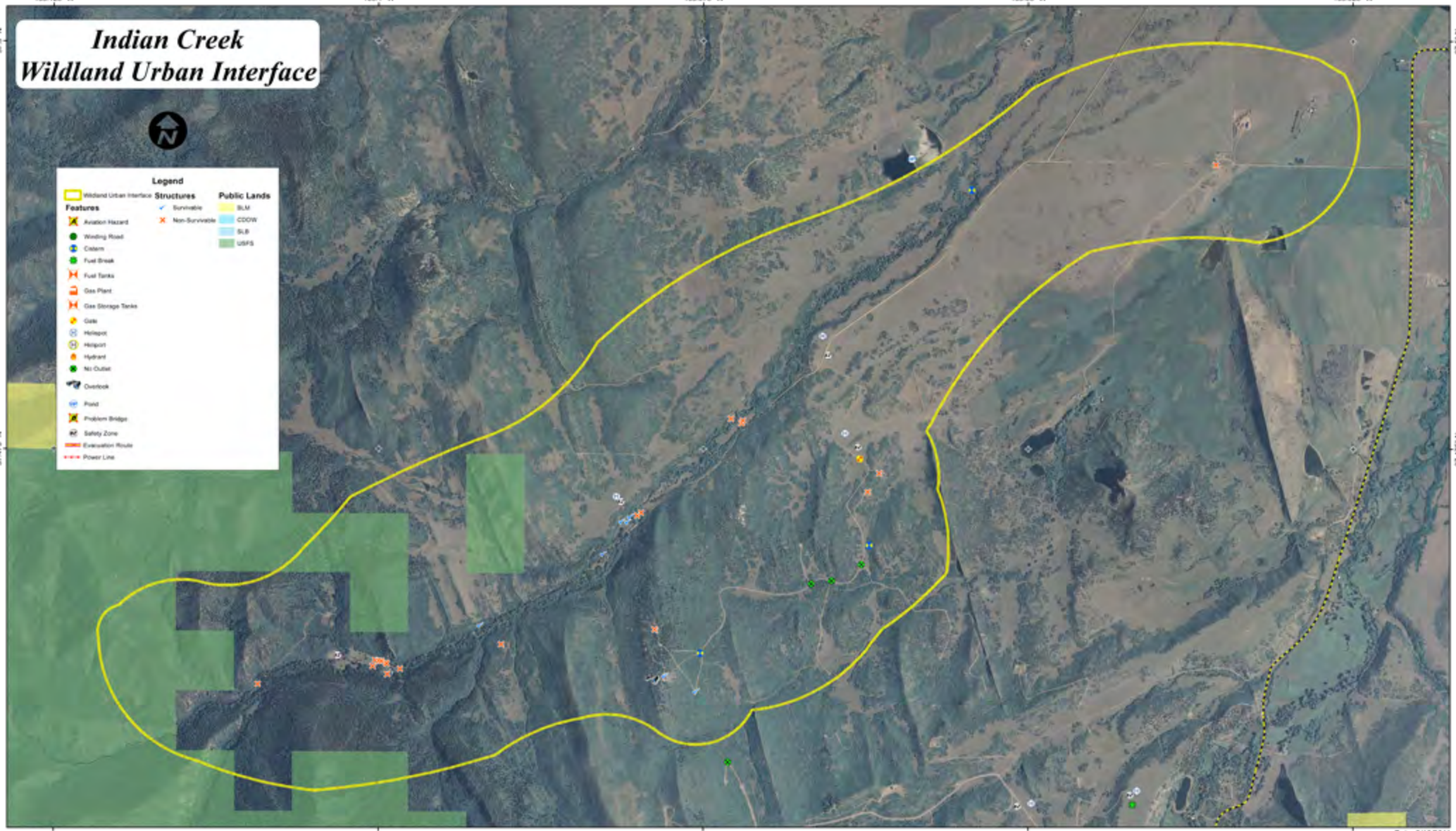
Structures
- Survivable
- Non-Survivable

Public Lands
- BLM
- CDOW
- SLB
- USFS

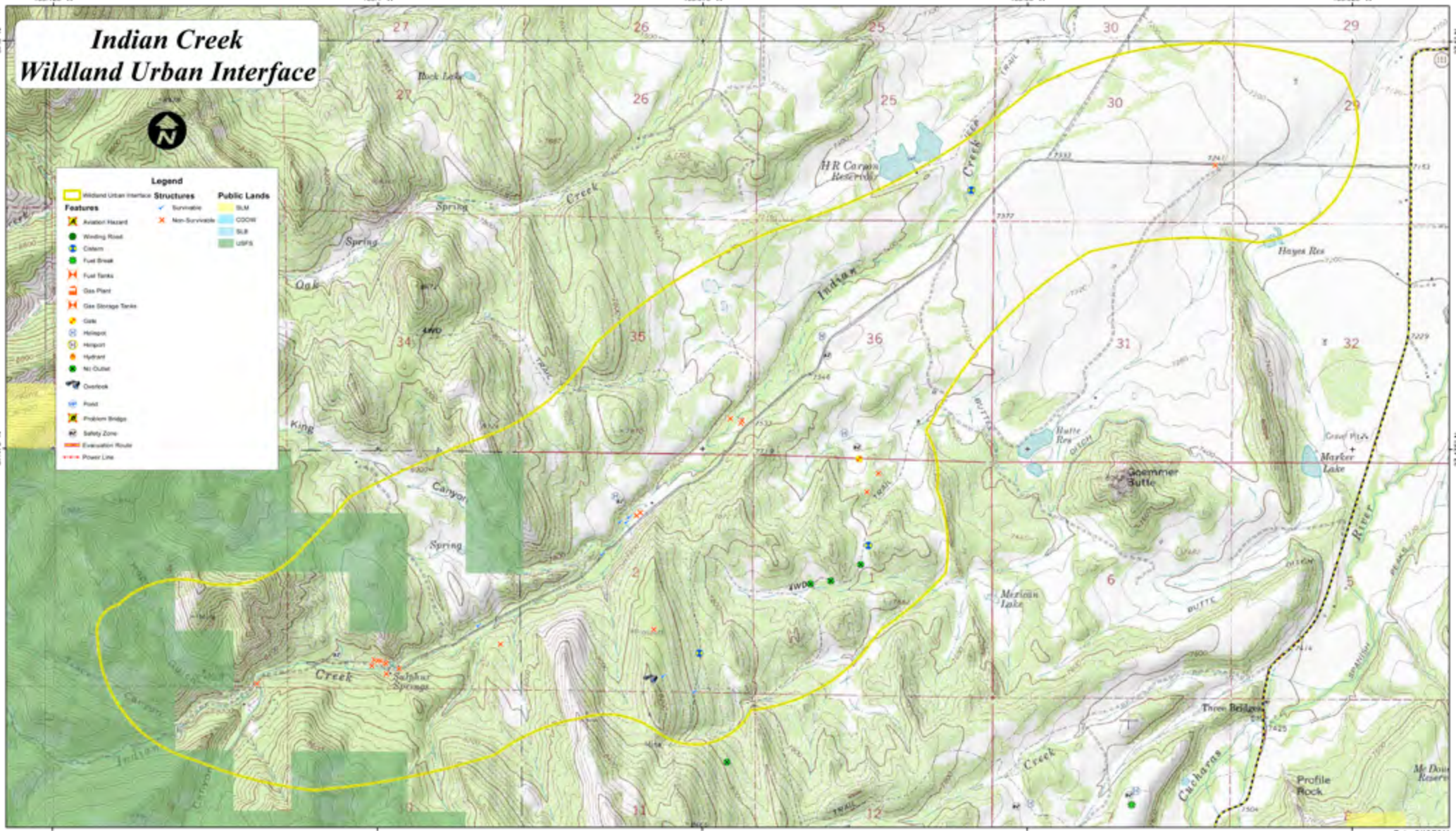
Date: 8/10/2011

0 0.5 1 2 3 4 5 Miles

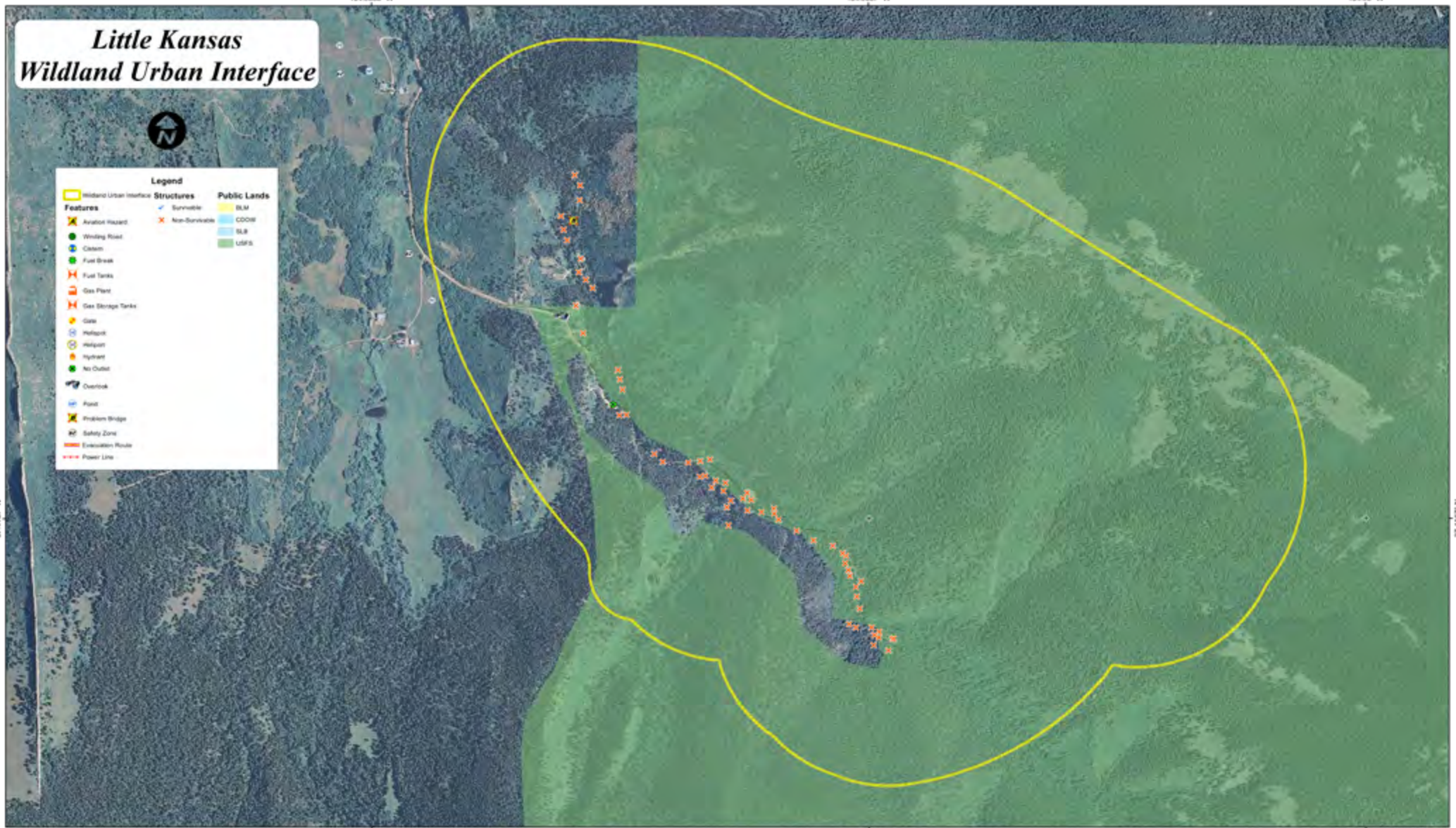
Indian Creek Wildland Urban Interface



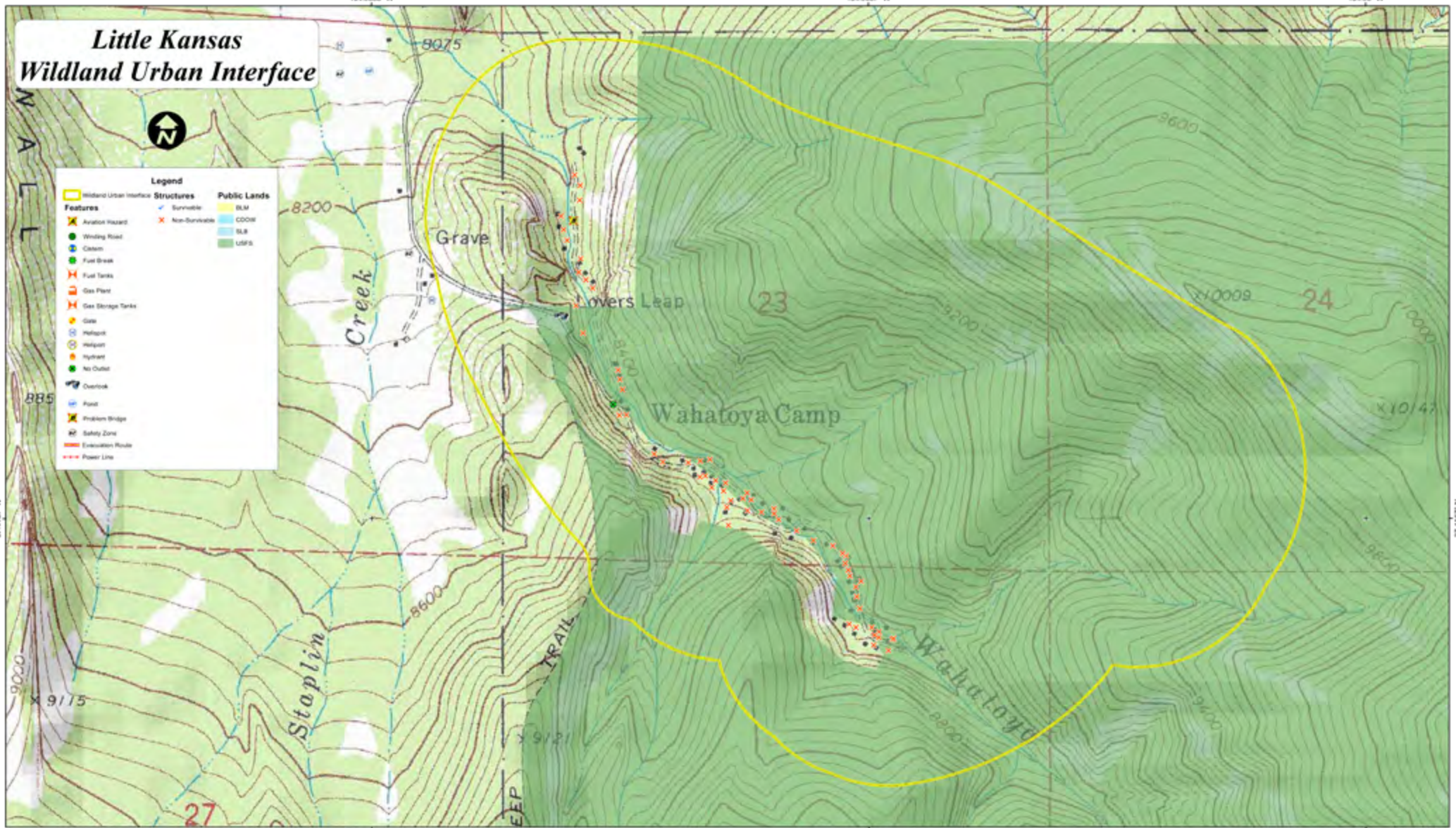
Indian Creek Wildland Urban Interface



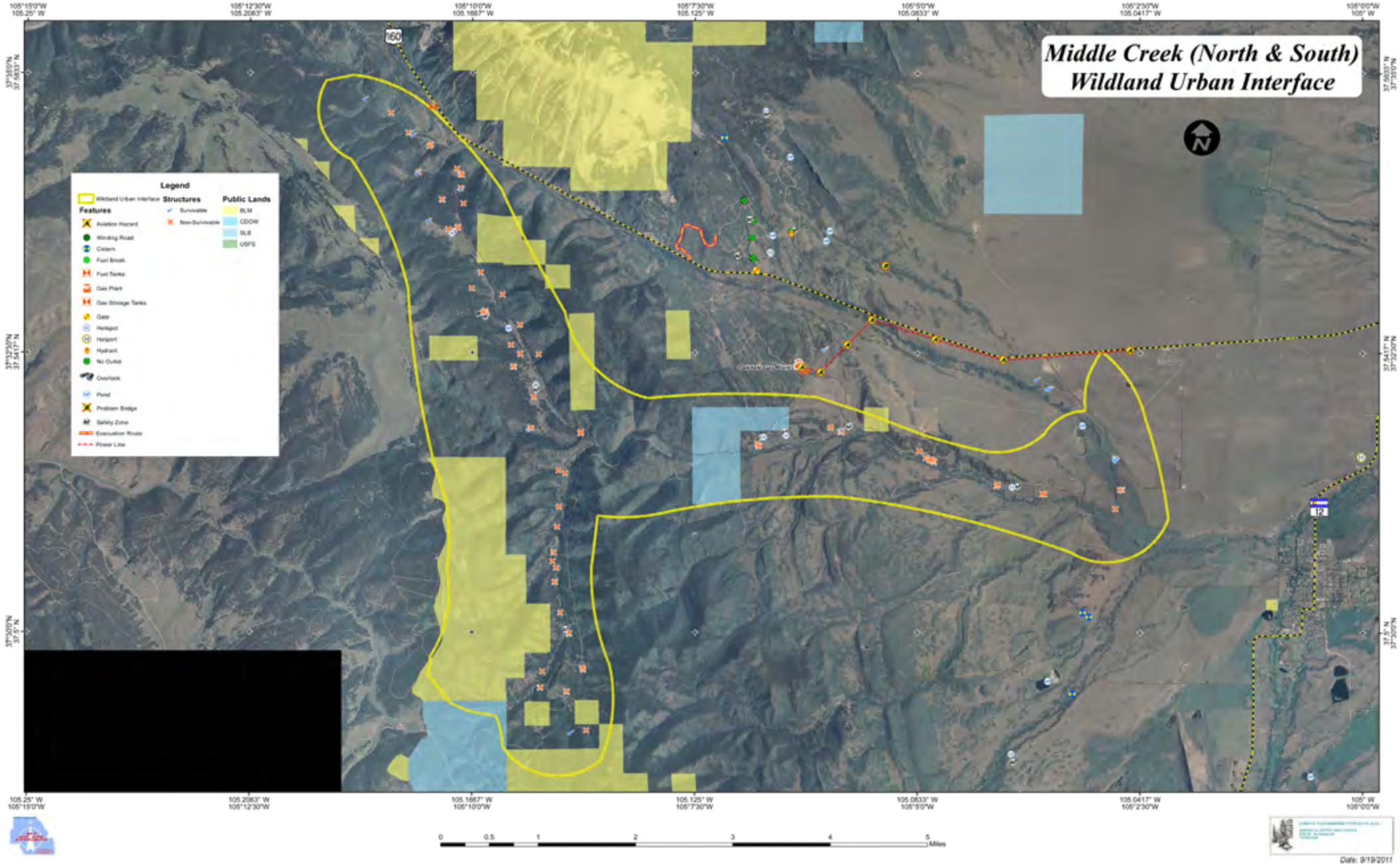
Little Kansas Wildland Urban Interface



Little Kansas Wildland Urban Interface



Middle Creek (North & South) Wildland Urban Interface



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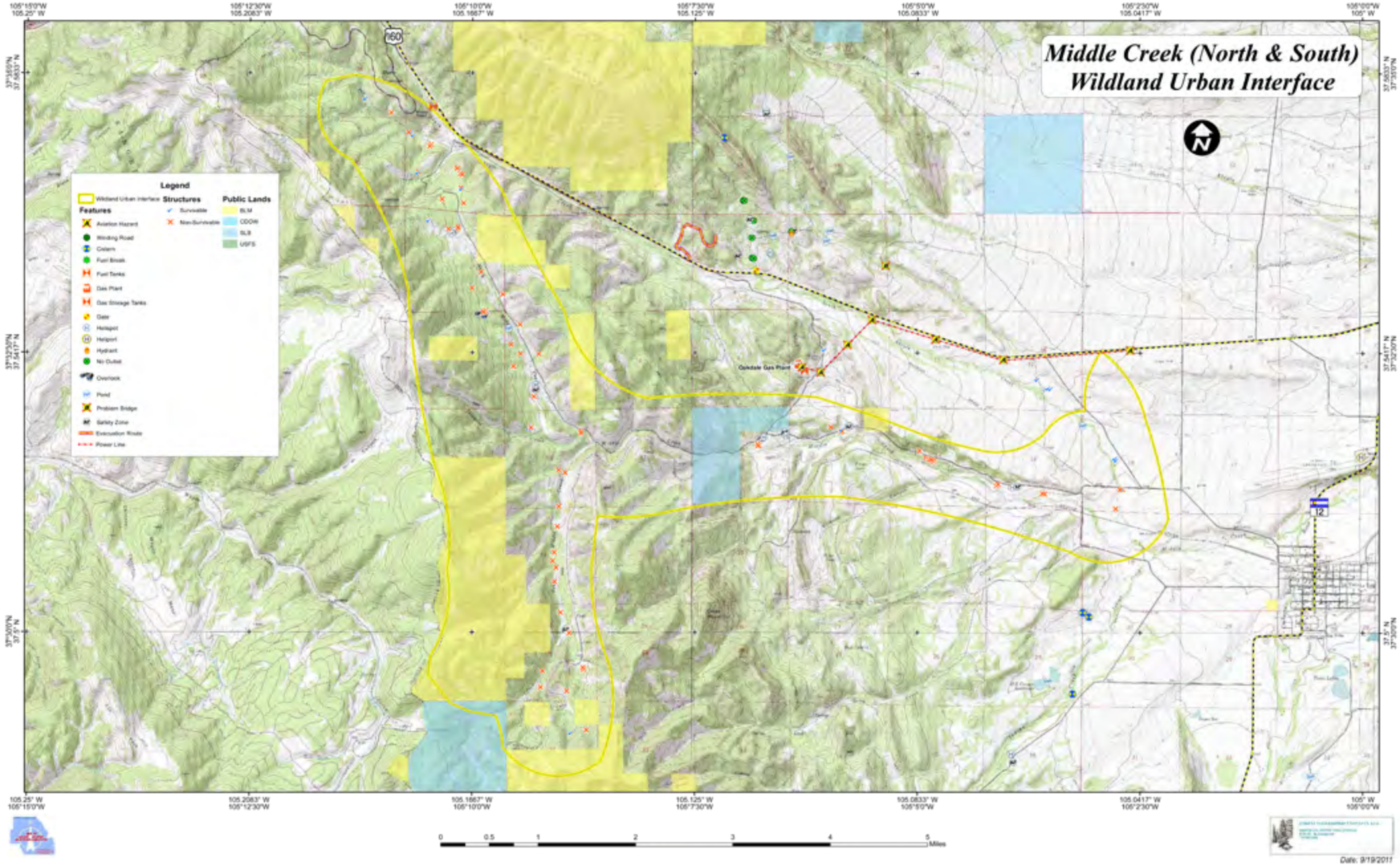
Middle Creek (North & South) Wildland Urban Interface



Date: 9/19/2011

Panadero/CMR Wildland Urban Interface

105°8'0"W
105.1333° W

105°7'0"W
105.1167° W

105°6'0"W
105.1° W

N 37°
N 37°12'

Legend

Wildland Urban Interface

Features

- Aviation Hazard
- Winding Road
- Cistern
- Fuel Break
- Fuel Tanks
- Gas Plant
- Gas Storage Tanks
- Gate
- Helispot
- Heliport
- Hydrant
- No Outlet
- Overlook
- Pond
- Problem Bridge
- Safety Zone
- Evacuation Route
- Power Line

Structures

- Survivable
- Non-Survivable

Public Lands

- BLM
- CDOW
- SLB
- USFS

Date: 9/19/2011

0 0.25 0.5 1 1.5 2 2.5 Miles

Panadero/CMR Wildland Urban Interface

105°8'0"W
105.1333° W

105°7'0"W
105.1167° W

105°6'0"W
105.1° W

37°2'30" N

Hill
Branch
Hill
Branch
Baker
Creek
PACK
TRAIL
Baker
Creek
PACK
TRAIL
River
White
Creek
South
Fork
9000
9200
9400
8800
8916
10930
10243
17
16
15
12

Legend

Wildland Urban Interface

Features
- Aviation Hazard
- Winding Road
- Cistern
- Fuel Break
- Fuel Tanks
- Gas Plant
- Gas Storage Tanks
- Gate
- Helispot
- Heliport
- Hydrant
- No Outlet
- Overlook
- Pond
- Problem Bridge
- Safety Zone
- Evacuation Route
- Power Line

Structures
- Survivable
- Non-Survivable

Public Lands
- BLM
- CDOW
- SLB
- USFS

105.1333° W
105°8'0"W

105.1167° W
105°7'0"W

105.1° W
105°6'0"W

37°2'30" N

Date: 9/19/2011

0 0.25 0.5 1 1.5 2 2.5 Miles

Pine Haven Wildland Urban Interface

105°6'0"W
105.1° W

105°5'30"W
105.0917° W

105°5'0"W
105.0833° W

N 41°35'37"
N 39°37'37"

Legend

Wildland Urban Interface

Features

- Aviation Hazard
- Winding Road
- Cistern
- Fuel Break
- Fuel Tanks
- Gas Plant
- Gas Storage Tanks
- Gate
- Helipad
- Heliport
- Hydrant
- No Outlet
- Overhead
- Pond
- Problem Bridge
- Safety Zone
- Evacuation Route
- Power Line

Structures

- Survivable
- Non-Survivable

Public Lands

- BLM
- CDOW
- SLB
- USFS

12

105.1° W
105°6'0"W

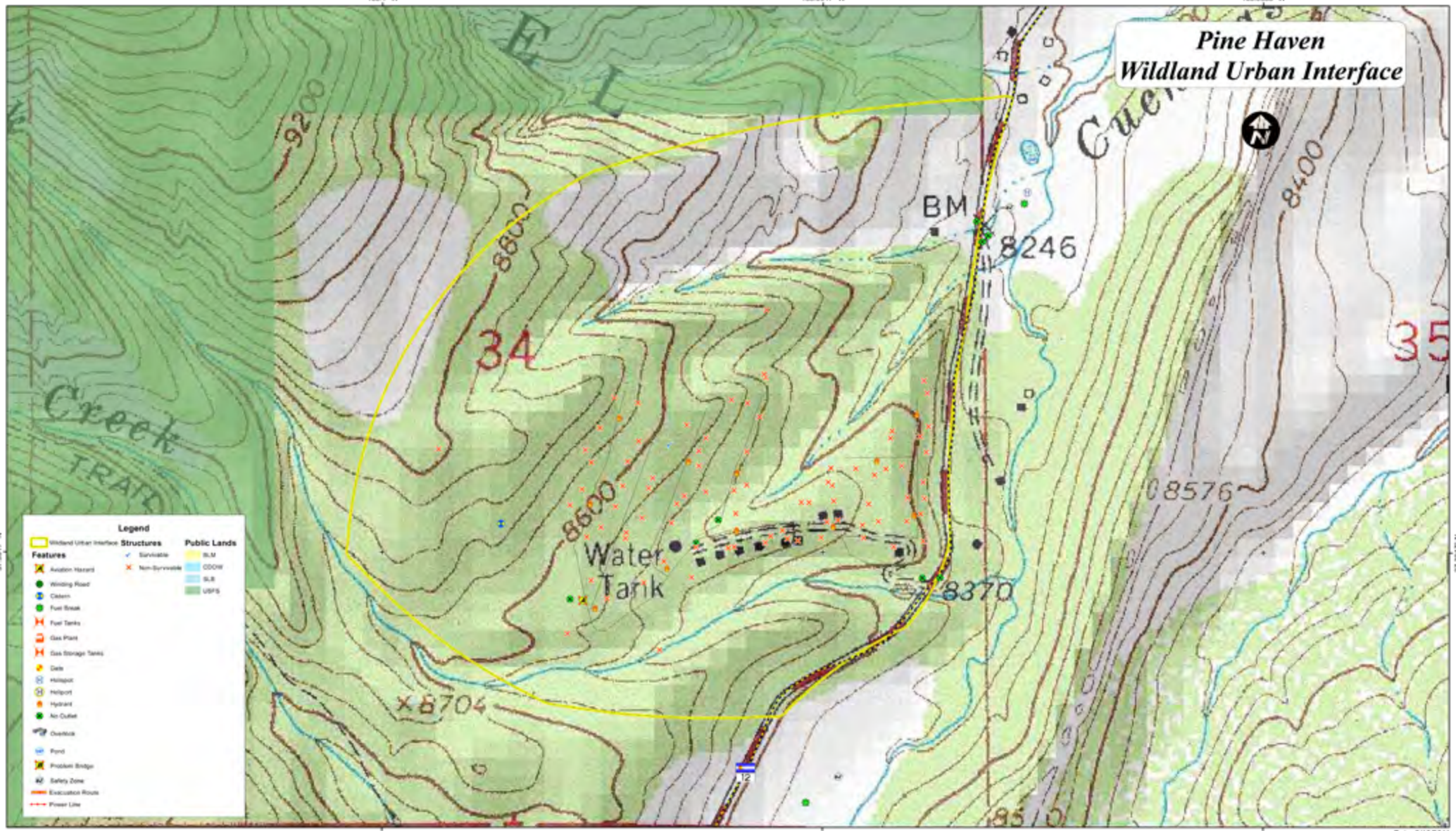
105.0917° W
105°5'30"W

105.0833° W
105°5'0"W

Date: 8/10/2011

0 0.125 0.25 0.5 0.75 1 Miles

Pine Haven
Wildland Urban Interface



Raspberry Mountain Wildland Urban Interface

105°7'0"W 105.1167° W
105°6'0"W 105.1° W
105°5'0"W 105.0833° W
105°4'0"W 105.0667° W
105°3'0"W 105.05° W
105°2'0"W 105.0333° W

37°2'7"N 37.45° N
37°2'7"N 37.45° N
37°2'60"N 37.4333° N
37°2'60"N 37.4333° N

Legend

Wildland Urban Interface

Features

- Aviation Hazard
- Winding Road
- Cistern
- Fuel Break
- Fuel Tanks
- Gas Plant
- Gas Storage Tanks
- Gate
- Helispot
- Heliport
- Hydrant
- No Outlet
- Overlook
- Pond
- Problem Bridge
- Safety Zone
- Evacuation Route
- Power Line

Structures

- Survivable
- Non-Survivable

Public Lands

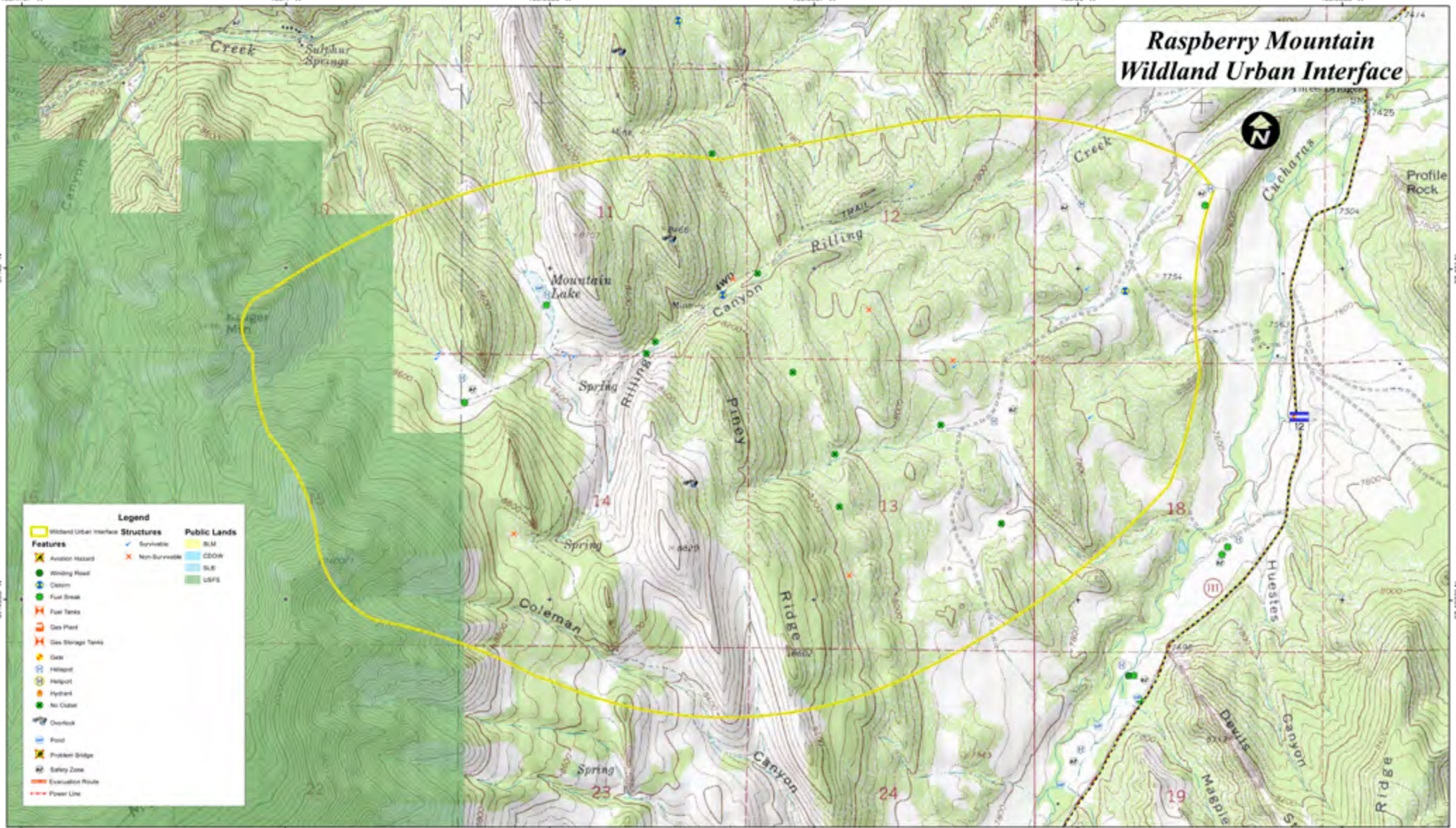
- BLM
- CDOW
- SLB
- USFS

105.1167° W 105°7'0"W
105.1° W 105°6'0"W
105.0833° W 105°5'0"W
105.0667° W 105°4'0"W
105.05° W 105°3'0"W
105.0333° W 105°2'0"W

Date: 8/10/2011

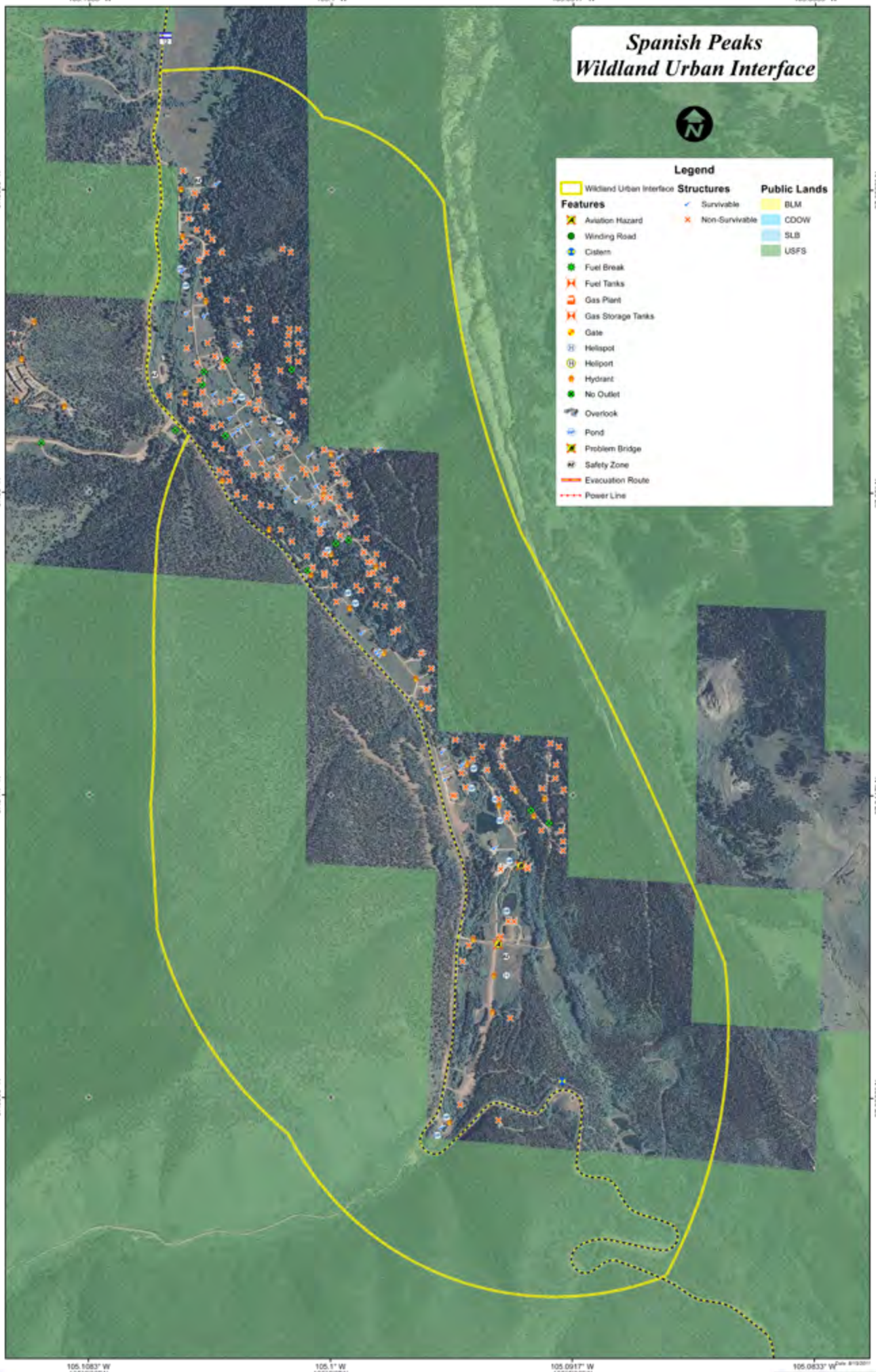
0 0.25 0.5 1 1.5 2 2.5 Miles

Raspberry Mountain Wildland Urban Interface

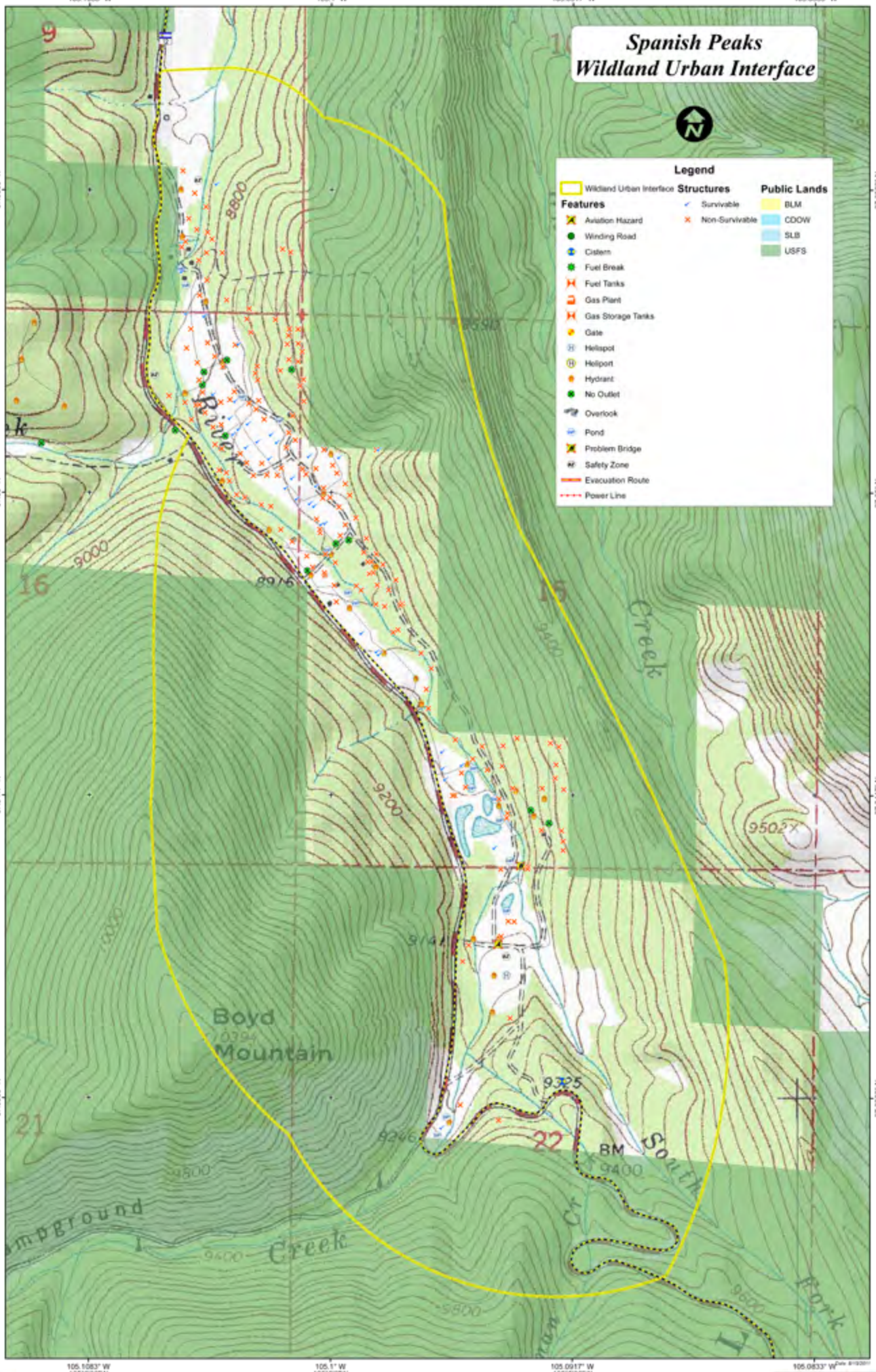


0 0.25 0.5 1 1.5 2 2.5 Miles

Spanish Peaks Wildland Urban Interface



Spanish Peaks Wildland Urban Interface



Tres Valles
Wildland Urban Interface

105°7'30"W
105.125° W

105°7'0"W
105.1167° W

105°6'30"W
105.1083° W

105°6'0"W
105.1° W

37°34'30"N
37.575° N

37°34'0"N
37.566667° N

37°33'30"N
37.558333° N

37°33'0"N
37.55° N

Legend

Wildland Urban Interface

Features

- Aviation Hazard
- Winding Road
- Cistern
- Fuel Break
- Fuel Tanks
- Gas Plant
- Gas Storage Tanks
- Gate
- Helispot
- Heliport
- Hydrant
- No Outlet
- Overlook
- Pond
- Problem Bridge
- Safety Zone
- Evacuation Route
- Power Line

Structures

- Survivable
- Non-Survivable

Public Lands

- BLM
- CDOW
- SLB
- USFS

105.125° W
105°7'30"W

105.1167° W
105°7'0"W

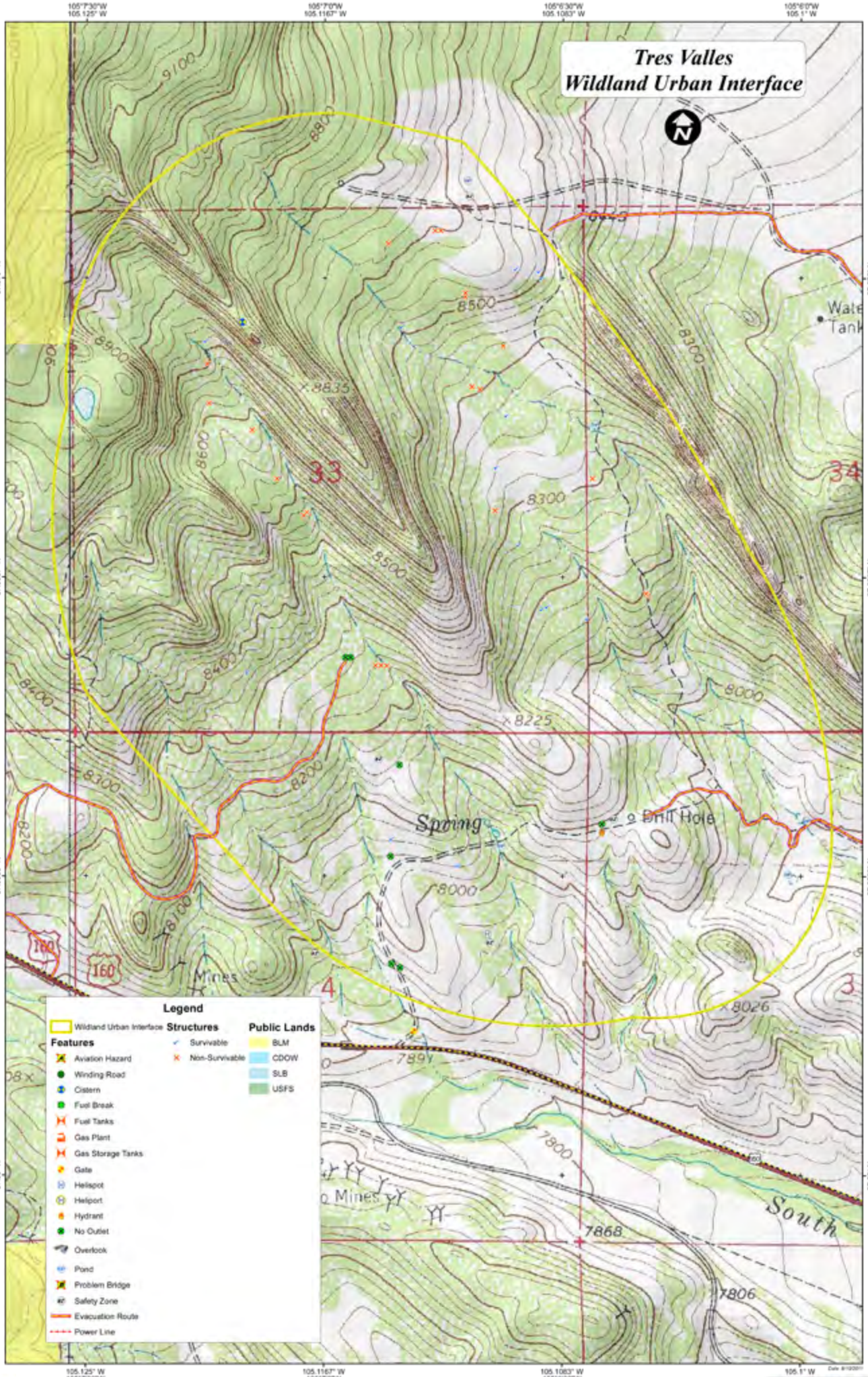
105.1083° W
105°6'30"W

105.1° W

Date: 8/10/2011

0 0.25 0.5 1 Miles

Tres Valles Wildland Urban Interface



Wahatoya & School Creek Wildland Urban Interface

105°0'0"W
105° W

104°57'30"W
104.9583° W

37°30'0"N
37.5° N

37°27'30"N
37.4583° N

37°25'0"N
37.416667° N

Legend

Wildland Urban Interface

Features

- Aviation Hazard
- Winding Road
- Cistern
- Fuel Break
- Fuel Tanks
- Gas Plant
- Gas Storage Tanks
- Gate
- Helispot
- Heliport
- Hydrant
- No Outlet
- Overlook
- Pond
- Problem Bridge
- Safety Zone
- Evacuation Route
- Power Line

Structures

- Survivable
- Non-Survivable

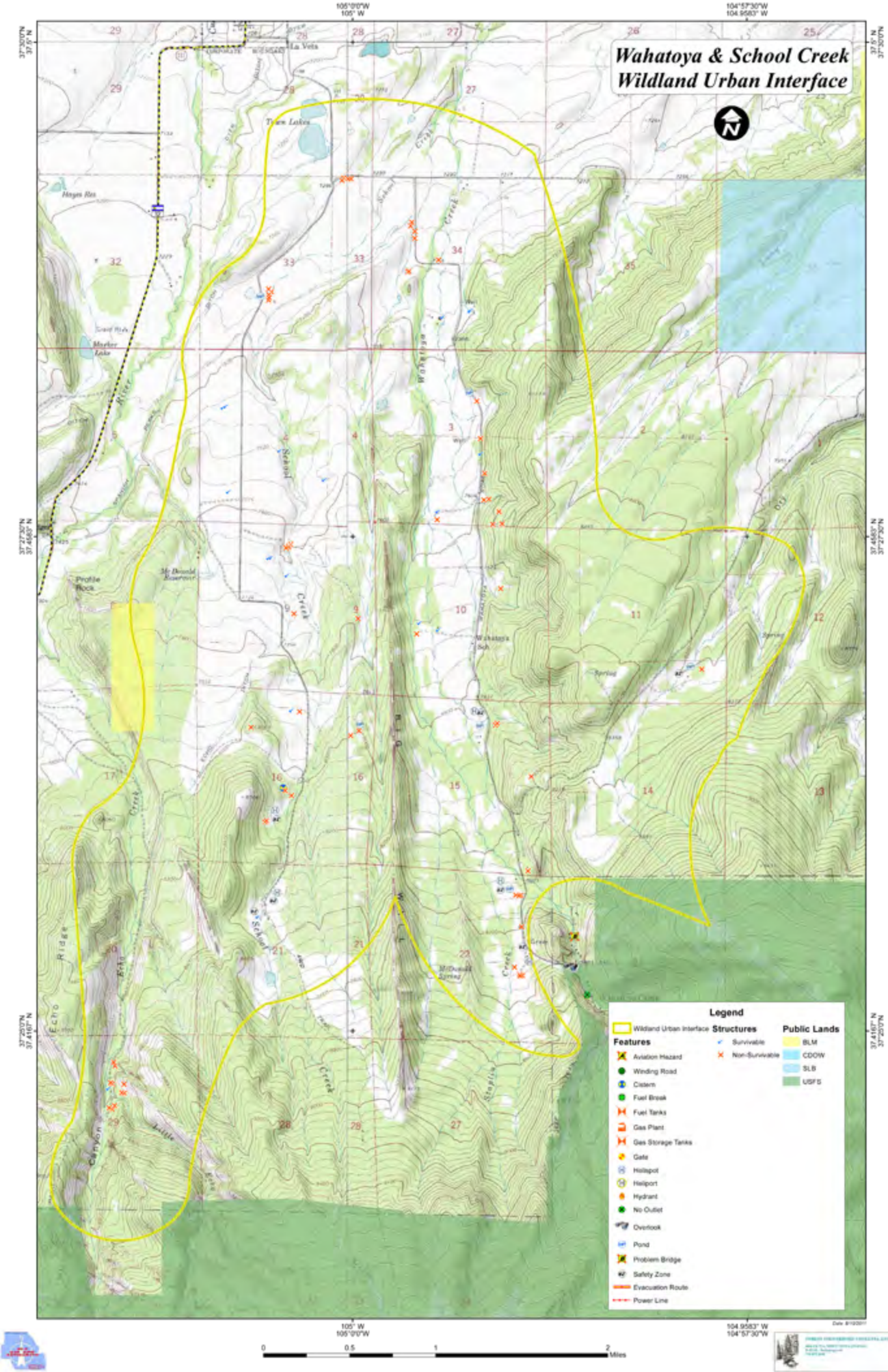
Public Lands

- BLM
- CDOW
- SLB
- USFS

Date: 8/10/2011

0 0.5 1 2 Miles

Wahatoya & School Creek Wildland Urban Interface



APPENDIX B – Fuel Model Descriptions

The primary fuels within La Veta FPD are forested land, shrub areas and grasslands. Oak with varying degrees of pine or Piñon are found at lower elevations. Ponderosa pine/Douglas-fir/aspen montane forests cover the mid-slope while Engelmann spruce is found at the higher elevations. Oak, 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 4
Fire intensity and fast-spreading fires involve the foliage, live and dead fine woody material, in the crowns of a nearly continuous secondary understory. Fuel bed depth is around six feet.

Fuel Model 5
Fire is generally carried in the surface fuels that are made up of litter cast by shrubs and the grasses or forbs in the understory. The fire are not generally very intense because surface loads are light, the shrubs are young, with little dead material, and the foliage contains little volatile material. Fuel bed depths average about two feet.

Fuel Model 6
Fires carry through the shrub layer where the foliage is more flammable than fuel model 5, but this requires moderate winds, greater than 8 mph at mid flame height. Fire will drop to the ground at low wind speeds or at openings in the stand. The shrubs are older, but not as tall as shrub types of model 4, nor do they contain as much fuel as fuel model 4. Fuel bed depths average 2.5 feet.

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. Only under

severe weather conditions involving high temperatures, low humidity's, and high winds do the fuels pose fire hazards. Closed canopy stands of short-needle conifers or hardwoods that have leafed out support fire in the compact litter layer. This layer is mainly needles, leaves, and occasionally twigs because little undergrowth is present in the stand. Representative conifer types are white pine, and lodgepole pine, spruce, fir, and larch.

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

The 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 (7.6-cm) or larger limbwood resulting from overmaturity or natural events that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees are more frequent in this fuel situation, leading to potential fire control difficulties. Any forest type may be considered if heavy down material is present; examples are insect- or disease-ridden stands, windthrown stands, overmature situations with deadfall, and
aged light thinning or partial-cut slash.

Fuel Model 11

Fires are fairly active in the slash and herbaceous material intermixed with the slash or dead/down stems. The spacing of the rather light fuel load, shading from overstory, or the aging of the fine fuels can contribute to limiting the fire
potential. Light partial cuts or thinning operations in mixed conifer stands, hardwood stands, and southern pine harvests are considered.

APPENDIX C – Fuel Hazard Reduction Guidelines

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

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

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

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

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

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

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

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

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

APPENDIX 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, the La Veta 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

Contact	Phone Number
Huerfano County Sheriff/Dispatch	(719)738-1600/(719)738-1044
Huerfano County Emergency Management Director	Diego Bobian (719)738-1537
Colorado State Patrol	Walsenburg (719)738-3546
Colorado State Forest Service	(719) 742-3588
Colorado Division of Wildlife	(719)561-5300
Colorado State Office of Emergency Services	(720)852-6600
Royal Gorge Field Office BLM	(719)269-8500
Pueblo Interagency Dispatch Center	(719)553-1600
Pike/San Isabel National Forest – San Carlos Ranger District	(719)269-8500/l(719)742-3681 L.V.
Federal Emergency Management Agency	Denver (303)235-4900
Local News Media	
San Luis Rio Grande RR-Emergency Dispatch	(608)314-9310
Red Cross	(719) 632-3563
Local Towing Services	La Veta Oil (719)742-3664
Spanish Peaks Hospital- ER	(719)738-5174

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 (BLM, US Forest Service and Colorado State Forest Service) believe evacuation may become necessary, notify the Huerfano County Sheriff and County Emergency Preparedness Directors
6) Fire suppression team and land managing agency managers should meet and coordinate with the Sheriff and County Emergency Preparedness Directors 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 County Emergency Preparedness Director 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
Cuchara	2	Hwy 12
Cuchara Pass	2	FSR 364 or Las Animas CR 46
Hwy 12 Corridor	2	Hwy 12
Hwy 160 Corridor	2	Hwy 160
Indian Creek	1	CR 421?
Little Kansas	1	CR 360
Middle Creek	3	CRs 440, 441, 442
Panadero	1	Panadero Ave. to Hwy 12
Pine Haven	1	PL1 to Hwy 12
Raspberry Mtn.	1	?
Spanish Peaks	2	Hwy 12
Tres Valles	1 +?	1 official and 2 more unofficial
Wahatoya	2	CR 360 or CR 363

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

- Establish and sign Safety Zones in areas where evacuation notification and implementation will be problematic and notify locals as to their location.
- 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
National Fire Protection Association
State Farm Fire and Casualty Company
National Institute of Standards & Technology
US Geological Survey
Insurance Services Office, Inc.
The Hartford Financial Services Group
California FAIR Plan Association
Allstate Insurance Company

Architectual Illustrations:
W. Spaulding, AIA

Photography:
Cover: Incident scenes; post-burn/damages
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.

table of contents

Large Fire Locations

January 1 to October 3, 2000

Courtesy National Interagency Fire Center
Boise, Idaho

introduction

Nearly 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

Wildfires 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.

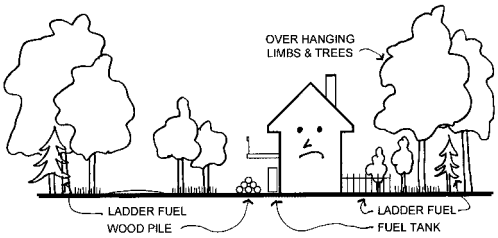
Consequently, you must take action before a fire starts.

© J Smalley, NJ • Pine Barrens

Just the Right Conditions

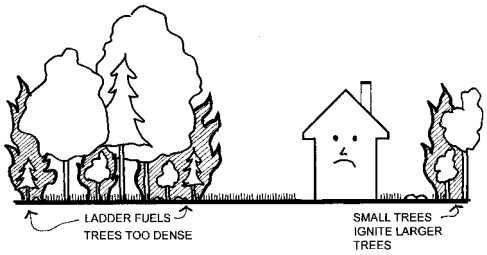
Conditions must be just right for a wildfire to start and spread. Specifically, fuel, weather and topography work together to determine how quickly a wildfire travels and at what intensity.

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



FUELS

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.



LADDER FUELS

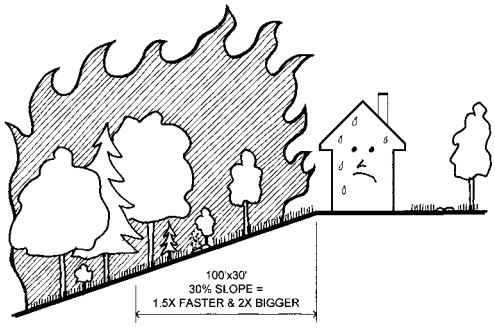
Structural Density: The closer the homes are together, the easier it is for the flames to spread from one structure to another.

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.

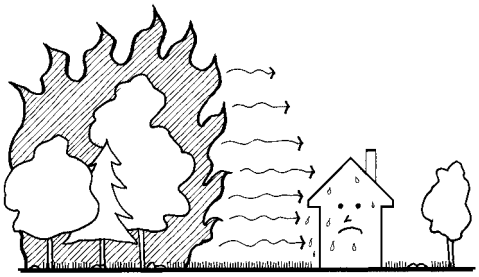


UP SLOPE

How Your Home Catches Fire

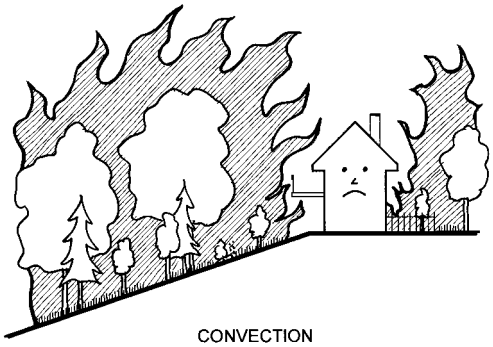
There are three ways that the wildfire can transfer itself from the natural vegetation or other burning homes to your home – through radiation, convection or firebrands.

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.



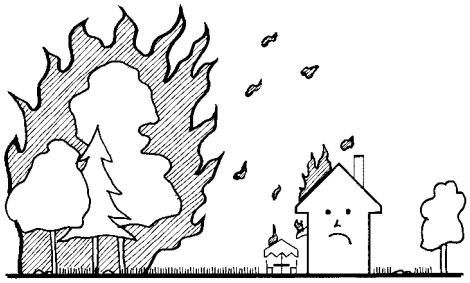
RADIATION

Convection: Contact with the convection column (flames) may also cause the wildfire to ignite your house. Typically, the convective heat column rises vertically, within the smoke plume.



CONVECTION

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

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

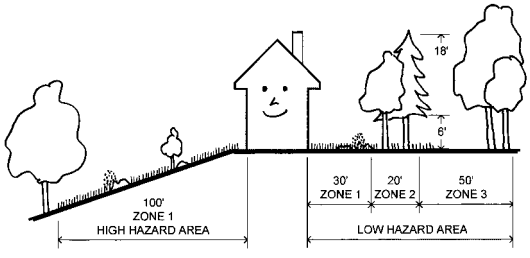
- History of nearby wildfires
- Dry climate with a dry season more than 3 months
- Steep terrain (grades average over 20%)
- Forested wildland within 100 feet of your home
- Native vegetation has not been incorporated into your landscape
- Trees are crowded within 30 feet of your home
- Manmade fuels 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.



FIREZONES

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

Creating 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

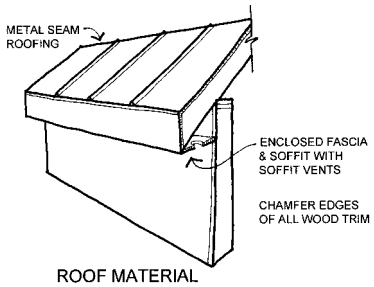
Examine your home's construction and materials. Use the following as a checklist.

- ☐ 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?

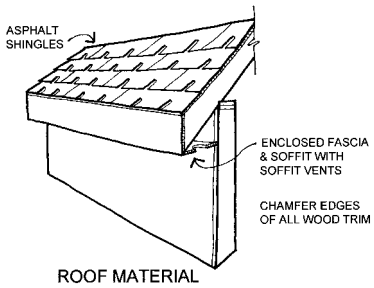
Taking Action

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.



ROOF MATERIAL



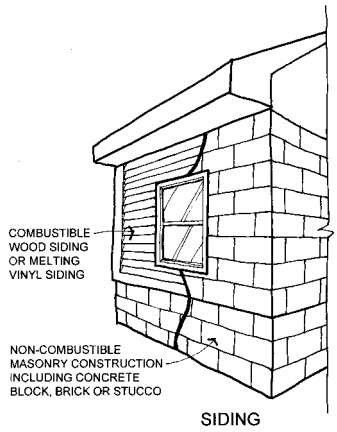
ROOF MATERIAL

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.

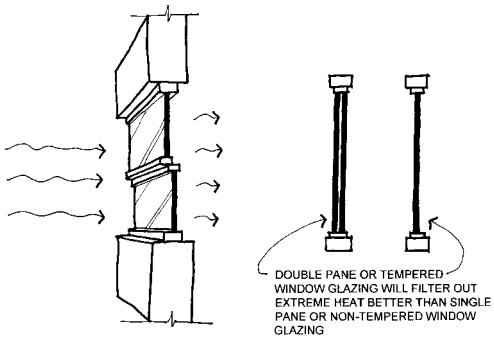
Wall materials that resist heat and flames include cement, plaster, stucco and concrete masonry such as stone, brick or block. Though some materials will not burn, such as vinyl, they may lose their integrity when exposed to high temperature and fall away or melt, providing the fire with a direct path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



SIDING

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.

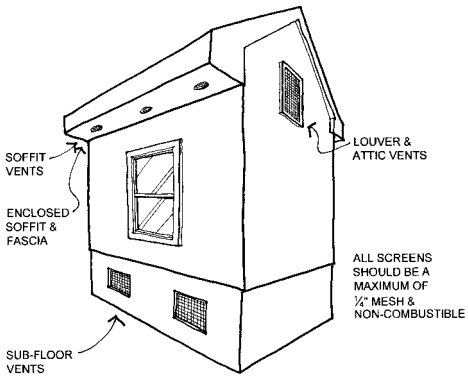
On the other hand, single or double pane tempered glass windows, doors and skylights typically fracture at higher exposures, well above the radiant heat exposures capable of igniting the surrounding wood.



WINDOW GLAZING

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.



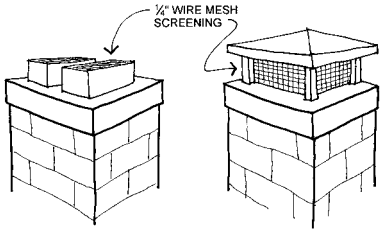
SCREENS AT VENTS

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.

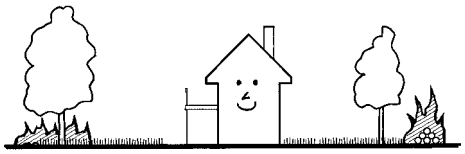


CHIMNEY SCREENS

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

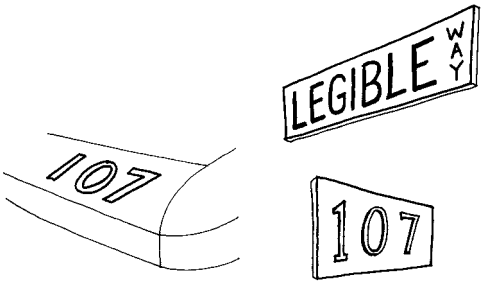
Even if you modify your home's landscape to incorporate the most fire-resistant materials and design into your home's construction, there is no guarantee that a wildfire will not threaten your home. It is important that your local fire department be able to find and defend your home.

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

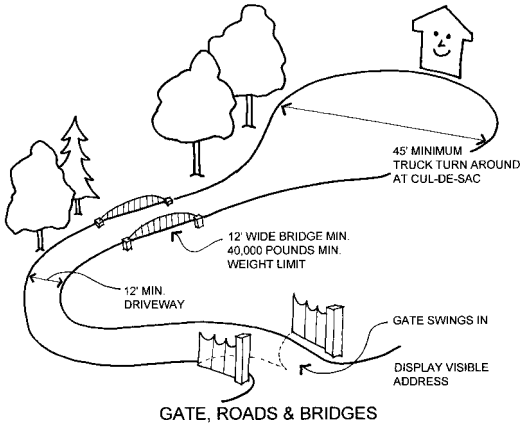
Street Signs and Numbers: If made from combustible materials, your street signs and numbers can ignite or melt, leaving the fire department with no ability to locate your home. It is critical that signs and numbers be noncombustible and visible from the road.

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.



SIGNAGE



GATE, ROADS & BRIDGES

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 outsides 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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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

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

Colorado State Forest Service

Knowledge to Go Places

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

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

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

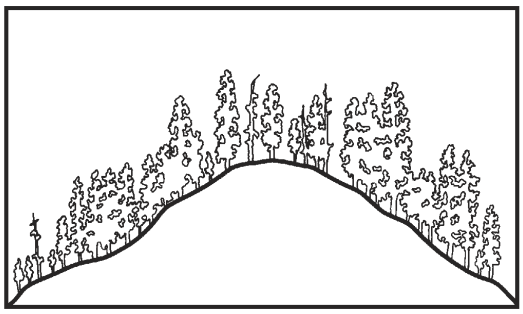
But with development inevitably comes a higher risk of wildfire as well as an ever-increasing potential for loss of life and property. Methods of fire suppression, pre-suppression needs, and homeowner and fire crew safety must all be considered in the planning and review of new developments as well as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

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

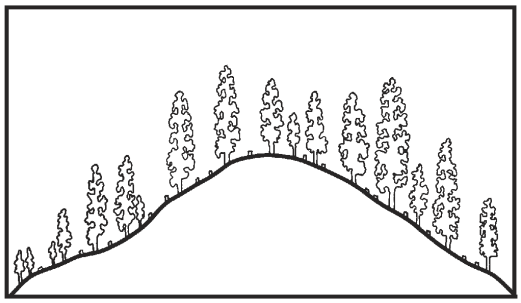
Fuelbreak vs Firebreak

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

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



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



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

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

Fuelbreak Limitations

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

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

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

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

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

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

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

The Need For A Fuelbreak

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

Potential Problem Indicator

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

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

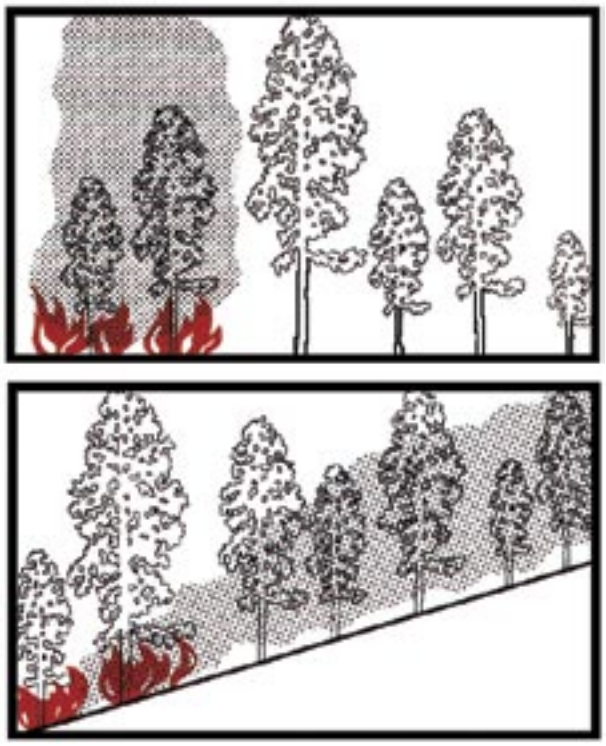
Legend: 5 – Problem may be crucial; 4 – Problem very likely;
3 – Exercise caution; 2 – Problem usually limited;
1 – No rating possible

Wildfire Hazard Maps

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

Slope

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



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

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

Topography

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

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

Chimney.

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

Saddle.

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

Flashover in V-shaped valley.

Crowning Potential

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

Crowning Potential Key

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

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

Ignition Sources

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

Fuelbreak Locations

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

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

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

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

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

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

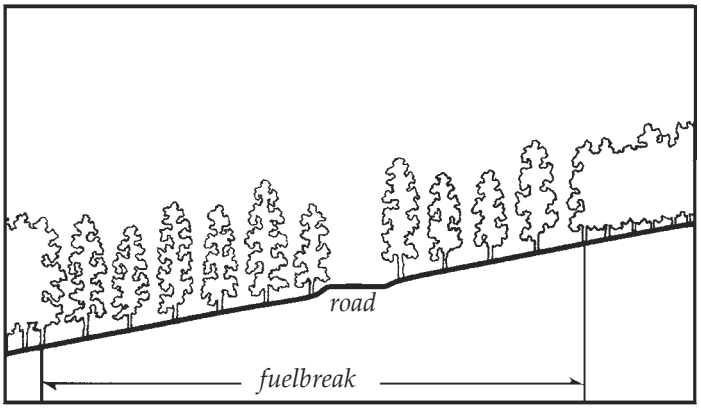
Aesthetics

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

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

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

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



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

Constructing the Fuelbreak

Fuelbreak Width and Slope Adjustments

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

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

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

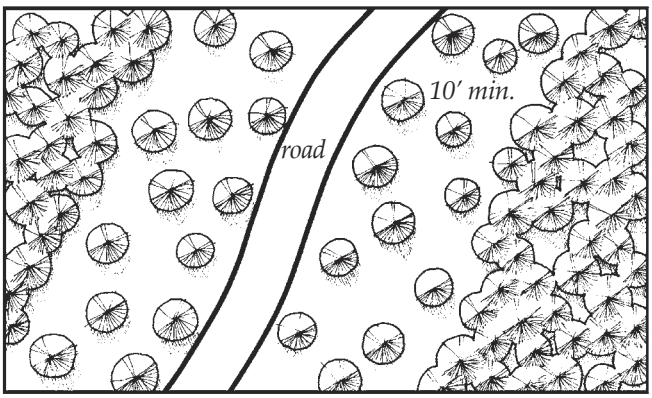
Fuelbreak Width/Slope

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

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

Stand Densities

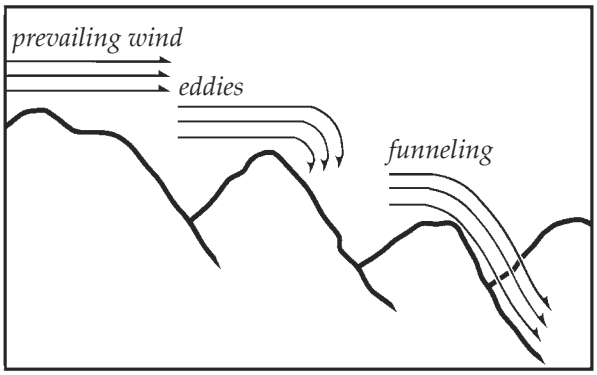
Crown separation is a more critical factor for fuelbreaks than a fixed tree density level. A *minimum* 10-foot spacing between the edges of tree crowns is recommended on level ground. As slope increases, crown spacing should also increase. However, small, isolated groups of trees may be retained for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



Plan view of fuelbreak showing minimum distance between tree crowns.

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

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



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

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

Debris Removal

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

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

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

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

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

Fuelbreak Maintenance

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

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

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

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

Conclusion

An image of well-designed communities for Colorado includes:

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

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

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

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

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

Wildfire Hazard & Risk Assessment Instructions

INTRODUCTION

The process for assessing your subdivision or neighborhood can be divided into five distinct steps. Each is necessary to efficiently and accurately perform the assessment. The steps should be completed in order; however, step 5 can be completed separately from the rest of the assessment. In completing your assessment, you will need to use the Wildfire Hazard and Risk Assessment Scoresheet found on this CD-ROM.

STEP 1 - IDENTIFY AREAS TO BE EVALUATED

There are two types of subdivisions that are at risk from a wildfire – boundary interface subdivisions and intermix interface subdivisions. Fully developed subdivisions whose lots form a distinct boundary with wildlands are called boundary interfaces. Subdivisions where undeveloped lots (wildlands) are interspersed with developed lots are referred to as intermix interfaces.

If the number of undeveloped lots within an intermix interface subdivision are few, the danger of a wildfire burning into the subdivision is greatly reduced. This usually occurs once the subdivision is more that 75% built out (three out of four lots are developed). Subdivisions where this occurs need not be assessed unless they also have a boundary interface component or the vegetation found on the undeveloped lots is rated extreme hazard.

Wildlands fewer than 5 acres and completely surrounded by development are referred to as "occluded interface" areas and need not be assessed unless it is felt that the undeveloped parcels pose a high risk to neighboring structures because of high fuel loads or high flammability characteristics of the structures.

Once the wildland/urban interface area to be assessed has been determined, give it a name (like "Oak Woods Unit South") and delineate the area on a map. If the subdivision is very large, divide it into neighborhoods, especially if the characteristics of the subdivision are not uniform throughout (for example: an area of the subdivision with five -to seven-acre lots may be assessed as a unit).

STEP 2 - IDENTIFY THE RISK

Determine if the immediate area (within five miles) has had a higher than average occurrence of wildfires. This can mean either a history of wildfires burning into the subdivision or a higher than average number of wildfires starting in the area. Your local forestry office can help you determine how this compares with the average for the county. If the immediate area does indeed have a higher than average occurrence of wildfires, you will need to assign risk points on the Wildfire Hazard and Risk Assessment Scoresheet.

STEP 3 - IDENTIFY THE FUEL HAZARD TYPE

Use the pictorial guide (Description of Fuel Models) on this CD-ROM to determine the vegetation types or fuel models within intermix areas and along the interface boundary.

continued ▸

If there is a mixture of vegetation types in the area, you should select the type most likely to do structural damage. This will probably be the vegetation type that is closest to the structures. Be sure to look beyond the edge of the vegetation boundary. Plants tend to be bigger along the edge of open areas in response to increased sunlight. You will get a better picture of the average vegetation heights by looking past the edge into the interior of the undeveloped area.

Once the vegetation type has been determined, assign the characteristic (light, medium, heavy, or slash) that accurately describes the fuel. Convert your selected vegetation type to points in Section B of the Wildfire Hazard and Risk Assessment scoresheet.

STEP 4 - COMPLETE THE WILDFIRE HAZARD AND RISK ASSESSMENT SCORESHEET

Evaluate the following factors on the scoresheet:

A. Means of Access
B. Vegetation (Fuel Models – evaluated in Step 3)
C. Topography
D. Additional Rating Factors
E. Roofing Assembly
F. Building Construction
G. Available Fire Protection
H. Placement of Gas and Electric Utilities
I. Totals for Home or Subdivision (total of all points)

STEP 5 - IDENTIFY CRITICAL FACILITIES TO BE PROTECTED

Critical facilities are those facilities that will need special protection from wildfire. This may be because the facilities are necessary to maintain infrastructure function, are smoke-tsensitive or would be very hazardous if ignited by an encroaching wildfire. A power substation, for example, may need additional brush clearance to provide adequate defensible space. In the case of a nursing home, a wildfire evacuation plan may also be necessary in order to quickly and efficiently transport patients out of smoky conditions. *This process can be completed at any stage of the assessment.* Seek the help of local fire service professionals and community leaders in identifying critical facilities and developing a plan to eliminate hazards that threaten these facilities.

Facilities that need special protection due to their flammability:

- Flammable liquid storage tanks
- Landfills/dumps/junk yards
- Sawmills and lumberyards
- Hazardous materials storage areas
- Schools/day care centers
- Nursing homes/assisted living facilities
- Medical facilities
- Airports
- Correctional facilities
- Roadways

Facilities that need special protection in order to maintain infrastructure function:

- Power plants/substations
- Power transmission lines
- Water plants/well fields
- Water treatment plants/lift stations
- Fire and law enforcement stations
- Communication towers

Wildfire Hazard & Risk Assessment Scoresheet

** This document is based upon the NFPA 1144

DIRECTIONS

Assign a value to the most appropriate element in each category and place the number of points in the box on the right.

A. Means of Access

1. Ingress and egress

a. Two or more roads in/out	0
b. One road in/out	7

2. Road width

a. ≥ 7.3 m (24 ft)	0
b. ≥ 6.1 m (20 ft) and < 7.3 m (24 ft)	2
c. < 6.1 m (20 ft)	4

3. All-season road condition

a. Surfaced road, grade < 5%	0
b. Surfaced road, grade > 5%	2
c. Non-surfaced road, grade < 5%	2
d. Non-surfaced road, grade > 5%	5
e. Other than all-season	7

4. Fire service access

a. ≤ 91.4 m (300 ft) with turnaround	0
b. > 91.4 m (300 ft) with turnaround	2
c. < 91.4 m (300 ft) with no turnaround	4
d. ≥ 91.4 m (300 ft) with no turnaround	5

5. Street signs

a. Present [102 cm (4 in.) in size and reflectorized]	0
b. Not present	5

B. Vegetation *(fuel models)*

1. Characteristics of predominate vegetation within 91.4 m (300 ft)

a. Light (eg, grasses, forbs, sawgrasses, and tundra) *NFDRS Fuel Models A, C, L, N, S, and T*	5
b. Medium (eg, light brush and small trees) *NFDRS Fuel Models D, E, F, H, P, Q, and U*	10
c. Heavy (eg, dense brush, timber and hardwoods) *NFDRS Fuel Models B, G, and O*	20
d. Slash (eg, timber harvesting residue) *NFDRS Fuel Models J, K, and L*	25

2. Defensible space

a. More than 30.48 m (100 ft) of vegetation treatment from the structure(s)	1
b. 21.6 m to 30.48 m (71 ft to 100 ft) of vegetation treatment from the structure(s)	3
c. 9.14 m to 21.3 m (30 ft to 70 ft) of vegetation treatment from the structure(s)	10
d. < 9.14 m (30 ft) of vegetation treatment from the structure(s)	25

C. Topography within 9.1 m *(300 ft)* of structure(s)

1. Slope

a. Slope ≤ 9%	1
b. Slope 10% to 20%	4
c. Slope 21% to 30%	7
d. Slope 31% to 40%	8
e. Slope > 41%	10

D. Additional Rating Factors *(rate all that apply)*

1. Miscellaneous

a. Topographical features that adversely affect wildland fire behavior	0-5	
b. Areas with a history of higher fire occurrence than surrounding areas due to special situations (eg, heavy lightning, railroads, escaped debris burning, and arson)	0-5	
c. Areas that are periodically exposed to unusually severe fire weather and strong dry winds	0-5	
d. Separation of adjacent structures that can contribute to fire spread	0-5	

E. Roofing Assembly

1. Roof class

a. Class A roof	0	
b. Class B roof	3	
c. Class C roof	15	
d. Nonrated	25	

F. Building Construction

1. Materials *(predominate)*

a. Noncombustible/fire-resistive siding, eaves, and deck	0	
b. Noncombustible/fire-resistive siding and combustible deck	5	
c. Combustible siding and deck	10	

2. Building setback relative to slopes of 30% or more

a. ≥ 9.14 m (30 ft) to slope	1	
b. < 9.14 m (30 ft) to slope	5	

G. Available Fire Protection

1. Water source availablility

a. Pressurized water source availability - 1892.7 L/min (500 gpm) hydrants ≤ 304.8 m (1000 ft) apart	0	
b. Pressurized water source availability - 946.4 L/min (250 gpm) hydrants ≤ 304.8 m (1000 ft) apart	1	
c. Nonpressurized water source availability (off site) - ≥ 946.4 L/min (250 gpm) continuous for 2 hours	3	
d. Nonpressurized water source availability (off site) - < 946.4 L/min (250 gpm) continuous for 2 hours	5	
e. Water unavailable	10	

2. Organized response resources

a. Station ≤ 8 km (5 mi.) from structure	1	
b. Station > 8 km (5 mi.) from structure	5	

3. Fixed fire protection

a. NFPA 13, 13R, 13D sprinkler system	0	
b. None	5	

H. Placement of Gas and Electric Utilities

1. Placement of utilities

a. Both underground	0	
b. One underground, one aboveground	3	
c. Both aboveground	5	

I. Totals for Home or Subdivision *(total of all points)*

Hazard Assessment	Total Points
Low	< 40
Moderate	40-69
High	70-112
Extreme	> 112

APPENDIX H – 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.

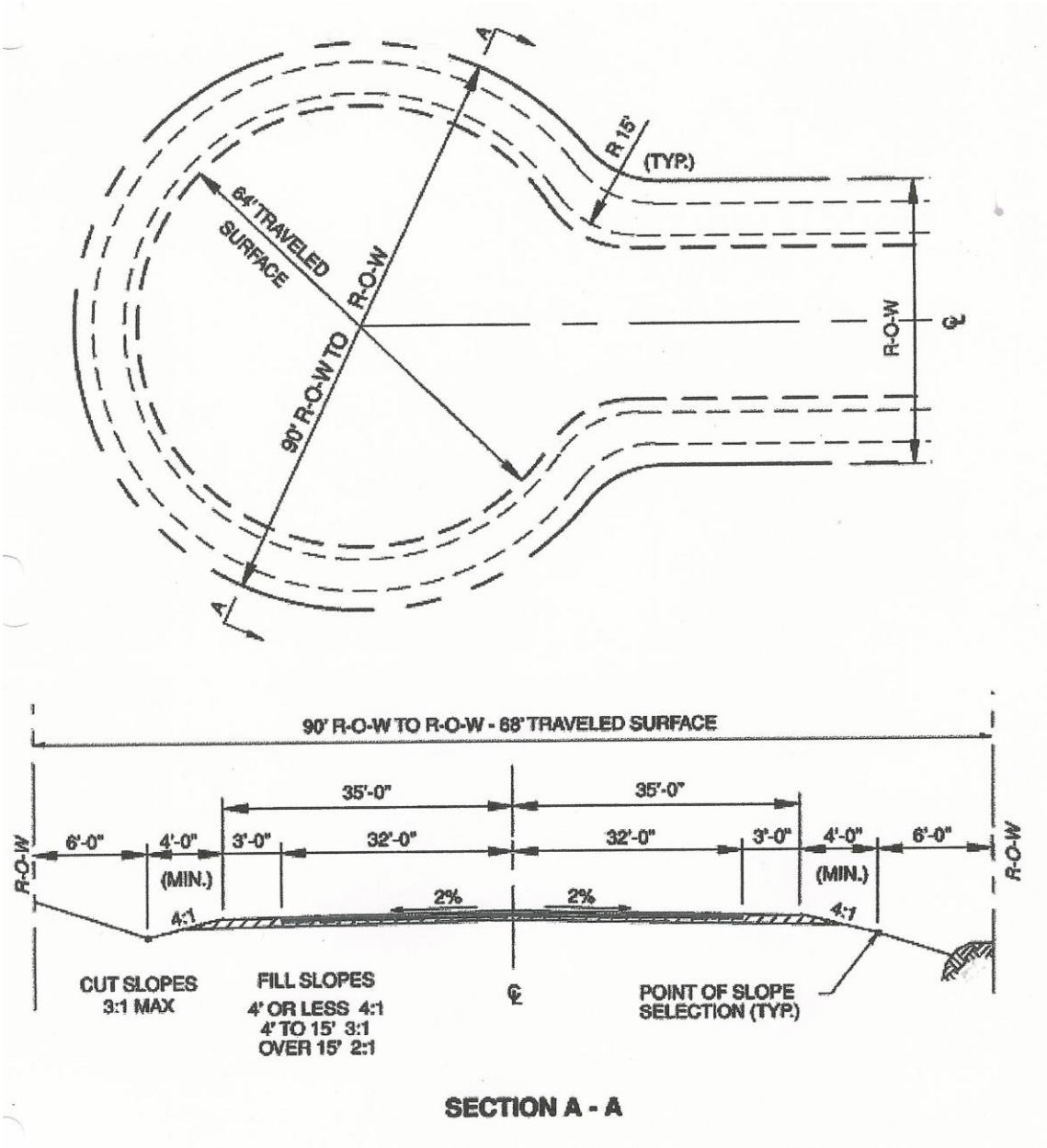
D. If the length of the driveway is less than 50’ then A and B above does not apply.

E. If the length exceeds 150’, a turnaround shall be provided in accordance with (template 1 or 2).

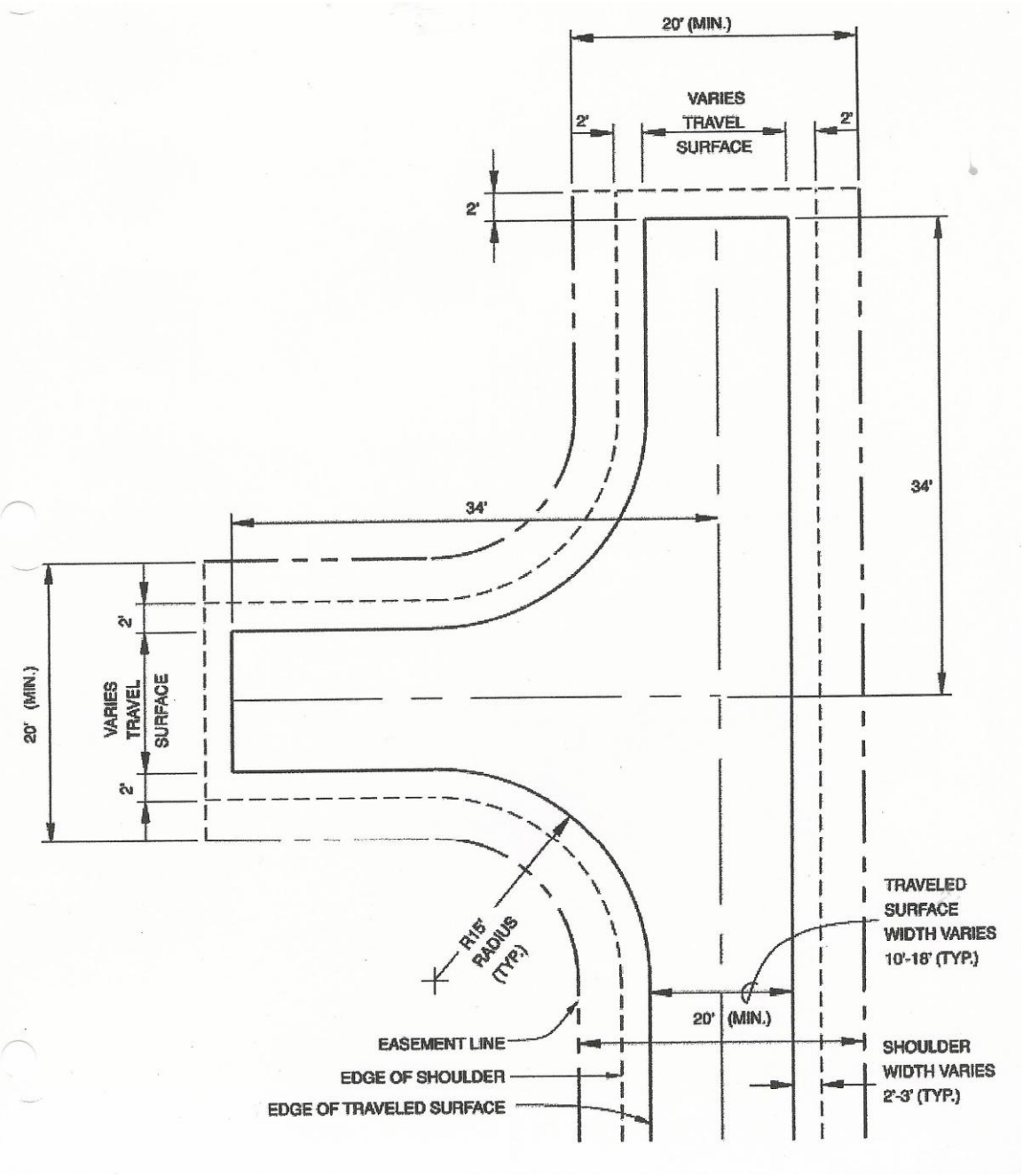
Driveway approaches and private road intersections with public roads shall meet the following:

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

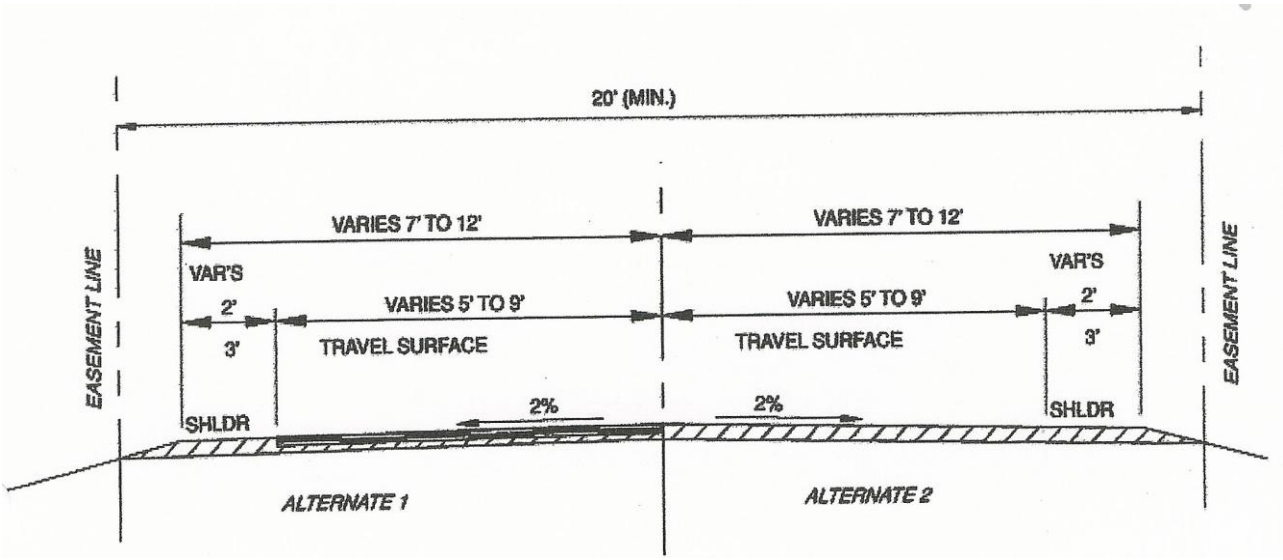
TEMPLATE 1 – Cul-de-sac



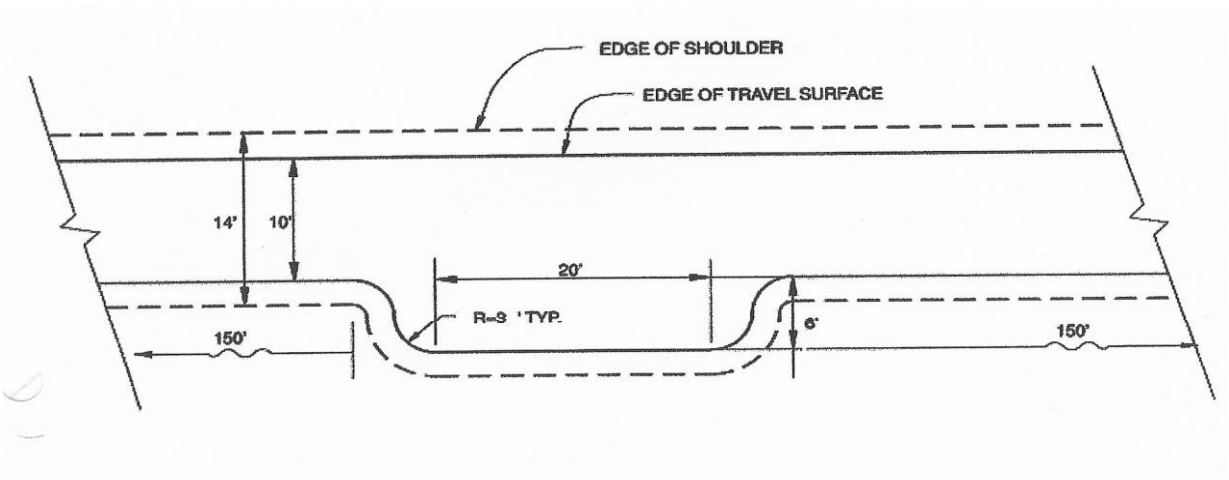
TEMPLATE 2 – Hammerhead Turnaround



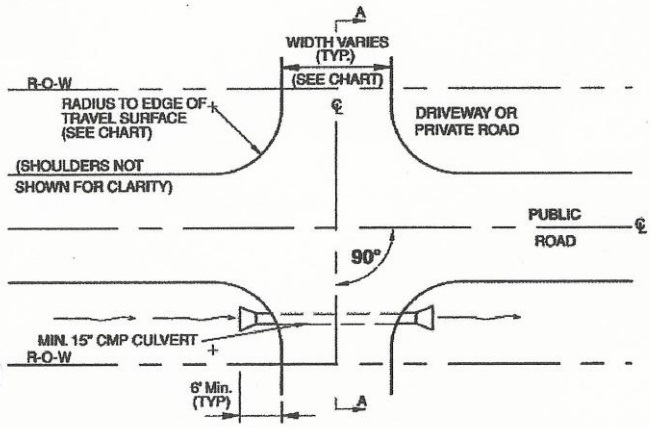
TEMPLATE 3 – Private Road



TEMPLATE 4 – Pull Out for Private Road



TEMPLATE 5 – Driveway Approaches for Roads



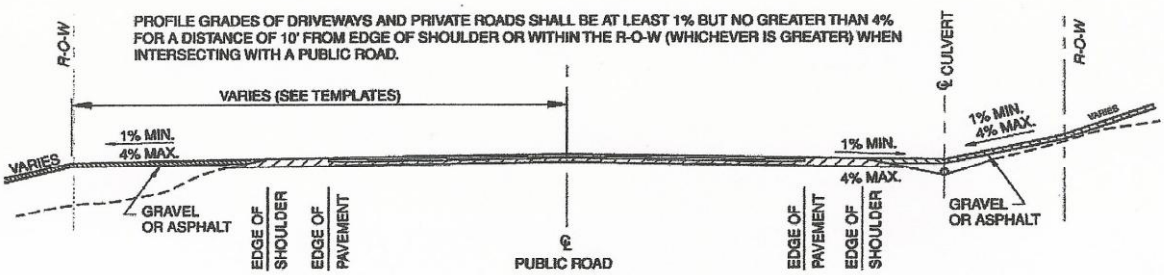
PLAN

DRIVEWAYS AND PRIVATE ROADS SHALL INTERSECT WITH PUBLIC ROADS AT RIGHT (90°) ANGLES OR AS NEARLY AT RIGHT ANGLES AS POSSIBLE FOR A DISTANCE OF:

- 25' FROM THE TRAVEL SURFACE OR WITHIN THE R-O-W (WHICHEVER IS GREATER) WHEN INTERSECTING WITH AN ARTERIAL ROAD, OR
- 15' FROM THE TRAVEL SURFACE OR WITHIN THE R-O-W (WHICHEVER IS GREATER) WHEN INTERSECTING WITH A COLLECTOR OR LOCAL ROAD.

TRAVEL SURFACE

	WIDTH (FEET)	RADIUS (FEET)
DRIVEWAY	10	10
PRIVATE ROAD	16-18	15



SECTION A - A

APPENDIX I – 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.

Home Ignition Zone – Includes an area surrounding the home within 100 to 200 feet. The potential for ignition depends on the home's exterior materials and design and the amount of heat to the home form the flames within the home ignition zone.

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

Insurance Services Office (ISO) Rating - An overall fire services rating developed for use in determining insurance premiums for residential and commercial property. Factors such 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 for more details.

Mitigation Actions - Those on-the-ground activities that will serve to increase the survivability of the structure to 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.

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.

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.

Appendix J: Potential Sources of Funding

The Secure Rural Schools and Community Self-Determination Act of 2000

Frequently Asked Questions

What is the SRS Act? When was it passed?

The Secure Rural Schools and Community Self-Determination Act of 2000 (SRS Act), Public Law (P.L.) 106-393, was enacted to provide five years of transitional assistance to rural counties affected by the decline in revenue from timber harvests on federal lands. Since 1908, 25- percent of Forest Service revenues, such as those from timber sales, mineral resources and grazing fees, have been returned to states in which national forest lands are located. Set to expire in 2006, the SRS Act was reauthorized and amended several times with the latest changes occurring in October 2008 under P.L. 110-343. Funds have been used for schools and roads and to create employment opportunities, maintain current infrastructure, and improve the watershed and ecosystem health.

What does the SRS Act do?

Originally, the SRS Act altered the county payment program of the U.S. Forest Service from FY2001-FY2006 to allow states or counties to choose whether to receive the average of the three highest payments for FY1986-FY1999 or the regular 25-percent payment. The SRS Act also required that counties receiving at least $100,000 had to spend 15 percent to 20 percent of those payments for specified county purposes, in accordance with Resource Advisory Committee (RAC) recommendations, or as determined by the Secretary of Agriculture for projects on federal lands. Counties must return unallocated portions to the U.S. Treasury.

Currently, the SRS Act requires counties choose to receive either: 1) a portion of their state's payment or 2) a rolling average of the total receipts for the past seven fiscal years. Counties choosing the first option are bound to that decision until 2011 (4 years); counties selecting the

rolling average may switch after two years. The total amount of available funding declines each fiscal year.

What does the SRS Act do for Colorado counties?

Counties that choose the rolling average may spend these funds on projects as they would 25-percent payments. Counties that instead choose a portion of the state's payment use the funds as described below:

<table>
<tr><th rowspan="2">SRS Provision</th><th colspan="3">County selects a portion of the state's payment</th></tr>
<tr><th>Less than $100,000</th><th>Between $100,000 and $350,000</th><th>More than $350,000</th></tr>
<tr><td>Title I: Roads and Schools</td><td rowspan="3">May spend 100% on Title I projects or may opt to spend 15-20% on Title II and Title III projects.</td><td>80-85% spent on this title.</td><td>80-85% spent on this title.</td></tr>
<tr><td>Title II: Special Projects / RAC</td><td rowspan="2">No more than 15-20% for Title II and Title III projects. May return 15-20% to US Treasury instead.</td><td rowspan="2">No more than 15-20% for Title II and Title III projects. Title III projects are capped at 7% of total funds. May return 15-20% to US Treasury instead.</td></tr>
<tr><td>Title III: County Funds</td></tr>
</table>

What are kinds of projects can be funded by the SRS Act?

The kinds of projects are limited by what is listed in the SRS Act.

Title I: Funds must be used in the same manner as 25-percent funds would normally be spent.

Title II: Funds may be used for projects as recommended by Resource Advisory Committees (RAC) and approved by the Secretary of Agriculture or his/her designee (i.e. a forest supervisor or district ranger). Title II funds may be used to make additional investments in, and create additional employment opportunities through, projects that improve the maintenance of existing infrastructure, implement stewardship objectives that enhance forest ecosystems, and restore and improve land health and water quality. Projects shall enjoy broad based support with objectives that may include, but are not limited to:

- Road, trail, and infrastructure maintenance or obliteration;
- Soil productivity improvement;
- Improvements in forest ecosystem health;
- Watershed restoration and maintenance;
- Restoration, maintenance and improvement of wildlife and fish habitat;
- Control of noxious and exotic weeds; and
- Re-establishment of native species.

At least 50 percent of all Title II funds must be used for projects that primarily are dedicated to:

- Road maintenance, decommissioning, or obliteration; or
- Restoration of streams and watersheds.

Title II projects must be recommended by a RAC and must be within the RAC's geographical boundary.

Additional information on Title II projects, RACs, and project planning and approval processes may be found at: https://wwwnotes.fs.fed.us/wo/secure_rural_schools.nsf.

Title III: Funds are used for projects developed and selected by the counties. Project proposals should describe the proposed use of the county funds and must be advertised for 45 days in any publication of local record to allow for public comment. Proposed projects also should be sent to the RAC if one exists in the county.

Funds may **only** be used to:

1. carry out activities under the Firewise Communities Program to provide homeowners in fire-sensitive ecosystems education and assistance with implementation, techniques in home-siting, home construction, and home landscaping that can help protect people and property from wildfires;

2. reimburse the participating county for search and rescue and other emergency services, including firefighting, that are performed on federal land after the date on which the use was approved and paid for by the participating county; and
3. develop Community Wildfire Protection Plans (CWPPs) in coordination with the Secretary of Agriculture.

In FY 2008, Colorado was paid $14,728,659 for Title I projects and $1,159,653 for Title III projects. The U.S. Forest Service was holding $1,316,980 for approved Title II projects.

Are these funds the same as the Payments-In-Lieu-of-Taxes (PILT) program?

No. The PILT program is administered by the U.S. Department of the Interior. These federal payments are made to local governments that help offset losses in property taxes due to nontaxable federal lands within their boundaries. Payments help local governments carry out such vital services as firefighting and police protection, construction of public schools and roads, and search-and-rescue operations. The payments are made annually for tax-exempt federal lands administered by the BLM, National Park Service, U.S. Fish and Wildlife Service (all agencies of the U.S. Department of the Interior), U.S. Forest Service (part of the U.S. Department of Agriculture), and for federal water projects and some military installations. For more information on PILT, please visit: http://www.doi.gov/pilt

Where can I go for more information?

If you have questions or need more information on specific projects, contact your US Forest Service district ranger. Contacts for RACs may be found by visiting the following website: https://wwwnotes.fs.fed.us/wo/secure_rural_schools.nsf/RAC_by_County?OpenView&Start=1&Count=1000&Expand=5#5

For additional information on the Secure Rural Schools Act, please consult the following references:

Public Law 106-393. 2000. The Secure Rural Schools and Community Self-Determination Act of 2000. Available online at http://www.blm.gov/or/files/PL106-393.pdf; last accessed 16 July 2009.

Public Law 110-343. 2008. Reauthorization of the Secure Rural Schools and Community Self-Determination Act of 2000. Available online at http://www.fs.fed.us/srs/docs/srs-bill-sec-601.pdf; last accessed 16 July 2009.

USDA. Forest Service. 2009. The Secure Rural Schools and Community Self-Determination Act of 2000. Reauthorization for Fiscal Years 2008—2011. Available online at http://www.fs.fed.us/srs; last accessed 16 July 2009.

----. 2008. Reauthorization of the Secure Rural Schools and Community Self-Determination Act of 2000. Available online at http://www.fs.fed.us/srs/docs/srs-bill-sec-601.pdf; last accessed 16 July 2009.

US Office of Management and Budget. 2009. Cost principles for state, local, and Indian tribal governments. 2 CFR 225. Available online at http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=f3e960da5d4f95af53523ae88cb38ab5&rgn=div5&view=text&node=2:1.1.2.3.6&idno=2; last accessed 17 July 2009. [Note: This document contains a glossary and instructions that might be useful for local governments that have been awarded federal grant monies.]

Womach, J. 2005. Agriculture: A glossary of terms, programs, and laws. Congressional Research Service. Available online at http://ncseonline.org/nle/crsreports/05jun/97-905.pdf; last accessed 16 July 2009.

Criteria and Instructions to States

2011 Colorado Wildland Urban Interface Grant Program

Congress has provided increased funding assistance to states through the USDA Forest Service State and Private Forestry programs since 2001. The focus of much of this additional funding was mitigating risk in Wildland Urban Interface (WUI) areas. In the West, the State Fire Assistance (SFA) funding is available and awarded through a competitive process with emphasis on hazard fuel reduction, information and education, and community and homeowner action. This portion of the National Fire Plan was developed to assist interface communities manage the unique hazards they find around them. Long-term solutions to interface challenges require informing and educating people who live in these areas about what they and their local organizations can do to mitigate these hazards.

The 10-Year Comprehensive Strategy focuses on assisting people and communities in the WUI to moderate the threat of catastrophic fire through the four National Fire Plan goals of improving prevention and suppression, reducing hazardous fuels, restoring fire-adapted ecosystems, and promoting community assistance.

Grant Criteria:

1) Reduce Hazardous Fuels / Restore Fire-adapted Ecosystems:

Recipients may facilitate and implement mitigating fuel treatments in or adjacent to identified fire prone communities to reduce the threat of wildfire to communities. Fuel reduction projects and vegetation treatments have been identified as a means of mitigating wildfire hazards. These are projects that remove or modify fuels in and/or adjacent to WUI development. Effective fuels mitigation treatments can be implemented across jurisdictional boundaries, on adjoining private lands, or within the respective communities. Projects of this type include fuel breaks, thinning, pruning, landscape modifications, etc. The overall purpose is to modify or break up the fuels in such a way as to lessen catastrophic fire and its threat to public and firefighter safety and damage to property. Another way to prevent future large, catastrophic wildfires from threatening communities is by carrying out appropriate treatments (such as prescribed burning or thinning) to restore and rehabilitate forest and grassland health in and adjacent to the WUI. Such treatments have reduced the severity of wildfires, and may have additional desirable outcomes, such as providing sustainable environmental, social and economic benefits. Project proposals should consider all elements required to implement treatments on the ground, which includes acquiring the necessary permits and consultations needed to complete plans and assessments.

Examples of projects that qualify (not all inclusive):

- Defensible space around homes and structures
- Shaded fuel breaks
- Fuels reduction beyond defensible space
- Removal of slash including piling and burning; mulching; grinding; etc.
- Prescribed fire
- Thinning
- Maintenance of **non-federally funded** fuels projects (explain in application narrative)

2) Improve Prevention/Education in the Interface:

Recipients can provide leadership to coordinate, develop, and distribute wildland urban interface education programs in association with insurance companies, communities, local government agencies, and other partners. Informational and educational projects must target mitigation of risk and prevention of loss. Projects should lead to the use or establishment of one or more fire program elements such as fire safety codes, implementation of Firewise safety practices, establishing local fire safe councils, fuels treatments

within fire prone communities, or community planning to define fire safe actions suited to the local ecosystem.

3) Planning: Community Wildfire Protection Plans (CWPP"s) are created by local communities and may address issues such as wildfire response, hazard mitigation, community preparedness, structure protection, or a combination of the above. The process of developing these plans can help a community clarify and refine its priorities for the protection of life, property, and critical infrastructure in the wildland-urban interface. The Healthy Forest Restoration Act (HFRA) minimum requirements for a CWPP are: 1) Collaboration (must be developed with community members, local and state government representatives in collaboration with federal agencies and other interested stakeholders**),** 2) Prioritized Fuel Reduction (plan must identify and prioritize areas for hazardous fuel reduction treatments and recommend the types and methods of treatment), and 3) Treatment of Structural Ignitability (must recommend measures that homeowners and communities can take to reduce the ignitability of structures throughout the area addressed in the plan). A copy of the CWPP Handbook can be found at: http://csfs.colostate.edu/pages/community-wf-protection-planning.html

Examples of projects that qualify (not all inclusive):

- Creation of CWPP/or equivalent document
- Priority projects listed in existing CWPPs covering the above criteria

4) Examples of Projects that DO NOT Qualify (not all inclusive):

- **Maintenance on previous federally funded fuels projects**
- Preparedness and suppression capacity building; such as purchase of fire department equipment (try VFA,

RFA, DHS and FEMA grant programs)

- Small business start-up funding
- Research and development projects (try Economic Action Program)
- GIS and database systems
- Construction/Infrastructure (building remodel, bridges, road construction, water development)

Grant Considerations:

(See score sheet attached which will be used by a panel of nine CSFS employees from across the state. Each application will be scored by three individuals and an average rating will be used in the ranking process. Please be mindful and follow "**Application Instructions**"). Additional helpful information on how applications are scored is as follows:

- Meets the "Grant Criteria"- If it does not, the application will be considered ineligible
- Meets the 50/50 match requirement*-if not, the application will be considered ineligible
- Each grant request will be limited to a maximum of $300,000.
- No state will receive more than 15% of the funds available in the west.
- All grants will be scored based on the following (highest possible score is 18)

[redacted]**lear contributions/matching share** (1 pt. max)

[redacted]**s this project achievable? Time, goals, accurate budget, etc.** (2 pt. max)

Yes, clearly = 2 pts Yes, but needs additional info / budget = 1 No = 0

[redacted]**s this project measurable? (Clearly states # of acres, # of educational/outreach**

programs etc.) (2 pt. max)

[redacted]**s this project clearly described, so the reviewer has a clear understanding?**

(2 pt. max)
[redacted]**oes the scope provide specific details?** (2 pt. max)
[redacted]
[redacted]x 9: (1 pt. max)
[redacted]

*A 50/50 match. The allocated grant amount must be matched in full by the recipient using a **non-federal source**. Exception: Title III funds under the Secure Rural Schools and Community Self-Determination Act of 2000, PL 106-393 are not considered federal dollars and may be used as match. **The matching share can be soft match (which includes training hours valued at an accepted rate, donated labor/equipment, etc) and/or hard match (which is actual dollars spent other than federal grant funds within the specified scope of work.) If the project is part of the consolidated payment grant, matching funds can be combined or met from any one or all program areas.**

Application Instructions:

The application is in adobe pdf format. It is fill in enabled in any form of Adobe Reader 5.0 or higher. If you do not have Adobe Reader, go to http://get.adobe.com/reader/ and download Reader 9.1.

1) All blocks are fill-in enabled and character locked. Applicants must fit all information into the allotted box space. Hold your mouse arrow over each block for further instructions. **Applications that have been modified for any reason will be considered ineligible by the review committee. Any attachments or additional documents that are not removed at the district level will not be considered by the review committee.**

2) **Applications must be submitted through the appropriate State Forester. State agencies must fill in the provided summary sheet and submit with the applications for committee review.**

3) Application guidelines by box number: (All boxes must be filled in on the application. If a box does not apply to your project fill in that space with NA.)

• ***Box 1 & 2***-Basic applicant and community at risk information.

• ***Box 3 & 4***-The totals in these boxes will add automatically when all data is entered into the fields. It is recommended you check all numbers add up correctly. See description of hard vs. soft match.

• ***Box 5***-Answer the specific questions. Under the three Project Category fields fill in only if they apply to your project. If, for example, Planning is not a part of your project fill in NA.

• ***Box 6***-The project area description should give an **overview** of the project to point out the hazards and clearly show the need for work in this area. If applying for a fuels reduction project, describe the vegetation types.

• ***Box 7***-The scope of work should explain exactly how the grant dollars will be spent on this project. Unlike the overview, this will provide the specific details of the project using measurable units where applicable. Be concise, say exactly what will be done with grant funds not what you expect the reviewer wants to hear. Use this block to explain any additional budget detail.

• ***Box 8***-Describe the contributions each partner will make to the project by stating the collaborating partners name and what they will be contributing to the project such as manpower, equipment, matching funds, etc. The questions: „Does this community have a plan?‟ and „Is this part of the

plan?‟ are drop boxes so click in the field, scroll up and down arrows will appear. Scroll up or down until you find the answer you are looking for.

• **Box 9-**Describe the landscape this project influences. Show how the project has or will have impact outside the immediate project area. For example, a project in a community may abut and compliment a Forest Service project on their land where they are creating a fuel break around your community defensible space project. Give specifics on how this project will tie into the larger picture of community protection. For information/education and or planning projects explain how your project compliments or enhances those by other agencies and/or ties into a greater goal. Explain the who, what, when, where, why, and how of its anticipated impacts.

• **Box 10-**The **Project Timeline** should include such things as: begin/end dates, milestones, quarterly accomplishments, etc.

Maintenance should clearly describe the who, what, when, where and why of how this project will remain effective and be sustained over time. The four main points to be included for fuels projects are:

1) Environmental Factors: describe the maintenance requirements unique to this project based on site characteristics i.e., present and future vegetation occupying the site, growth rates, returned natural fire intervals or any other environmental factor that affects the continued maintenance of this project.

2) Education: describe how key players have been trained and educated to maintain the project and explain their understanding of the needs and expectations of the project‟s maintenance.

3) Commitment: describe the commitment by the individual/community to maintain this project into the future, i.e. state laws, CWPP terms, signed landowner agreements or other documents or agreements that hold the sub-grantee accountable for project maintenance over time.

4) Monitoring: describe who will be responsible for monitoring the project, what qualifications they have if they are not obvious (i.e. State Forestry personnel, Fire Safe Council member, Fire Department personnel, etc.), and at what intervals they will be checking (i.e. yearly, quarterly, etc); clearly describe timelines, milestones, and measurable.

Sustainability should clearly describe how the project will be sustained over time.

Application Due Dates:

The standard *Colorado WUI Application* must be used. This form should be filled out and submitted **electronically** to the appropriate District Forester by their district deadline.

ATTENTION: District Foresters

All applications must be received by Jane Lopez by 4:00 p.m., MDT on Thursday August 19 2010. The email address to send the applications to is: Jane.Lopez@Colostate.edu **This deadline applies to prioritized applications along with the completed summary sheet for each district. Individuals must submit the application to the appropriate District Office for prioritization, they may not submit directly to the address above. The applications will then be reviewed and sent on to the WFLC. When submitting prioritized applications to Jane, name the files by District and priority number (ex. GO01, GO02, etc…).**

Each district will set its own internal deadlines for its cooperators, partners, and client's applications so they may be reviewed and prioritized at the district level before submission to Jane Lopez by the deadline above.

APPENDIX K – References and Publications

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

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

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

Dennis F.C. 1999. Forest Home fire safety. No. 6.304 Natural Resource Series, Colorado State University Cooperative Extension.

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

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

Helms, John. 1998. The Dictionary of Forestry. Society of American Foresters.
Troy, Austin & Kennedy, Roger. Editors. 2007 Living on the Edge, Volume 6: Economic, Institutional and Management Perspectives on Wildfire Hazard in the Urban Interface (Advances in the Economics of Environmental Resources). JAI Press - Elsevier

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

Minimum Standards for Delivering Community Wildfire Protection Plans. 2009 Colorado state Forest Service.

NFPA 1144 – Standard for Protection of Life and Property from Wildfire, 2002 Edition

NFPA 295 – Standard for Wildfire Control, 1998 Edition

Preparing a Community Wildfire Protection Plan - A Hanbook for Wildland-Urban Interface Communities. 2004. Society of American Foresters, Western Governors' Association etal.

Publications

- Creating Wildfire-Defensible Zones, no 6.302, F.C. Dennis, CSU Cooperative Extension, 5/2003
- Fire Resistant Landscaping, no 6.303, F.C. Dennis, CSU Cooperative Extension, 5/1999
- Forest Home Fire Safety, no 6.304, F.C. Dennis, CSU Cooperative Extension, 5/1999
- FireWise Plant Materials, no 6.305, F.C. Dennis, CSU Cooperative Extension, 11/2003
- Grass Seed Mixes to Reduce Wildfire Hazards, no 6.306, F.C. Dennis, CSU Cooperative Extension, 10/2003
- Vegetative Recovery After Wildfire, no 6.307, R. Moench, CSU Cooperative Extension, 10/2003
- Soil Erosion Control After Wildfire, no 6.308, R. Moench & J. Fusaro, CSU Cooperative Extension, 10/2003
- 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

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- NFPA 295 – Standard for Wildfire Control, 1998 Edition

- Preparing a Community Wildfire Protection Plan - A Hanbook for Wildland-Urban Interface Communities. 2004. Society of American Foresters, Western Governors' Association etal.