Community Wildfire Protection Plan

Northern Saguache Fire Protection District

December 2007

Prepared by

Land Stewardship Associates, LLC

Community Wildfire Protection Plan

Northern Saguache
Fire Protection District

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 people involved in its development. The CWPP may address issues such as wildfire response, hazard mitigation, community preparedness, 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 and FireWise education of residents in the community.

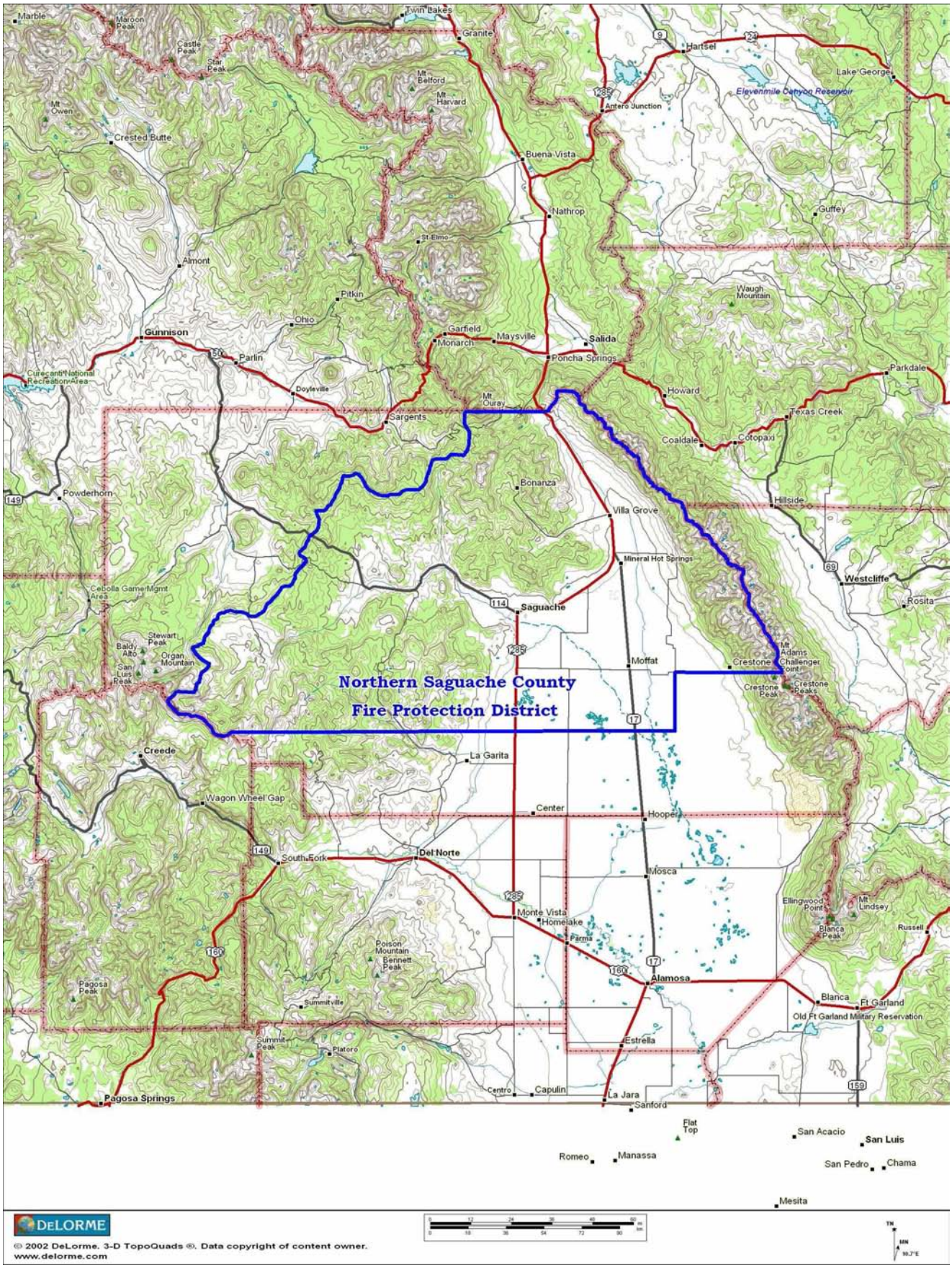
The wildland urban interface (WUI) is another term found throughout this document. It can be simply described as the geographical area where structures and other human development meet or intermingle with wildland vegetative fuels. For the purposes of community wildfire protection planning a more specific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

a.) an area extending ½ mile from the boundary of an at risk community, and/or

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, and/or
2. Has a geographic feature that aids in creating an effective fire break, such as a road or ridge top, and/or

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.


Northern Saguache County
Fire Protection District
Marble
Maroon Peak
Castle Peak
Star Peak
Twin Lakes
Granite
Mt Belford
Mt Harvard
Mt Owen
Crested Butte
Antero Junction
Hartsel
Lake George
Eleven Mile Canyon Reservoir
Buena Vista
Nathrop
Guffey
St Elmo
Almont
Pitkin
Ohio
Gunnison
Garfield
Monarch
Maysville
Salida
Poncha Springs
Waugh Mountain
Parkdale
Howard
Texas Creek
Cotopaxi
Coaldale
Curecanti National Recreation Area
Doyleville
Mt Ouray
Sargents
Parlin
Powderhorn
Bonanza
Villa Grove
Hillside
Mineral Hot Springs
Westcliffe
Rosita
Cebolla Game Mgmt Area
Saguache
Stewart Peak
Bald Alto
Organ Mountain
San Luis Peak
Moffat
Crestone
Mt Adams
Challenger Point
Crestone Peak
Crestone Peaks
Creede
La Garita
Wagon Wheel Gap
Center
Hooper
South Fork
Del Norte
Mosca
Monte Vista
Homelake
Parma
Ellingwood Point
Mt Lindsey
Blanca Peak
Russell
Poison Mountain
Bennett Peak
Alamosa
Pagosa Peak
Summitville
Blanca
Ft Garland
Old Ft Garland Military Reservation
Summit Peak
Platoro
Estrella
Pagosa Springs
Centro
Capulin
La Jara
Sanford
Flat Top
San Acacio
San Luis
Romeo
Manassa
San Pedro
Chama
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I. COMMUNITY IDENTIFICATION AND DESCRIPTION

The Northern Saguache Fire Protection District (NSFPD) is located in the San Luis Valley in south central Colorado. It covers an area of approximately 1,605 square miles (1,027,200 acres) and ranges in elevation from 7,500 feet on the valley floor to well over 13,000 feet in the Sangre De Cristo Range. Saguache Creek, San Luis Creek, and Carnero Creek are the primary drainages in the FPD. The FPD's north and west boundary follows the Continental Divide. The preceding vicinity map identifies the location of the area and its proximity to the remainder of the San Luis Valley.

Fifteen Wildland Urban Interface (WUI) areas, totaling 114,570 acres, have been designated as WUI and identified within the NSFPD. They are ranked by risk for wildfire and listed in Table 1.

Table 1: Wildfire Hazard Summary of NSFPD WUI Areas.

Low Hazard	Moderate Hazard	High Hazard
Moffat	Bonanza	Crestone
Swede Corner	Carnero Creek	Jacks Creek
	Kelly Creek	Kerber Creek
	Lazy KV Corridor	Little Kerber Creek
	Lime Creek	Noland Gulch
	Mishak Lakes	Valley View
	North Tracy Canyon	
	Schecter Gulch	
	*Silver Creek Lakes**	

** Silver Creek Lakes is outside the NSFPD but is within Saguache County.*

The area is dominated by irrigated farmlands or high desert chico on the Valley floor and transitions to pinyon pine forest along the foothills. Ponderosa pine/Douglas-fir/aspen montane forests cover the mid-slope while Engelmann spruce and alpine meadows are found at the higher elevations. Ponderosa pine/Douglas-fir forests are generally dense enough to sustain a substantial crown fire resulting in a high fire risk.

Northern Saguache Fire Protection District is characterized by mountain communities with permanent and recreational home sites scattered throughout; and by farm communities on the valley floor with little or no interface with forested vegetation. While the valley floor may appear to have a relatively benign wildfire hazard; chico, grass and some cured agricultural crops can burn with high rates of spread and worrisome intensity.

Much of the FPD is comprised of public lands managed by the Bureau of Land Management, Colorado State Land Board, and US Forest Service. Numerous

private parcels are scattered throughout these public holdings. Many of the private tracts have been subdivided into 35 acre parcels and contain both permanent and recreational home sites along with vacant land.

US Highway 285 and Colorado State Highways 17 and 114 provide primary paved access with numerous high quality County gravel roads providing access to the various neighborhoods. Road quality within subdivisions varies dramatically.

NSFPD has five fire stations located in Bonanza, Crestone, Moffat, Saguache, and Villa Grove. Mutual aid can be easily provided by the Alamosa, Baca Grande, Center, Del Norte, Monte Vista, Mosca/Hooper, and Poncha Springs Fire Departments. The Bureau of Land Management, National Park Service and US Forest Service also have wildland fire crews available during the normal fire season.

Villa Grove Fire Station

The initial CWPP Core Team meeting was held on July 18, 2007. Participants included members of the Northern Saguache Fire Protection District, Saguache County Office of Emergency Management, Bureau of Land Management, US Forest Service, and Land Stewardship Associates.

The Core Team reviewed the overall wildland fire protection situation in the FPD and discussed issues, concerns and opportunities. WUI boundaries were delineated on a map. Station wildland resource inventories were discussed. An open house public meeting for interested parties was scheduled for Saturday, September 1, at 2:00 pm at the Villa Grove fire station. The open house was attended by concerned land owners, volunteer firemen and agency personnel.

II. COMMUNITY ASSESSMENT

The overall risk within the FPD from wildland fire varies from high to low depending upon a wide variety of factors. This section discusses the facets considered that led to the overall ratings.

Fuel Hazards
Dense pinyon juniper, ponderosa pine and Douglas fir stands cover mountainous portions of the planning area while grass and shrub types are found on the valley floor and foot hills. Most of the WUI areas are located at lower elevations.

Valley floor and foothills grass and shrub fuel loading are highly variable, ranging from heavy fuel loads in fuel models 1 & 2 to sparse vegetation with considerable bare ground exposed. Irrigated agricultural land also covers substantial area on the valley floor. Fires in the denser grass and shrub types can be very difficult to control on the typical dry, windy afternoons common in the San Luis Valley. See Appendix B for a full discussion of Fuel Models

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

The following Northern Saguache Fire Protection District Wildfire Hazard Map (page 12) indicates the majority of the WUIs have a fuel hazard assessment of low to high. Local topography and poor access further aggravate fire behavior and control.

Risk of Ignition and Wildfire Occurrence
Wildland fires have burned throughout the fire protection district since lightning and dry biomass has been present on the landscape. An astute observer will note the many old fire scars in forested areas. Charred stumps, snags and large aspen stands date back to the late 1800s when lightning collaborated with drought to create the vegetative mosaic we enjoy today. Large 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. Two large, intense wildfires have burned in the San Luis Valley within the last five years. The Million Fire of 2002 burned over 9,000 acres and eleven homes, while the Mato Vega Fire of 2006 burned over 13,000 acres. Both of these incidents occurred in overstocked forested areas during very dry conditions. The Coolbroth fire of 2006 burned over 250 acres and provided a reminder that similar large wildfires are inevitable in the NSFPD. The Coolbroth fire caused the evacuation of the Carnero Creek community.

Western vegetation has responded to the scarcity of natural fires by becoming denser and much more flammable. Most pre-European forests and rangelands experienced cyclical, low intensity, fires that burned across wide expanses. These occasional fires favored some plants over others and fire sponsored vegetative mosaics were abundant. Human intervention in the natural fire regimes has had unintended consequences. Today's forests are much denser and rangelands often have more woody shrubs and trees than in the past. In these dense forests wildfires burn much hotter and cover more ground than in the past.

When structures are scattered throughout a more flammable landscape a disaster that effects the human environment is just a spark away during dry windy weather.

Low fuel moistures and relative humidity are common in the area, as are periods of high winds. When dry and windy conditions coincide the stage is set for the occurrence of large, wildfires, which are difficult to control. Human population is increasing in the FPD. Fires originating in or near communities are the most immediate concern, but fires starting well beyond the boundaries of the WUI area can have profound effects upon these communities. Rapid rates of spread and long distance spotting are the norms for fires in the vicinity.

Areas with high to moderate fuel loading are the most worrisome. Table 2 provides fire behavior predictions for several fuel models and representative weather conditions.

Table 2: NSFPD WUI Fire Behavior Predictions

FUEL MODEL	**RATE of SPREAD** (ft/hr)	**FLAME LENGTH** (Feet)	**SIZE @ 1 HOUR** (Acres)	**PERIMETER @ 1 HR.** **(Feet)**	**SPOTTING DISTANCE** (Miles)
1	1,162	2	21	3,500	0.4
(101)	297	1	1	924	0.4
2	1,947	6	30	4,686	0.5
6	3,128	7	77	7,524	0.5
9	165	2	.4	462	0.4
2/9 0% Slope	2,376	8	43	5,610	0.5
2/9 20% Slope	2,442	8	46	5,874	0.5
2/9 40% Slope	2,772	9	56	6,534	0.5

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

In fuel model 1 grass is the primary fire carrier. Fuel model 101 is also a grass fuel model but it has much sparser and shorter grass than a typical fuel model 1. Fuel model 2 is composed of a mix of grass and shrub wherein the shrubs add fuel bed depth and fire intensity. Young dense stands of pinyon, juniper and other conifers are usually classified as fuel model 6 when the crowns will be the primary carrier of fire. Taller, closed canopy ponderosa pine stands usually are classified as fuel model 9 due to the long needled litter layer that covers the ground. The combination of fuel models 2 & 9 best represents the fire characteristics manifested by fires in the vegetative mosaics found in the pine/shrub transition zone.

Fuel Model 2 in the Lime Creek drainage

Anderson Fuel Model for Northern Saguache Fire Protection District

Legend

- Northern Saguache FPD
- WUI Communities
- Subdivision Boundaries

Anderson 13 Fuel Model

- 1
- 2
- 4
- 5
- 6
- 8
- 9
- 10

7/19/2007

Bonanza
Kelly Creek
Jack's Creek
Kerber Creek
Noland Gulch
Valley View
Little Kerber Creek
Schecter Gulch
Lazy KV Corridor
North Tracy Canyon
Swede Corner
Crestone
Lime Creek
Carnero Creek
MIshak Lakes

50
285
114
17

0 3.75 7.5 15 22.5 30 Miles

Fire Hazard for Northern Saguache Fire Protection District

Legend

- Northern Saguache FPD
- WUI Communities
- Subdivision Boundaries

Fire Hazard (based on Slope, Aspect & Vegetation)

Fuel_Rank

- Low
- Moderate
- High

7/19/2007

Bonanza
Kelly Creek
Jack's Creek
Kerber Creek
Noland Gulch
Valley View
Little Kerber Creek
Schecter Gulch
Lazy KV Corridor
North Tracy Canyon
Swede Corner
Crestone
Lime Creek
Carnero Creek
Mishak Lakes

50
285
114
17

0 3.75 7.5 15 22.5 30 Miles

Community Values at Risk

Values - There are about 15 communities, (neighborhoods) or subdivisions with home sites in the NSFPD WUI areas. Table 1 provides a summary of the neighborhood wildfire hazard evaluations. Many have heavy fuels in close proximity to developments while others have rather light fuels in their vicinity.

Less than a third of the structures have recognizable survivable space.

> *Survivable space is: ~ An area of reduced fuels between the home and untouched wildland that provides enough distance to ensure the structure can survive without extensive effort from either the homeowner or the fire department.*

Many structures have flammable material nearby, on the porch or under decks, increasing their vulnerability. A few of the structures have wooden shingle or shake roofs. Composition and wooden roofs tend to hold pine needles and forest debris allowing accumulations that also increase susceptibility to firebrands. Most 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 factors considered in neighborhood hazard evaluations are contained in Appendix I: Subdivision Hazard Evaluation Form.

Baxter's Lumber Mill is vulnerable to wildland fire and is of special concern. It is surrounded on three sides by grass. Sawmills are inherently prone to spot fires due to all the woody debris, sawdust and shavings that result from the sawmill operation.

Baxter's Lumber Mill

Another area of special significance is the J Kyle Braid Leadership Center north of Villa Grove. It hosts many teenagers for workshops and seminars on leadership. The site backs up to dense pine and oak vegetation and has only one road for ingress and egress.

Access - The primary and secondary road access within the NSFPD is good. Roads inside the various neighborhoods are much less predictable. Not all developments have more than one way into and 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. (See Appendix G for details on access to home sites and the Fire Hazard Map for access roads to neighborhoods). Road signs and home and cabin addresses that are visible from the road or are spotty at best.

Narrow road with no turn around

Steep road with tight switch-backs

Risk - Because of the lack of survivable space around many home sites, natural fuel continuity and steep slopes between some of the neighborhoods, it would be very difficult to protect some home sites from wildfire during periods of high to extreme fire danger.

Four subdivisions are of special concern to firefighters for the following reasons:

- **Jacks Creek:**
  - Steep, rough roads
  - Limited turnaround space at road ends
  - Flashy fuels
  - Limited Safety Zones
  - Poor escape routes
- **Elk Horn Ranch:**
  - Steep Roads & Slopes
  - Rapid Spread Rates

- Crown Fire Potential
- Questionable Escape Routes & Safety Zones

Steep slopes on Elk Horn Ranch Subdivision

► **Lime Creek:**
- Bad Roads
- Poor Escape Routes
- No Good Safety Zones
- No Survivable Space

► **Noland Gulch**:
- Potential fire intensity
- Roads in drainage bottoms
- No good Safety Zones
- Poor escape routes

Wildland firefighter actions during moderate and above fire danger situations, in these four developments, should focus on evacuating residents and taking indirect suppression action where it can be safely completed. Attempting to protect individual structures will compromise firefighter safety.

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 provide guidance for planning evacuation routes, safety zones and developing an evacuation plan.

The fire protection district may want to work with the County Sheriff to develop a strategy for augmenting evacuation planning with “shelter in place” procedures and training.

Local Preparedness and Protection Capability:
The location of fire fighting stations and equipment are displayed in the following Table 3: Fire Suppression Equipment in NSFPD:

Table 3: Fire Suppression Equipment in NSFPD

FIRE STATION	RESOURCE KIND	TYPE	UNIQUE FEATURES
Crestone	Brush patrol firefighting	6	4x4 250 gal. foam
Crestone	Water tender firefighting	1	6x6 2500 gal 400 gpm
Crestone	Water tender firefighting	1	3000 gal 400 gpm portatank
Moffat	Brush patrol firefighting	6	350 gal foam generator
Moffat	Engine, fire pumper	1	1000 gal 750 gpm foam
Moffat	Water tender firefighting	1	6x6 2800 gal
Saguache	Brush patrol firefighting	6	4x4 foam generator, lights
Saguache	Engine, fire pumper	1	1000 gal 1000 gpm
Saguache	Engine, fire pumper	1	500 gal, 1500 gpm, extrication, Class A foam
Saguache	Mass casualty incident trailer	4	
Saguache	Water tender firefighting	1	3750 gal, 750 gpm
Saguache	Wilderness search & rescue Team	other	(2) 4 wheelers
Villa Grove	Brush patrol firefighting	6	4x4, Foam generator, lights
Villa Grove	Brush patrol firefighting	6	4x4
Villa Grove	Water tender firefighting	2	1600 gal, 400 gpm, 4x4
Villa Grove	Water tender firefighting	2	1500 gal, portable pump
USFS Saguache	Wildland fire engine	6	4x4 300gal
NPS Great Sand Dunes	Wildland fire engine	6	4x4 300 gal
Interagency fire crew (BLM, NPS & USFS)	Wildland firefighters		10 personnel

Recent Wildfire Mitigation Projects:
The town of Crestone completed a Wildfire Assessment and Mitigation Plan in 2002. It called for several immediate actions that have been, for the most part, accomplished. A new high capacity fire well has been drilled. Flammable debris piles found in many yards in 2002 have been hauled off and six hundred and thirty acres of fuel breaks and forest thinning and fuels reduction have been completed on public lands surrounding the town. The town's next priority is to thin trees on private lands to the north and west of the Crestone.

The BLM has completed 1,278 acres of thinning/fuels reduction in the Noland Gulch area, two hundred sixty five acres of thinning to reduce wildfire hazards in the Bonanza area and one hundred thirty two acres of hazard reduction in the Cody Gulch area.

Meanwhile the USFS has been working to reduce wildland fuel accumulations on approximately four hundred acres associated with insect damage to the ponderosa pine forest around Little Kerber Creek.

Wildfire hazard mitigation on 3,905 acres around WUI communities has been completed in the NSFPD since 2003.

Untreated Pinon stands near the town of Crestone

Shaded fuel break in a Pinon stand near the town of Crestone

III. COMMUNITY MITIGATION PLAN

The Core Team developed the following mitigation plan based on their knowledge of the wildland fire issues in the FPD and in consultation with interested parties during the Open House in Villa Grove on September 1, 2007.

All open house attendees were land owners in the FPD that were concerned about their vulnerability to wildfire. Their primary concerns have been addressed in the assessment and mitigation plan. All attendees were willing to work toward improving the survivable space around their structures. They were particularly interested in more FireWise type information with a preference for on-site consultation with someone familiar with survivable space concepts.

Table 4: NSFPD Recommended Prescribed Burning within WUI Areas depicts fuel treatments within WUIs. Appendix A: Maps displays location of strategic landscape prescribed burns and evacuation routes. Table 5: NSFPD Fuel Treatment Actions on Evacuation Routes depicts mitigation needs along suggested evacuation routes.

While the BLM & USFS have completed close to 4,000 acres of hazardous fuels reduction work on public lands, private landowners must accept responsibility for completing work on their own property. 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 WUI will decline as long as property owners have the right to live in forested areas and develop their land however they choose.

Heavy fuel loading next to a structure in Jack's Creek Subdivision

The other option is to reduce the intensity of fires that will burn through areas surrounding structures. Much of this responsibility falls on the homeowner, developer and future purchasers. When isolated private parcels are scattered across public lands the question becomes how

culpable is the State, County and federal government for developments placed in naturally hazardous vegetation. In the past, private land owners have expected their public land neighbors to do most of the fire hazard reduction on lands immediately adjacent to private lands. This convenient transfer of responsibility to the public has saved private land owners money and allowed them to have a more "*natural setting"* around their home. When the inevitable fire burns across the landscape it does not discriminate between public or private lands. Crown and spot fires have a way of neutralizing well intended, limited scale, fuel reduction projects. A well tended forest a half mile from a structure may reduce the intensity of a fast moving wildfire but it will not significantly improve survivability of structures in developments that have not completed their own fire hazard reduction work.

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

Reducing flammability across a large area surrounding structures, public or private, is the key to reducing structure loss. One of the most cost effective tools land managers have to treat large expanses is prescribed burning. Prescribed fire is an appropriate tool to reduce fire hazard and at the same time promotes long term vegetative health. This plan calls for applying prescribed fire to all ponderosa pine/Douglas-fir stands on public lands, within the NSFPD wildland urban interface areas. This approach will also be the most cost effective treatment. Table 4: NSFPD Recommended Prescribed Burning within WUI Areas and the Prescribed Burn Area maps in Appendix A depicts recommended fuel treatments within WUIs. Maps show areas that are suggested for treatment.

Table 4: NSFPD Recommended Prescribed Burning within WUI Areas

WUI	DF (AC)	PP (AC)	TOTAL (AC)	ESTIMATED COST ($)	PRIORITY
Carnero	928	0	928	185,600	3
Jacks Creek	896	805	1,701	340,000	6
Kelly Creek	1,270	0	1,270	254,000	5
Kerber Creek	1,156	0	1,156	231,200	4
Lime Creek	379	0	379	75,800	9
Little Kerber	5,040	0	5,040	1,008,000	1
Noland Gulch	543	0	543	108,600	7
North Tracy Canyon	105	3,208	3,313	662,600	2
Schecter Gulch	105	0	105	21,000	8
Totals	10,422	4,013	14,435	2,886,800	-

Wildfire Prevention and Fire Loss Mitigation

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

Survivable space is the key to structure protection. NSFPD along with Saguache County and CSFS should initiate an on going program to encourage individual landowners to assure their responsibility for the safety of their life and property while living in wildfire prone areas. This includes advocating FireWise home construction and property maintenance activities.

Stacked wood under a deck is an ideal site for blown embers to ignite a structure fire

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 thinning to create shaded fuel-breaks by reducing the canopy cover to 40 percent or less and treating 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. Table 5: NSFPD Fuel Treatment Actions on Evacuation Routes depicts the mitigation needs, estimated costs and priority of treatment along suggested evacuation routes. Suggested evacuation routes are displayed in Appendix A: Maps.

Table 5: NSFPD Fuel Treatment along Evacuation Routes

WUI AREA	THINNING CONIFER MILES	THIN COST $	MOWING SHRUBLAND MILES	MOW COST $	TOTAL COST $	PRIORITY
Carnero Creek	1.3	18,720	0	0	18,720	10
Crestone	0	0	2.0	960	960	1
Jacks Creek	1.8	25,920	2.0	960	26,880	2
Kelly Creek	1.9	27,360	1.5	720	28,080	9
Kerber Creek	2.0	28,800	0	0	28,800	8
Lime Creek	4.0	57,600	0	0	57,600	3
Little Kerber Creek	2.1	30,240	0	0	30,240	4
Noland Gulch	2.8	40,320	0	0	40,320	5
North Tracy Canyon	3.3	47,520	0.3	144	47,664	6
Schecter Gulch	4.9	70,560	3.7	1,776	72,336	7
Totals	24.1	347,040	9.5	4,560	351,600	~

Note: Thinning was estimated to cost $300/acre or $14,400/ mile and mowing was estimated to cost $10/acre or $480/mile

Improved Protection Capability
Table 3 describes the existing fire suppression resources within the FPD. Wildland firefighting experience and training is limited but could be improved by encouraging NSFPD to send members to wildfire academies and as cooperators encourage firefighters to gain experience with CSFS on state or national fires.

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

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

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

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

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

5.2.2.4 Wildfire Hazard Areas:

The County shall not approve any development if the proposed project is located in an identified wildfire hazard area, or is suspected by the County to be in a wildfire hazard area, unless the developer can submit adequate evidence, prepared by a qualified professional forester, that the proposed project meets the following criteria:

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

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

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

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

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

5.3.9 Fire Protection System:

If the project is within an existing fire protection district, written confirmation is required that current fire code requirements have been met. If outside a fire protection district a fire protection plan shall be reviewed by the Saguache County Sheriff, Fire Chief of the appropriate Fire Protection District or other qualified

individual. The County shall not approve any project without implementation of an adequate fire protection plan.

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

> *Where cul-de-sac road are approved turnouts shall be provided. Bulb type turnarounds shall have a minimum road surface of 90 feet in diameter and minimum right-of-way of 110 feet in diameter. An alternative to the bulb type turnaround is the use of hammerhead turnaround.*
>
> *The maximum length of roads ending in turnarounds shall be 600 feet in areas with a high wildfire hazard and 1,000 feet in all other areas. When a variance from this standard is requested at least one of the following shall be provided:*
>
> *a. central water service,*
> *b. an alternative water supply acceptable to the local fire authority,*
> *c. monitored residential sprinklers in all residences on the cul-de-sac.*
>
> *In addition, turnouts may be required when a variance is requested.*
>
> *Driveway Widths: The dimensions of driveway widths and centerline curve radii shall be as shown in Table 27-12.*
>
> *Single family residence driveways in excess of 400 feet in length shall provide an adequate turnaround for emergency equipment within 150 feet of the dwelling unit. Driveways serving multi family, industrial or commercial development shall provide a turnaround as specified in Figure 27-7 if the driveway has a dead end.*

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

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

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

Strategic Recommendations:

NSFPD relies on volunteers to provide all the fire services for a large area. Adding additional work such as FireWise consultations and working with County

Commissioners to improve planning, zoning, road and bridge standards will increase the workload for this dedicated but over-committed group.

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

Table 6 summarizes mitigation actions by suggested priority and estimated cost for implementation.

Table 6: Implementation Items, Priority & Cost

MITIGATION ACTION	PRIORITY	ESTIMATED COST ($)
Work with County Commissioners on wildland fire standards for development	1	8,000
Conduct four FireWise workshops for WUI residents.	2	6,000
Provide interested parties with FireWise on site consultations. (@ $150 each) estimate 300 consults over next 5 years.	3	45,000
Provide FireWise information to all new property owners and applicants for building permits	4	1,000/yr
Wildland firefighter training for NSFPD personnel. Get 10 folks qualified as FF2	5	10,000
Improve natural vegetation resistance to wildfire using prescribed burning.	6	300,000

NOTE: The first 3 priorities will best be accomplished via a part time CWPP coordinator.

Fuel Loading at Valley View Hot Springs along an Evacuation Route

IV. IMPLEMENTATION & MONITORING

Implementation:
Table 7: Action Plan for Completing the NSFPD CWPP identifies the responsibilities and tasks necessary to accomplish the job at hand. The priorities and responsibilities have been negotiated and agreed to by Core Team and various named individuals.
The Core Team will

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

The CWPP Coordinators roles will be to:

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

Table 7: Action Plan for Completing the NSFPD CWPP

MITIGATION ACTION	TARGET DATE	ASSIGNED TO	COMPLETED ✓
Work with County Commissioners on wildland fire standards for development	9/15/2008	CWPP Coordinator	
Conduct four FireWise workshops for WUI residents.	9/15/2009	CWPP Coordinator	
Provide interested parties with FireWise on- site consultations. (@ $150 each) estimate 300 consults over next 5 years.	Ongoing	CWPP Coordinator	
Wildland firefighter training for NSFPD personnel. Get 10 people qualified as FF2	5/15/2008	Wes Moore	
Improve natural vegetation resistance to wildfire using prescribed burning.	1,000 acres/year	Brian Garcia & Sid Hall	

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

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

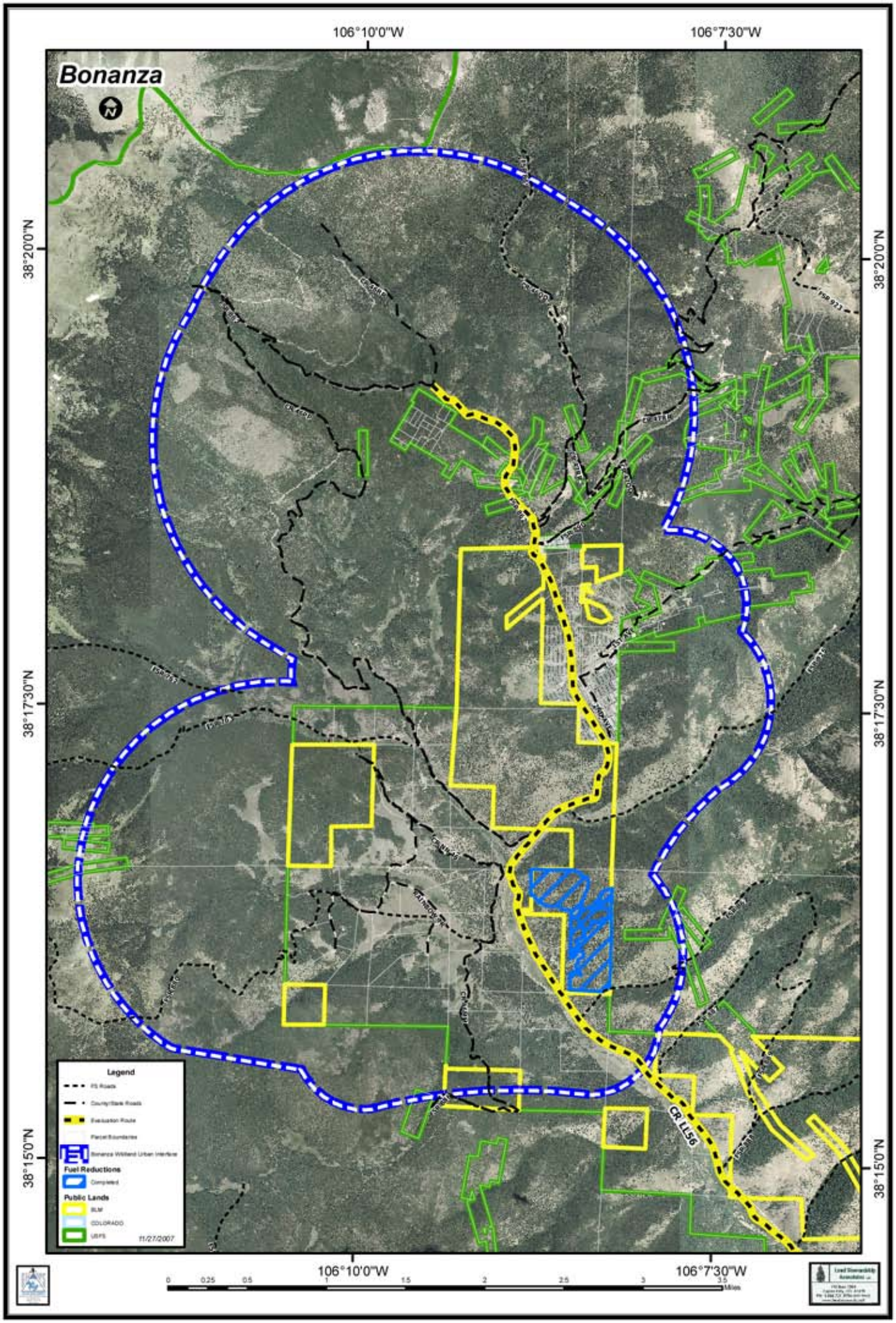
Appendix G: Road & Driveway Specifications for Emergency Access

Appendix H: Saguache County Triage

Appendix I: Subdivision Hazard Evaluation Form

Appendix J: Definition of Terms

Appendix K: References and Publications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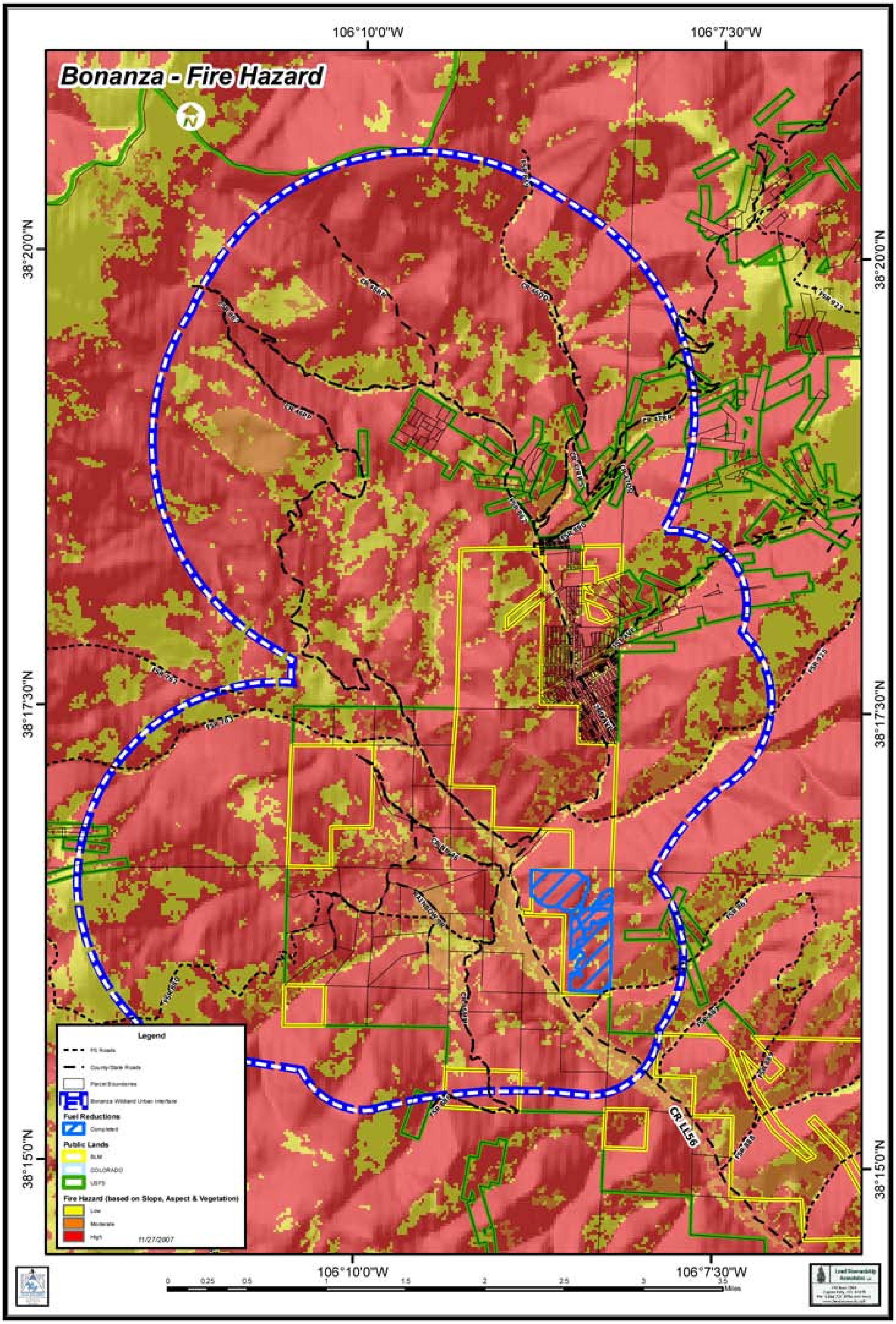
106°7'30"W
Bonanza
38°20'0"N
38°17'30"N
38°15'0"N
CR LL56
Legend
FS Roads
County/State Roads
Evacuation Route
Parcel Boundaries
Bonanza Wildland Urban Interface
Fuel Reductions
Completed
Public Lands
BLM
COLORADO
USFS
11/27/2007
0 0.25 0.5 1 1.5 2 2.5 3 3.5
Miles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106°7'30"W
38°20'0"N
38°17'30"N
38°15'0"N
CR LL56
Legend
FS Roads
County/State Roads
Parcel Boundaries
Bonanza Wildland Urban Interface
Fuel Reductions
Completed
Public Lands
BLM
COLORADO
USFS
Fire Hazard (based on Slope, Aspect & Vegetation)
Low
Moderate
High
11/27/2007
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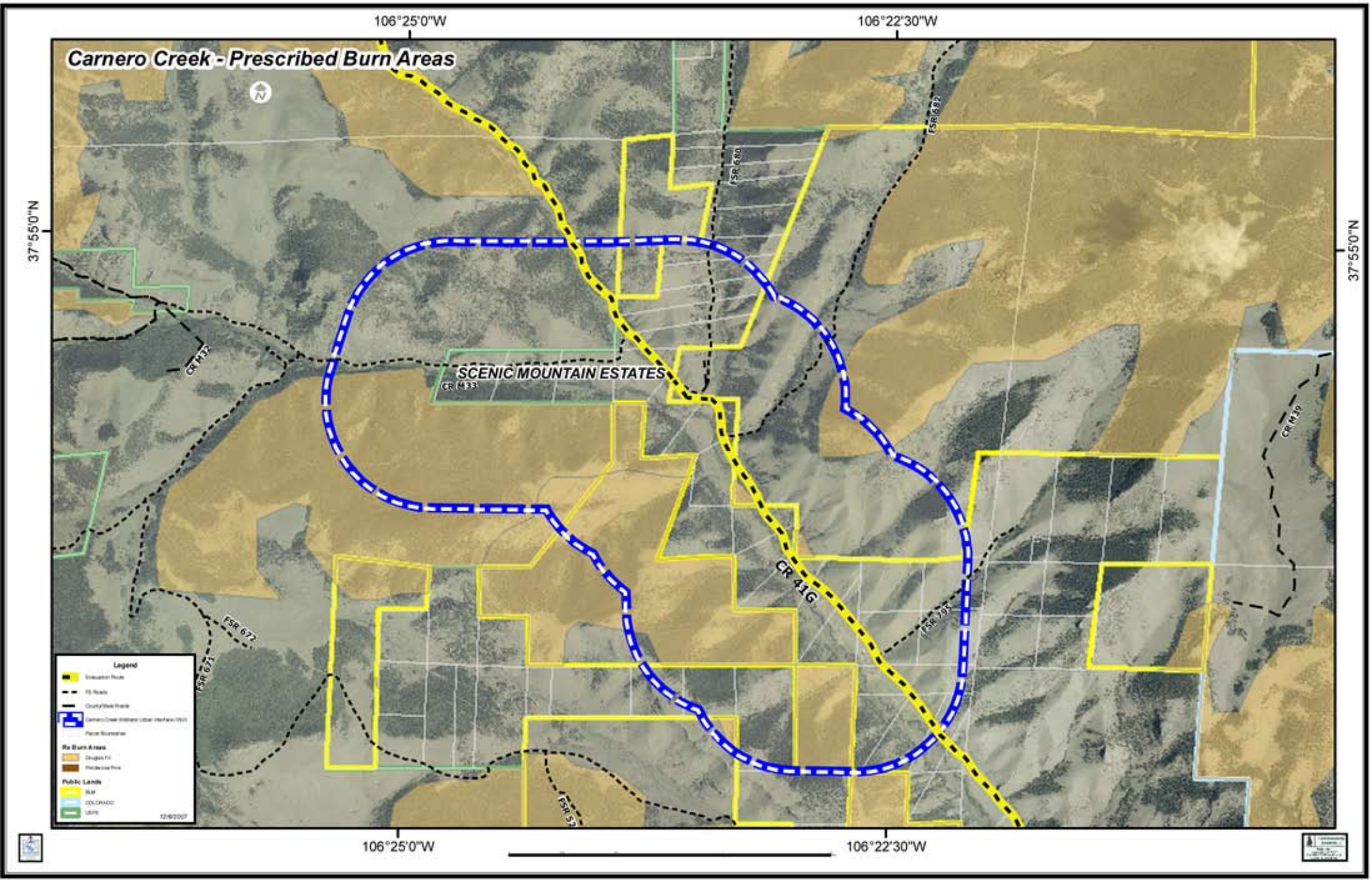
0.25
0.5
1
1.5
2
2.5
3
3.5
Miles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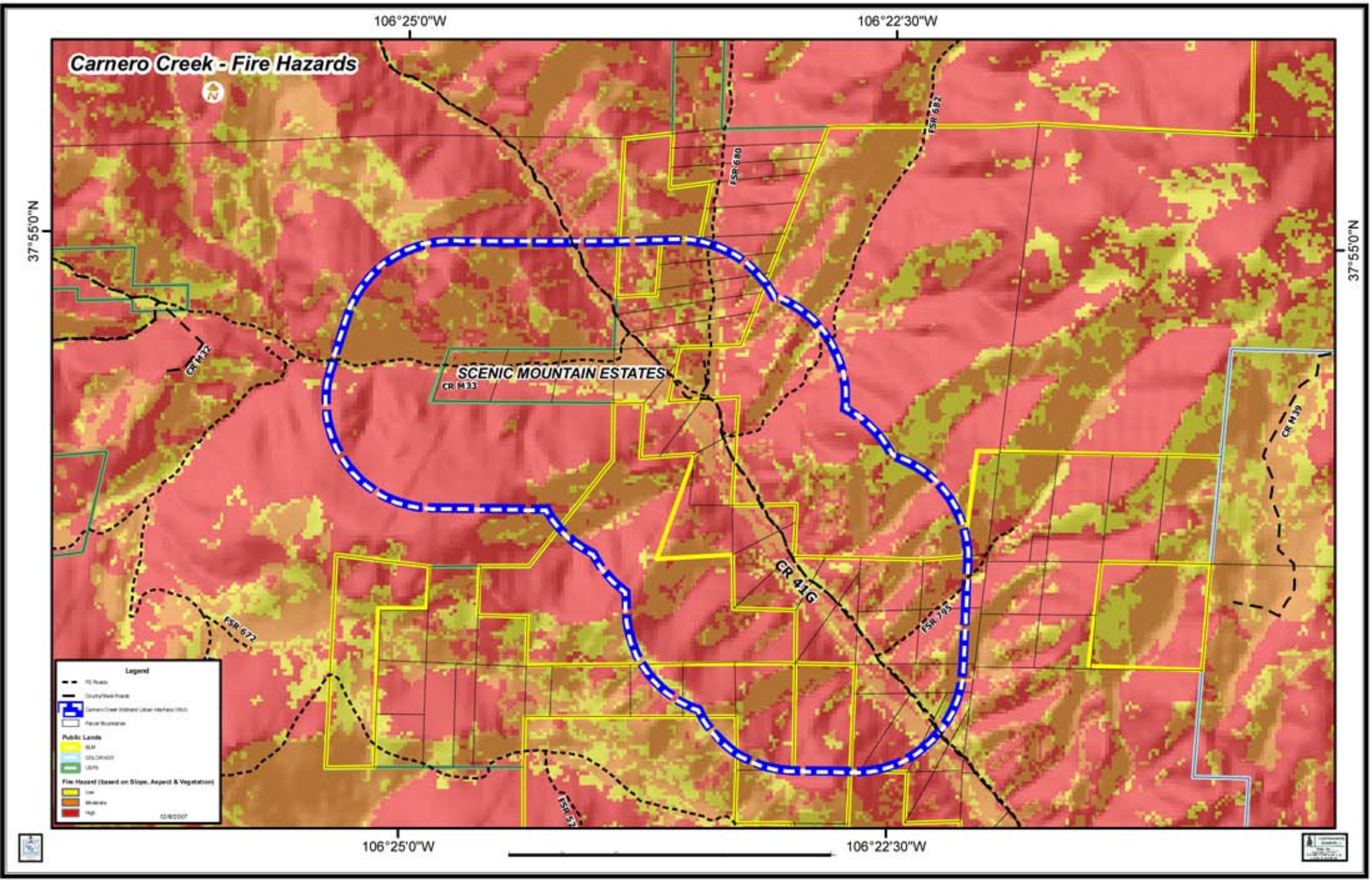
CR M37
CR M39
CR 41G
FSR 582
FSR 570
FSR 672
FSR 671
FSR 79
Legend
Rx Burn Areas
Public Lands


Carnero Creek - Fire Hazards
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37°55'0"N
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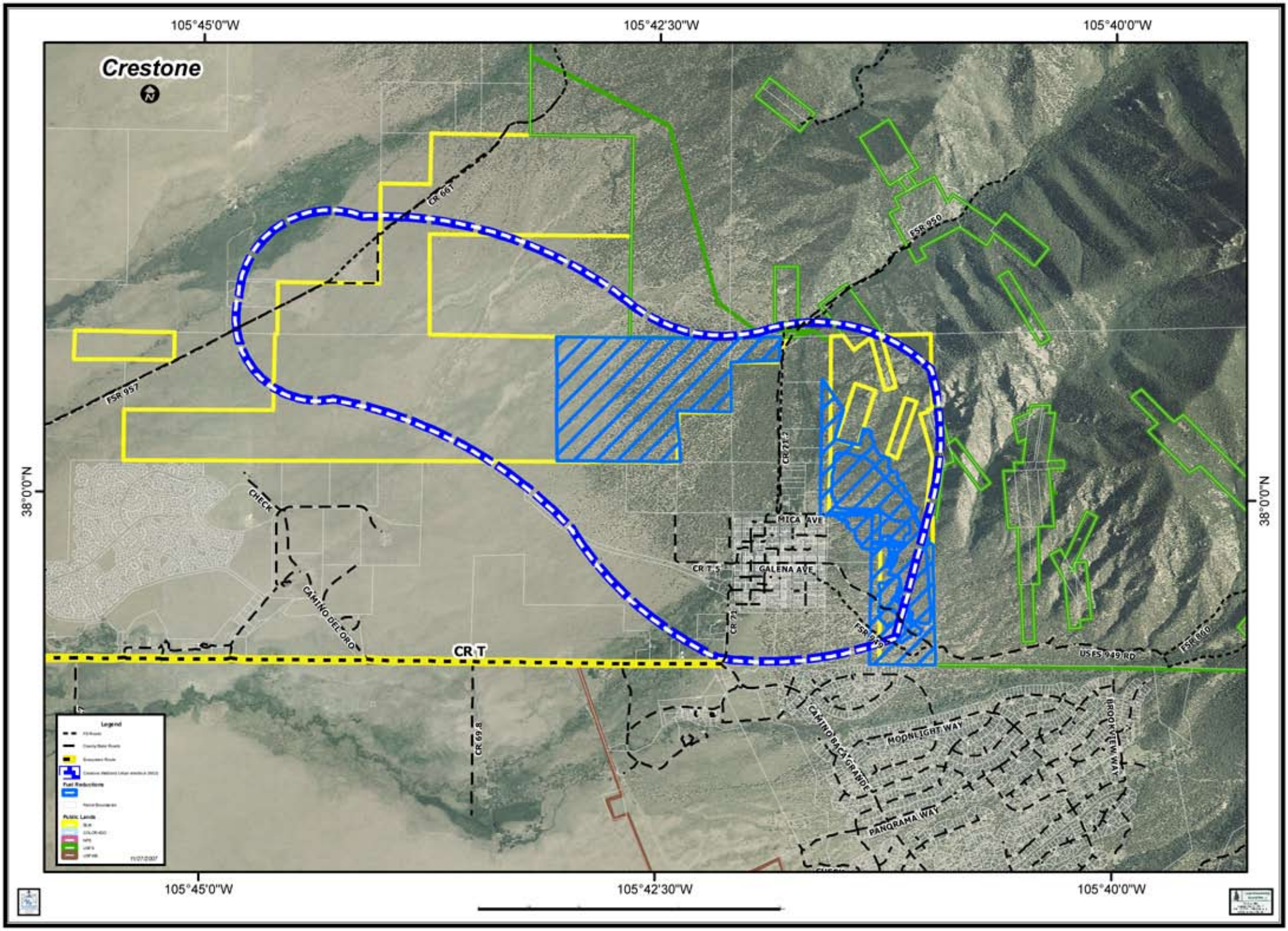
CR M32
CR M39
CR 41G
FSR 682
FSR 680
FSR 672
FSR 78
Legend
Public Lands
Fire Hazard (based on Slope, Aspect & Vegetation)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105°40'0"W
38°0'0"N
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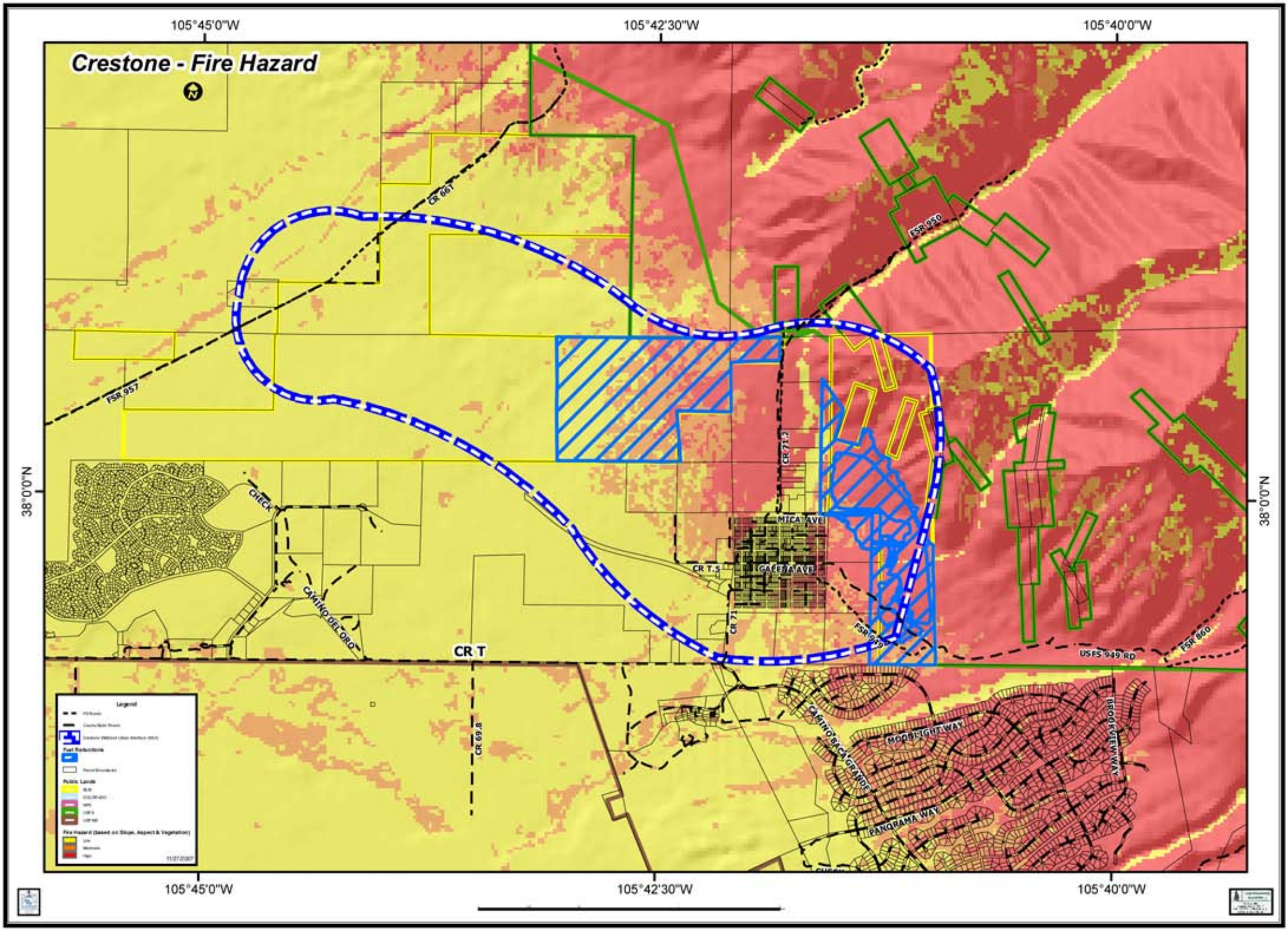
FSR 957
FSR 950
CR 71.5
CHECK
MICA AVE
CR T.5
GALENA AVE
CR 71
FSR 949
CAMINO DEL ORO
CR T
US FS 949 RD
FSR 660
CR 69.8
CAMINO BACA GRANDE
MOONLIGHT WAY
BROOKVIEW WAY
PANORAMA WAY
Legend
Fuel Reductions
Public Lands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105°40'0"W
38°0'0"N
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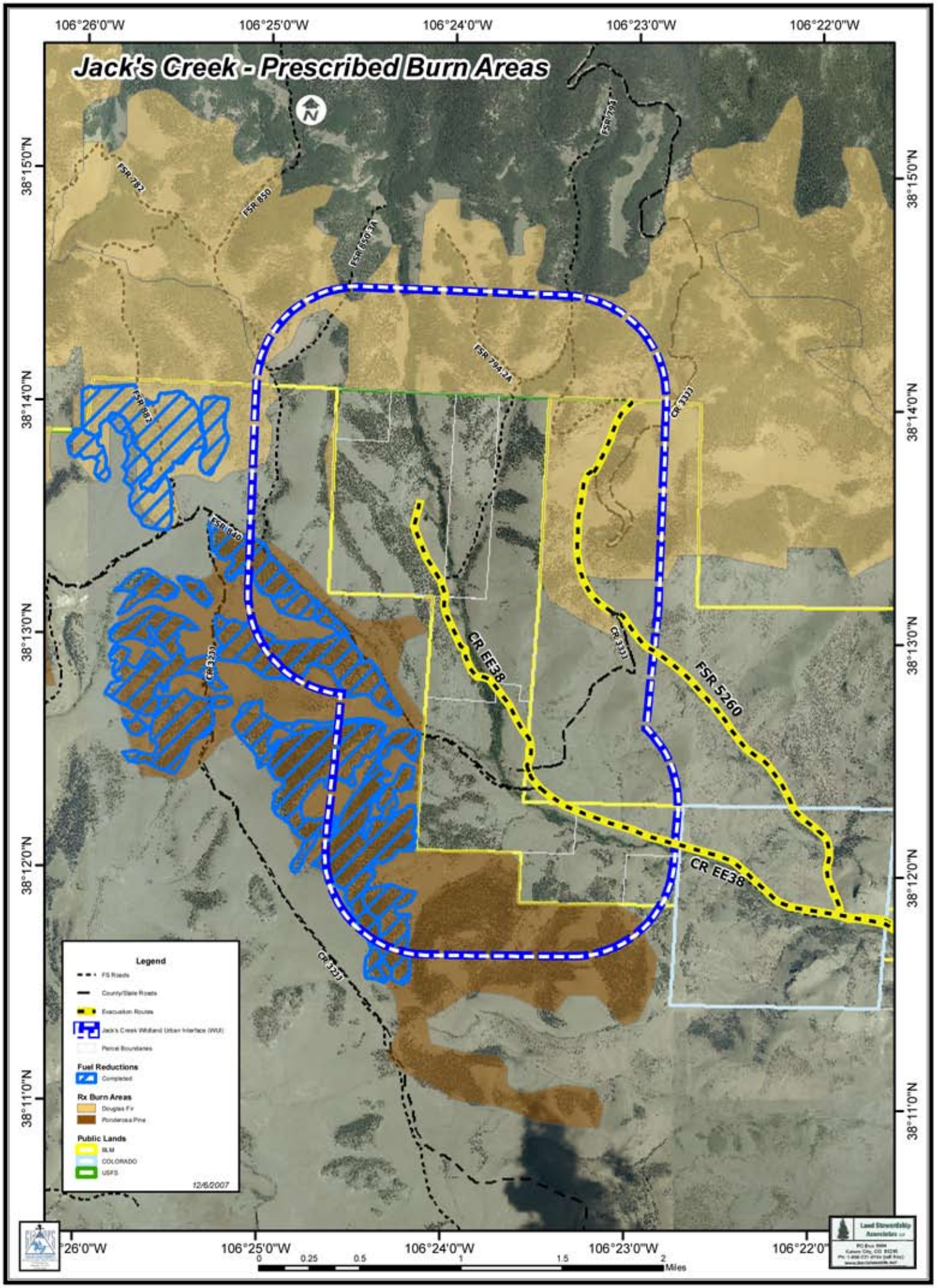
FSR 957
FSR 950
CR 71.5
CHECK
MICA AVE
CR T.5
GALENA AVE
CR 71
FSR 979
USFS 949 RD
FSR 860
CAMINO DEL ORO
CR T
CR 69.8
CAMINO BAJA GRANDE
MOONLIGHT WAY
BROOKVIEW WAY
PANORAMA WAY
Legend
Fuel Reductions
Public Lands
Fire Hazard (based on Slope, Aspect & Vegetation)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106°23'0"W
106°22'0"W
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38°14'0"N
38°13'0"N
38°12'0"N
38°11'0"N
FSR 782
FSR 850
FSR 850-A
FSR 794
FSR 794-2A
FSR 882
FSR 840
CR 3331
CR EE38
FSR 5260
Legend
FS Roads
County/State Roads
Evacuation Routes
Jack's Creek Wildland Urban Interface (WUI)
Parcel Boundaries
Fuel Reductions
Completed
Rx Burn Areas
Douglas Fir
Ponderosa Pine
Public Lands
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COLORADO
USFS
12/6/2007
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0.25
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1.5
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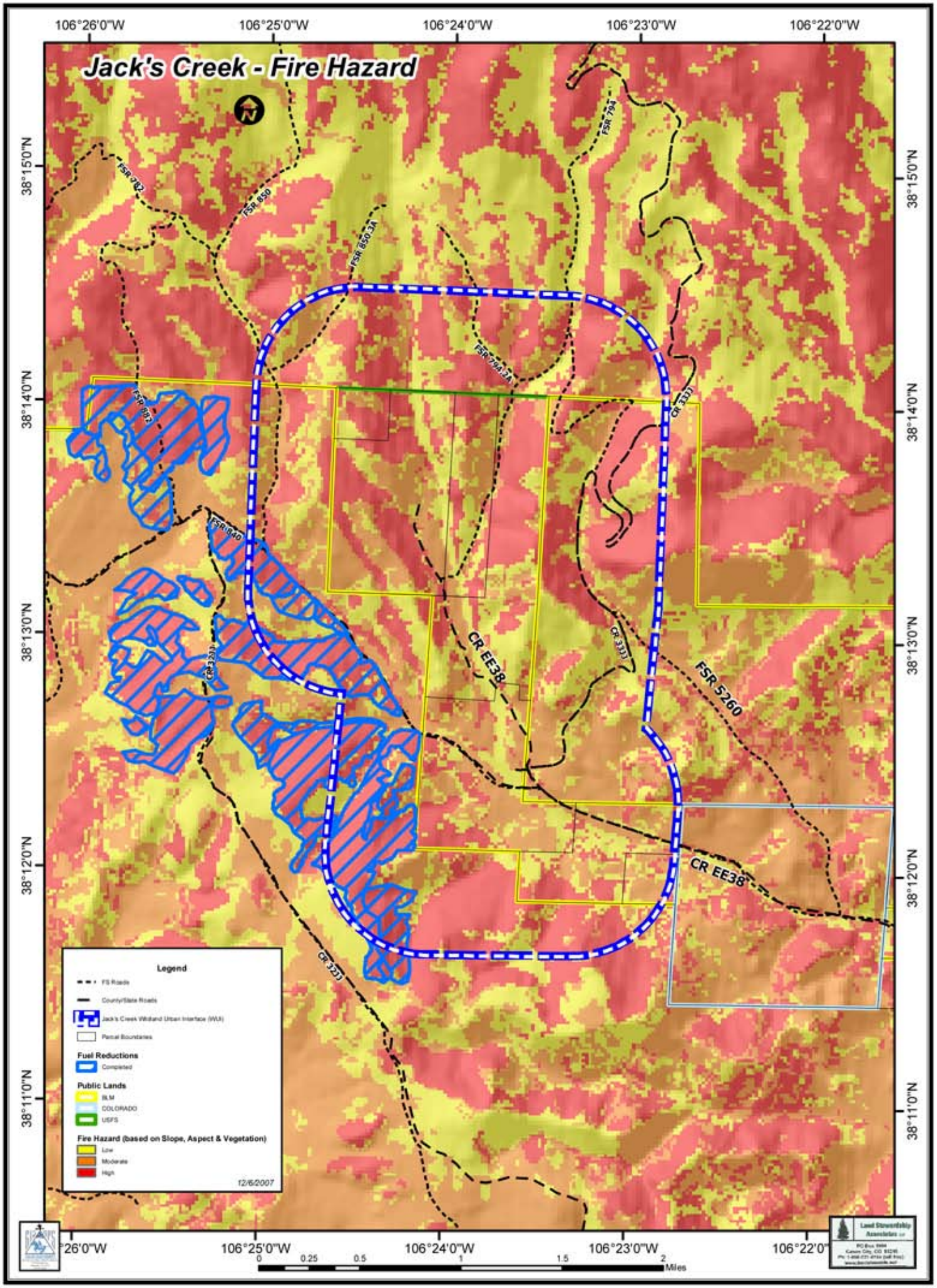
Miles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38°14'0"N
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FSR 850.3A
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FSR 794.1A
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County/State Roads
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USFS
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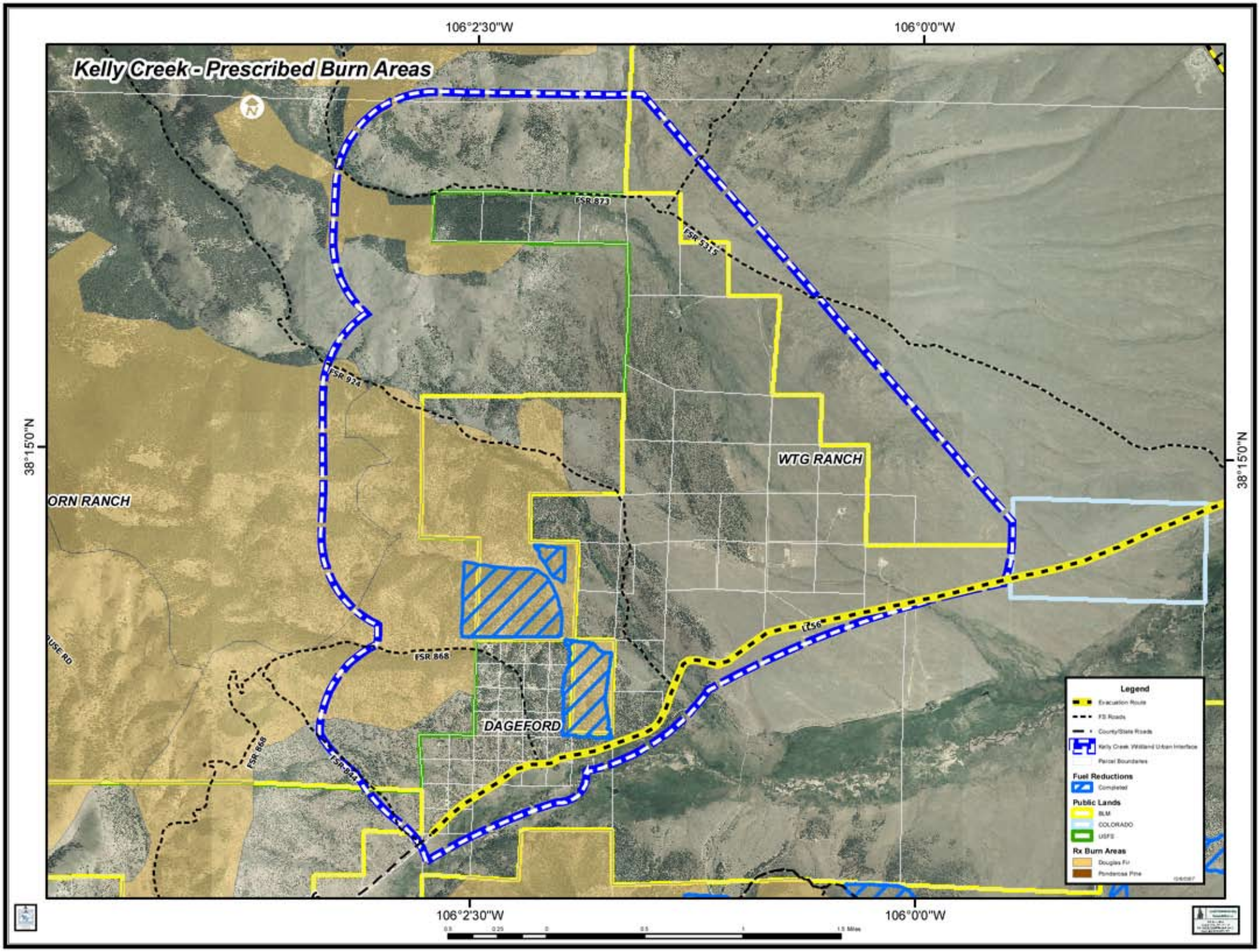
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FSR 5315
FSR 974
WTG RANCH
ORN RANCH
FSR 868
DAGEFORD
FSR 868
FSR 844
Legend
Evacuation Route
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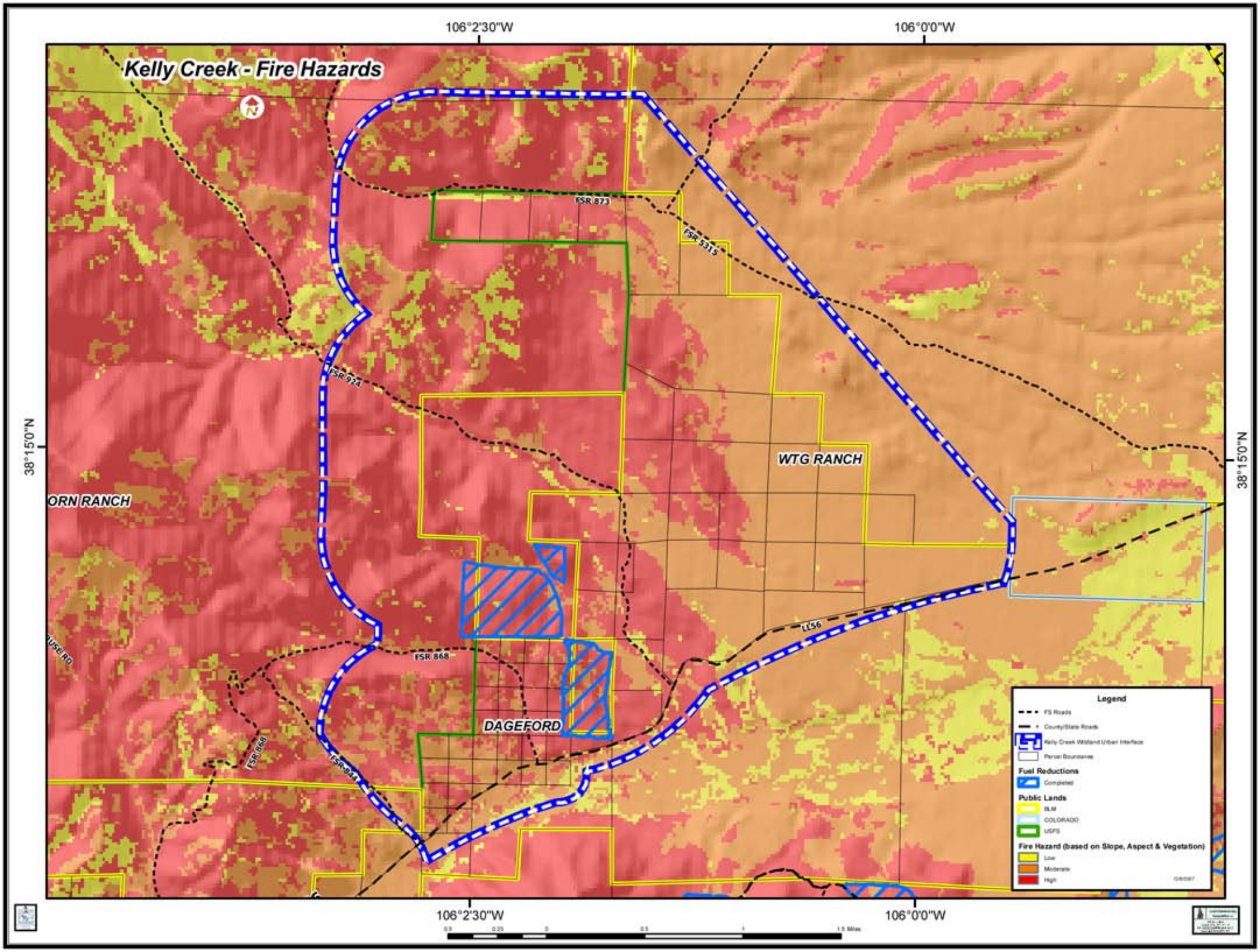
Rx Burn Areas
Douglas Fir
Ponderosa Pine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38°15'0"N
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FSR 924
WTG RANCH
ORN RANCH
FSR 868
DAGEFORD
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Legend
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County/State Roads
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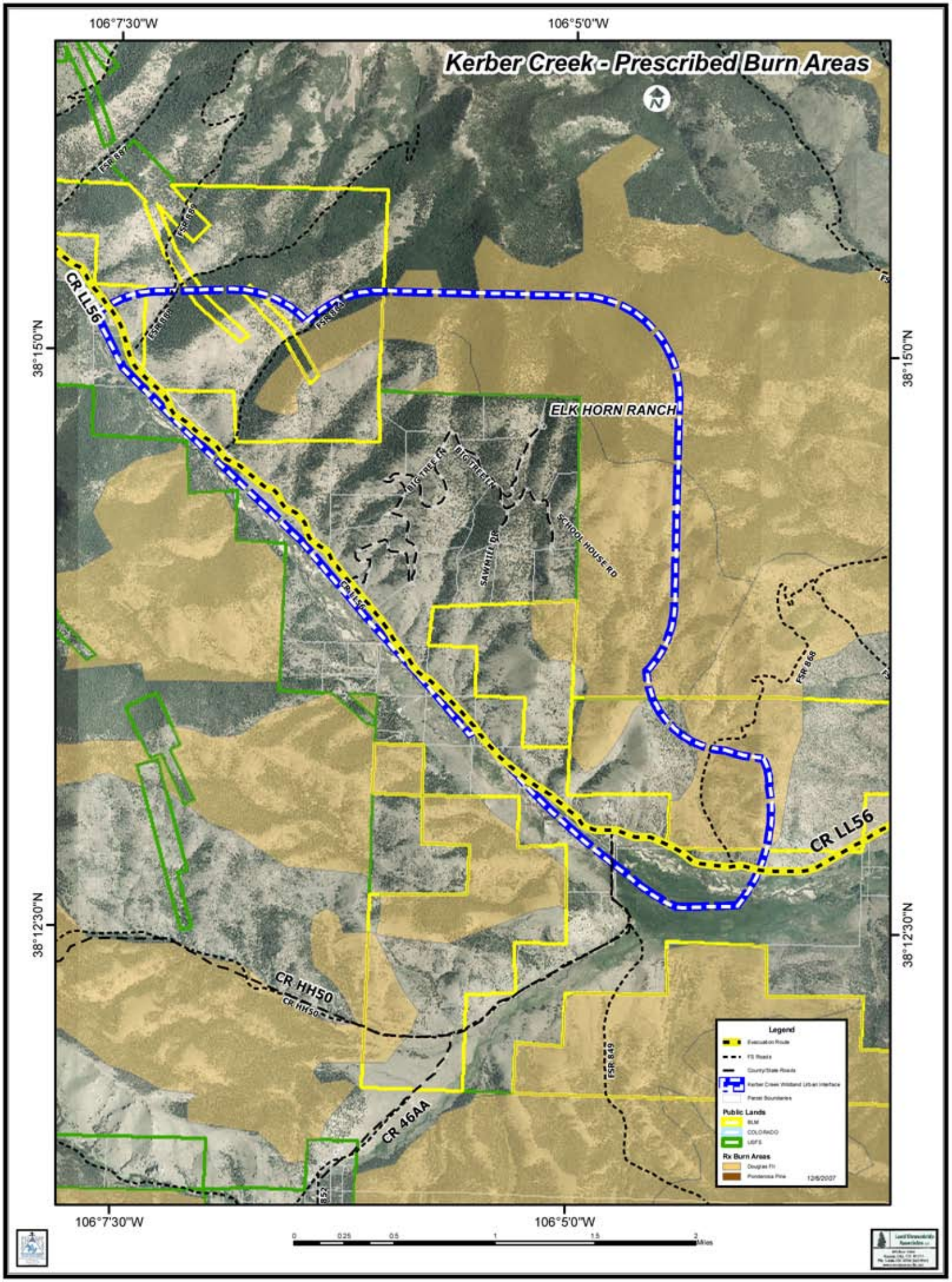
Kerber Creek - Prescribed Burn Areas
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38°12'30"N
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CR HH50
CR 46AA
FSR 847
FSR 849
FSR 868
BIG TREE LN
SAWMILL DR
SCHOOL HOUSE RD
Legend
Evacuation Route
FS Roads
County/State Roads
Kerber Creek Wildland Urban Interface
Parcel Boundaries
Public Lands
BLM
COLORADO
USFS
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Ponderosa Pine
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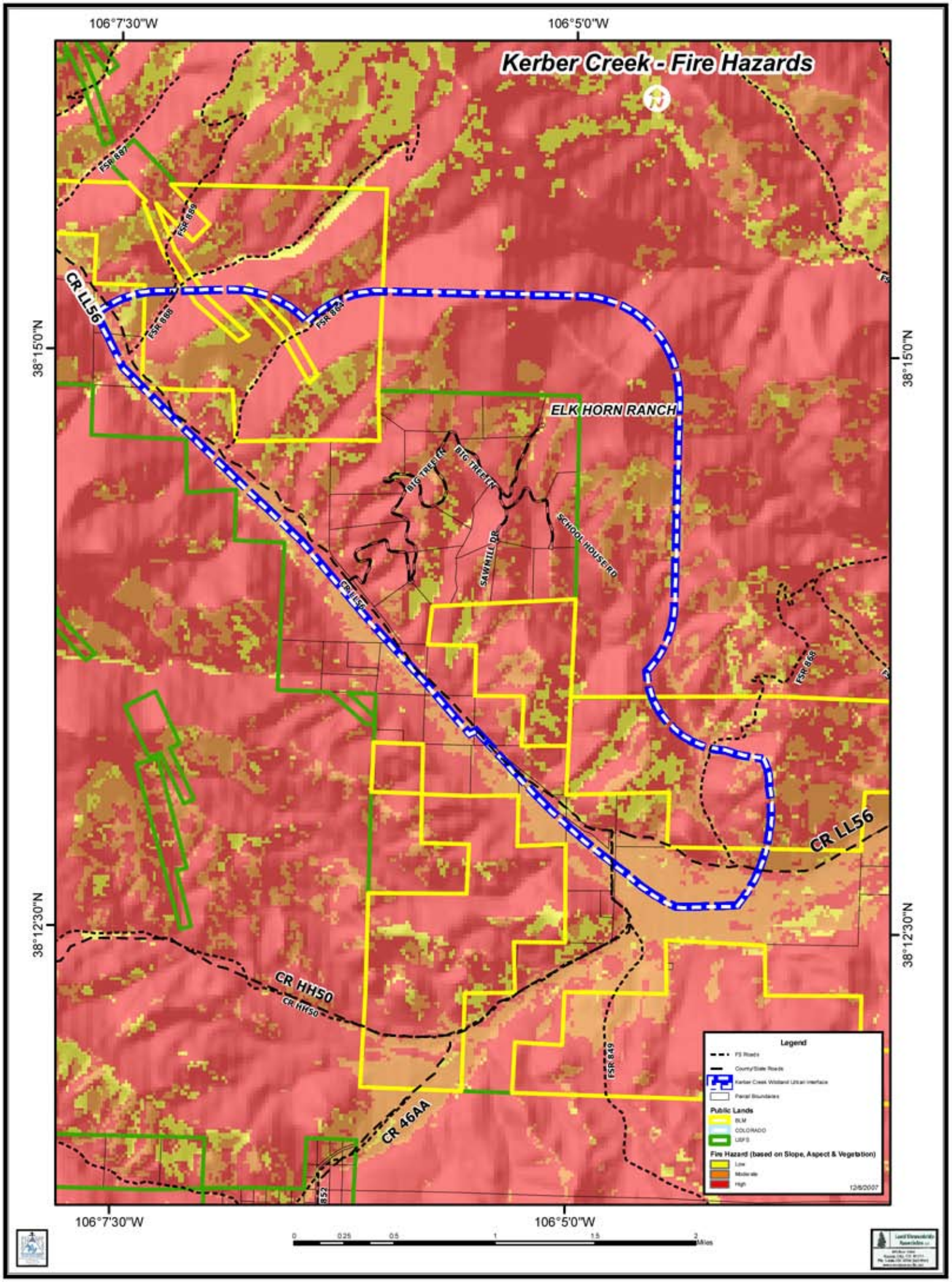
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38°12'30"N
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FSR 888
FSR 868
ELK HORN RANCH
BIG TREE LN
SAWMILL DR
SCHOOL HOUSE RD
CR HH50
CR 46AA
FSR 849
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Legend
FS Roads
County/State Roads
Kerber Creek Wildland Urban Interface
Parcel Boundaries
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COLORADO
USFS
Fire Hazard (based on Slope, Aspect & Vegetation)
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Moderate
High
12/8/2007
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1.5
2
Miles

Lazy KV Corridor

106°0'0"W 105°57'30"W 105°55'0"W 105°52'30"W

38°10'0"N 38°7'30"N 38°5'0"N 38°2'30"N 38°0'0"N

285

CR DD.2

CR AA

CR Y

CR 54Y

CR 55

CR U60

17

HAZARD AVE

RUNDEE DR

MARTINEZ DR

BAREA DR

GLORIA B DR

EVA K DR

DAWN DR

LEE KORA DR

JOHNSON AVE

WIENKE AVE

CROSBY AVE

HAZARD CR

FIFTEENTH ST

TENTH ST

9TH ST

BROADWAY

REYNOLDS AVE

CARFIELD AVE

CR CC

CR 62

CR U60

Legend

- County/State Roads
- Evacuation Routes
- Lazy KV Corridor Wildland Urban Interface (WUI)
- Parcel Boundaries

Public Lands

- BLM
- COLORADO
- USFS

0 0.25 0.5 1 1.5 2 2.5 3 Miles

Lazy KV Corridor - Fire Hazard

106°0'0"W 105°57'30"W 105°55'0"W 105°52'30"W

38°10'0"N 38°7'30"N 38°5'0"N 38°2'30"N 38°0'0"N

CR DD.2
CR AA
CR U60
CR Y
CR X
CR 54
CR 54Y
CR 55
HAZARD AVE
JOHNSON AVE
FIFTEENTH ST
TENTH ST
9TH ST
BROADWAY

Legend

- County/State Roads
- Lazy KV Corridor Wildland Urban Interface (WUI)
- Parcel Boundaries

Public Lands

- BLM
- COLORADO
- USFS

Fire Hazard (based on Slope, Aspect & Vegetation)

- Low
- Moderate
- High

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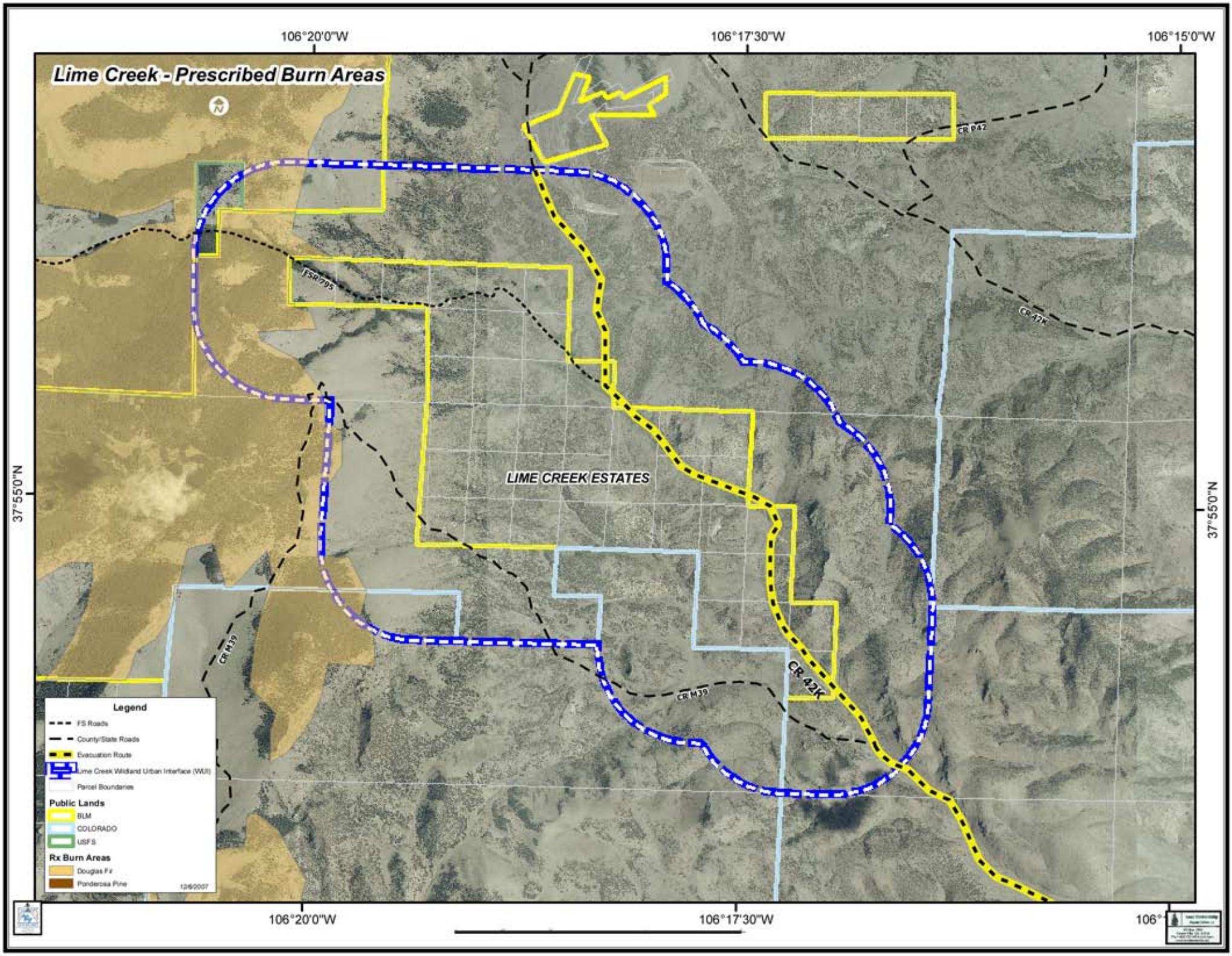
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106°15'0"W
37°55'0"N
LIME CREEK ESTATES
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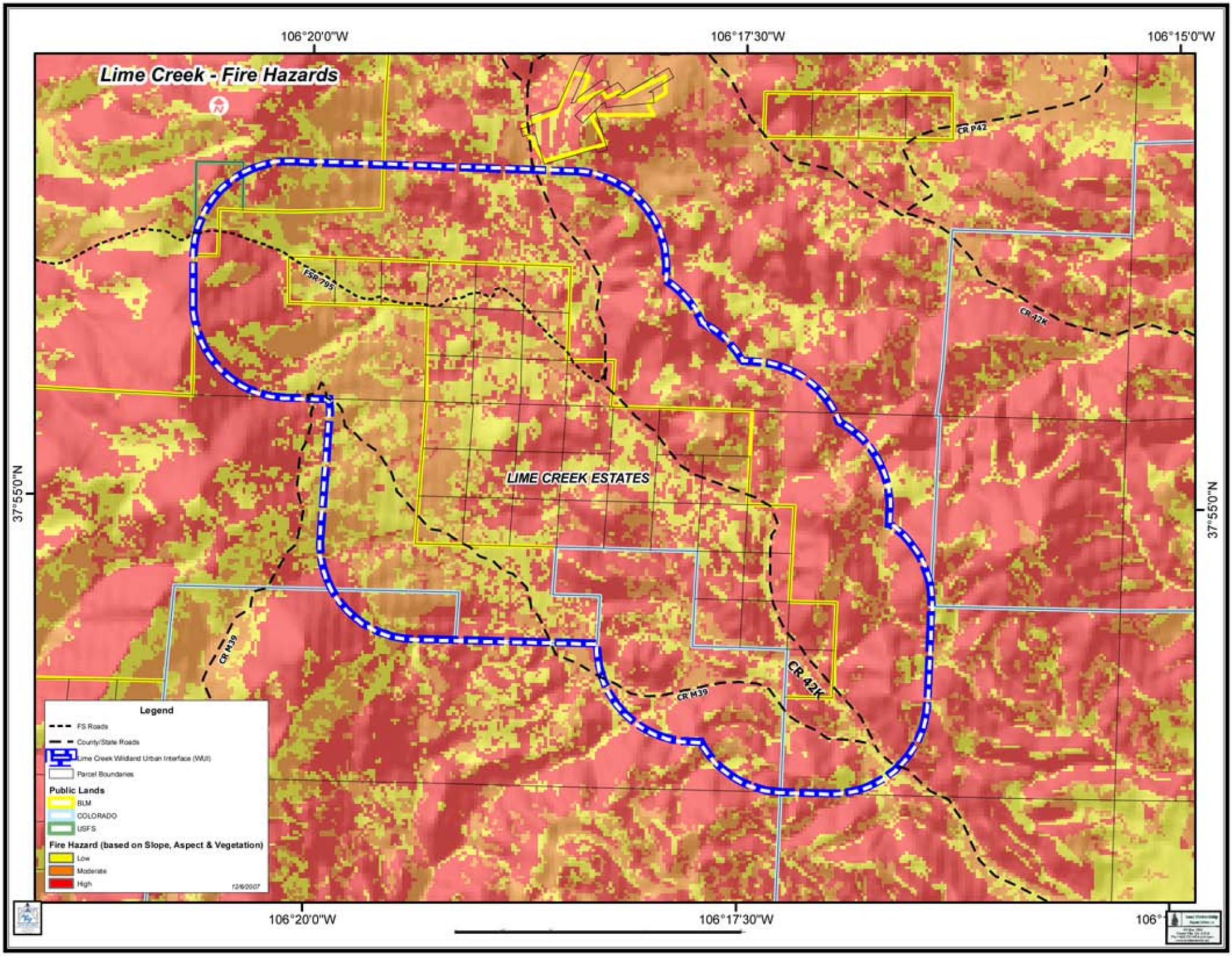
CR P42
CR 42K
CR M39
Legend
FS Roads
County/State Roads
Evacuation Route
Lime Creek Wildland Urban Interface (WUI)
Parcel Boundaries
Public Lands
BLM
COLORADO
USFS
Rx Burn Areas
Douglas Fir
Ponderosa Pine
12/6/2007


Lime Creek - Fire Hazards
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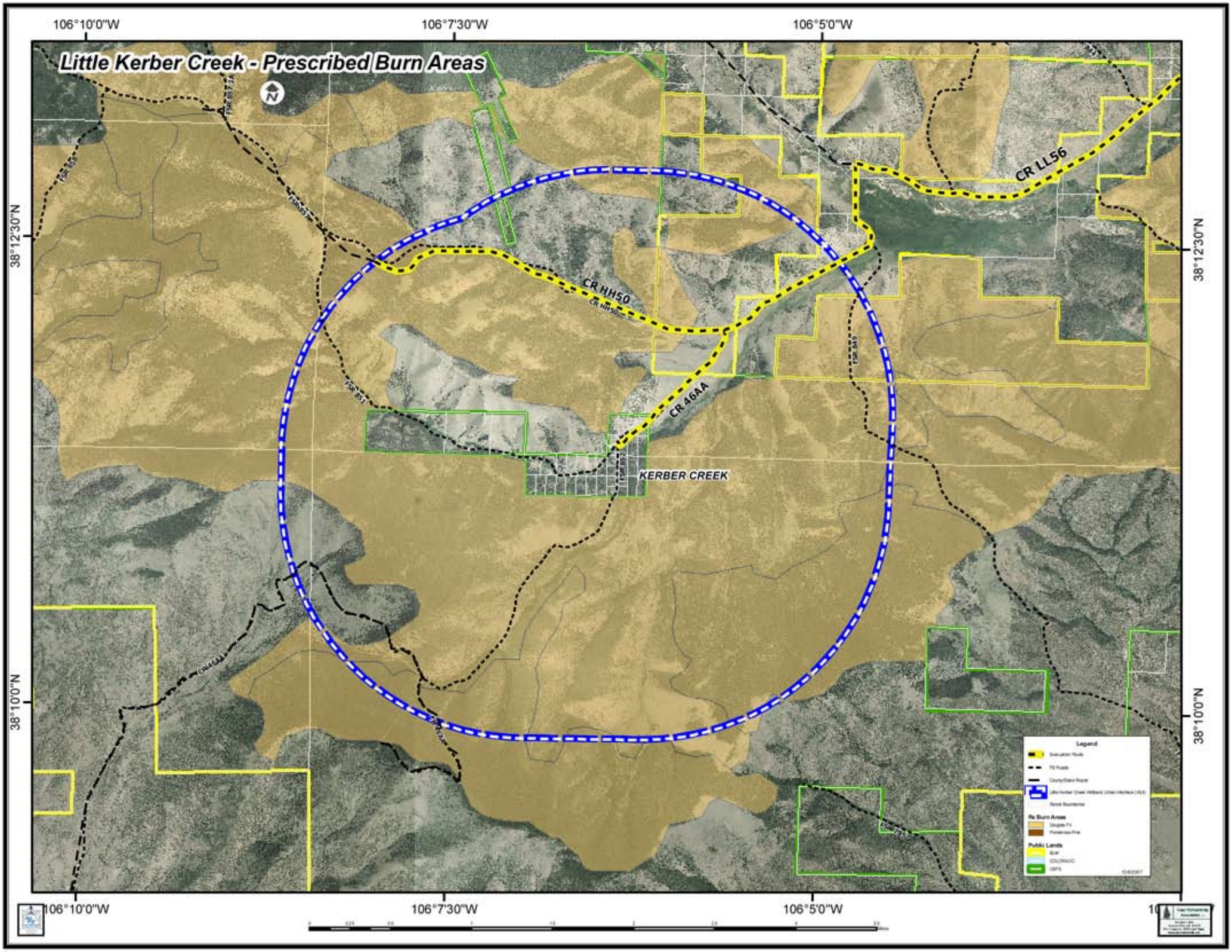
106°17'30"W
106°15'0"W
37°55'0"N
LIME CREEK ESTATES
FSR 795
CR P42
CR 42K
CR M39
Legend
FS Roads
County/State Roads
Lime Creek Wildland Urban Interface (WUI)
Parcel Boundaries
Public Lands
BLM
COLORADO
USFS
Fire Hazard (based on Slope, Aspect & Vegetation)
Low
Moderate
High
12/6/2007


Little Kerber Creek - Prescribed Burn Areas
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106°5'0"W
38°12'30"N
38°10'0"N
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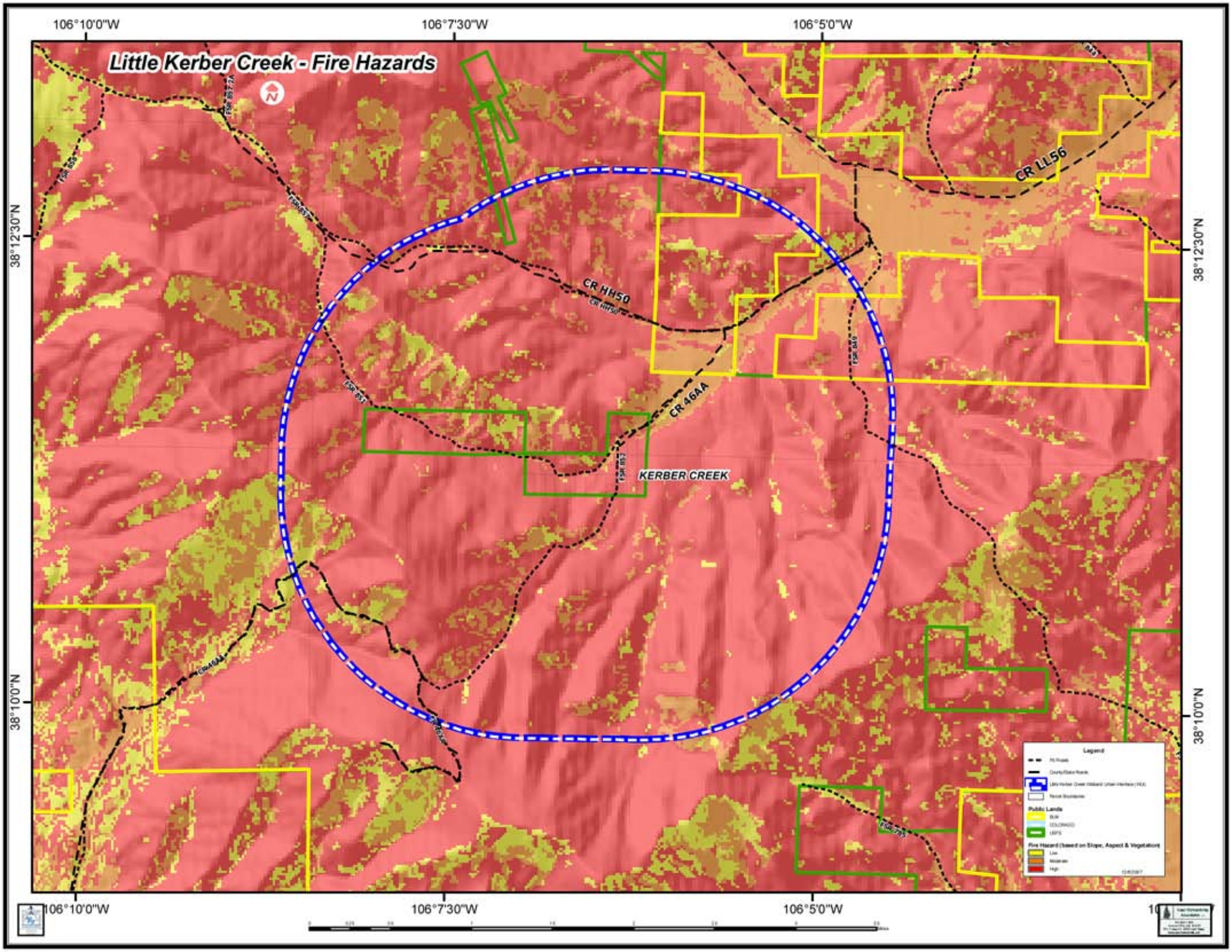
CR HH50
CR 46AA
KERBER CREEK
FSR 857.2A
FSR 856
FSR 857
FSR 851
FSR 849
FSR 851.2
Legend
Rx Burn Areas
Douglas Fir
Ponderosa Pine
Public Lands
BLM
COLORADO
USFS


Little Kerber Creek - Fire Hazards
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106°7'30"W
106°5'0"W
38°12'30"N
38°10'0"N
CR LL56
CR HH50
CR 46AA
KERBER CREEK
FSR 857.2A
FSR 856
FSR 857
FSR 851
FSR 857
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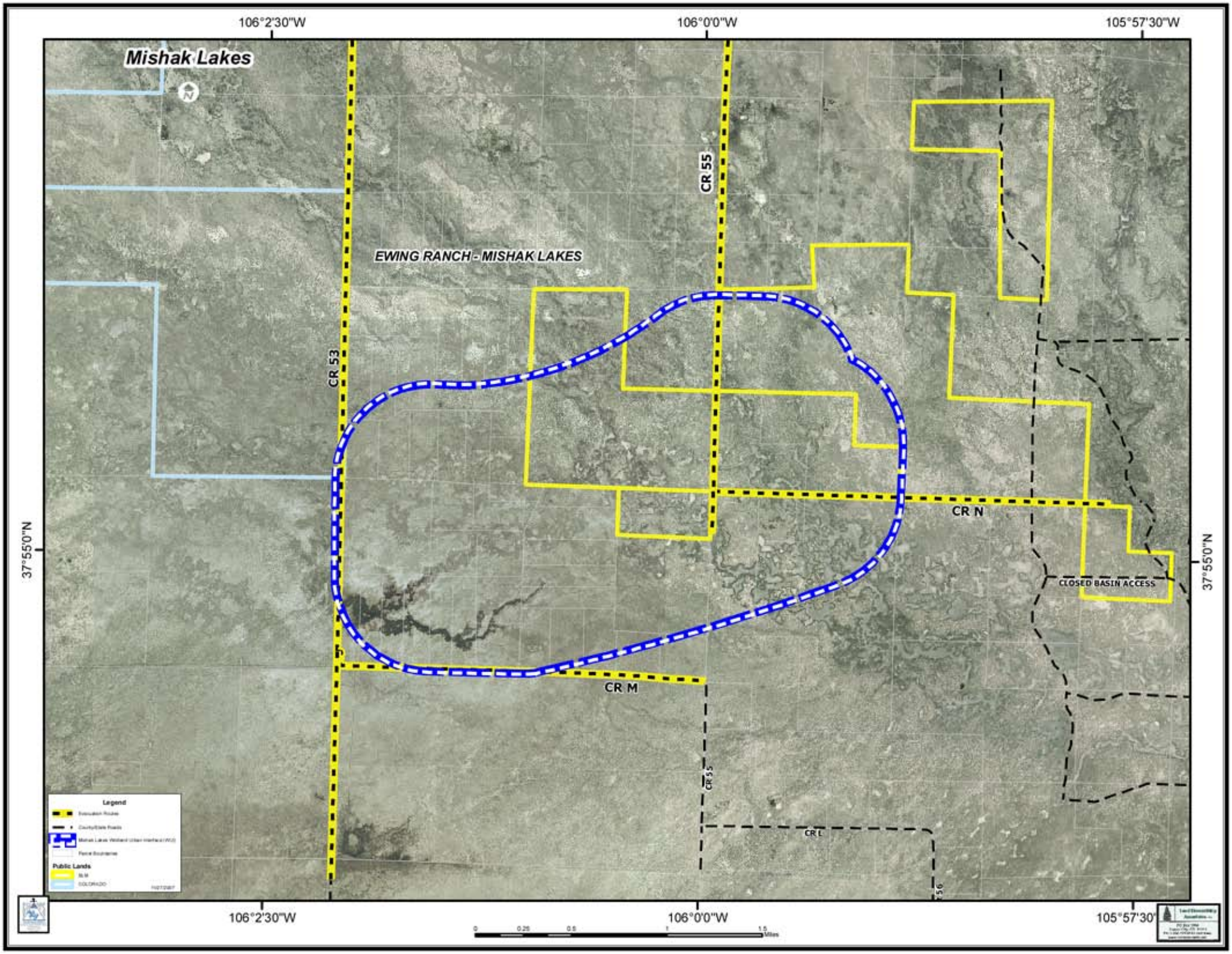
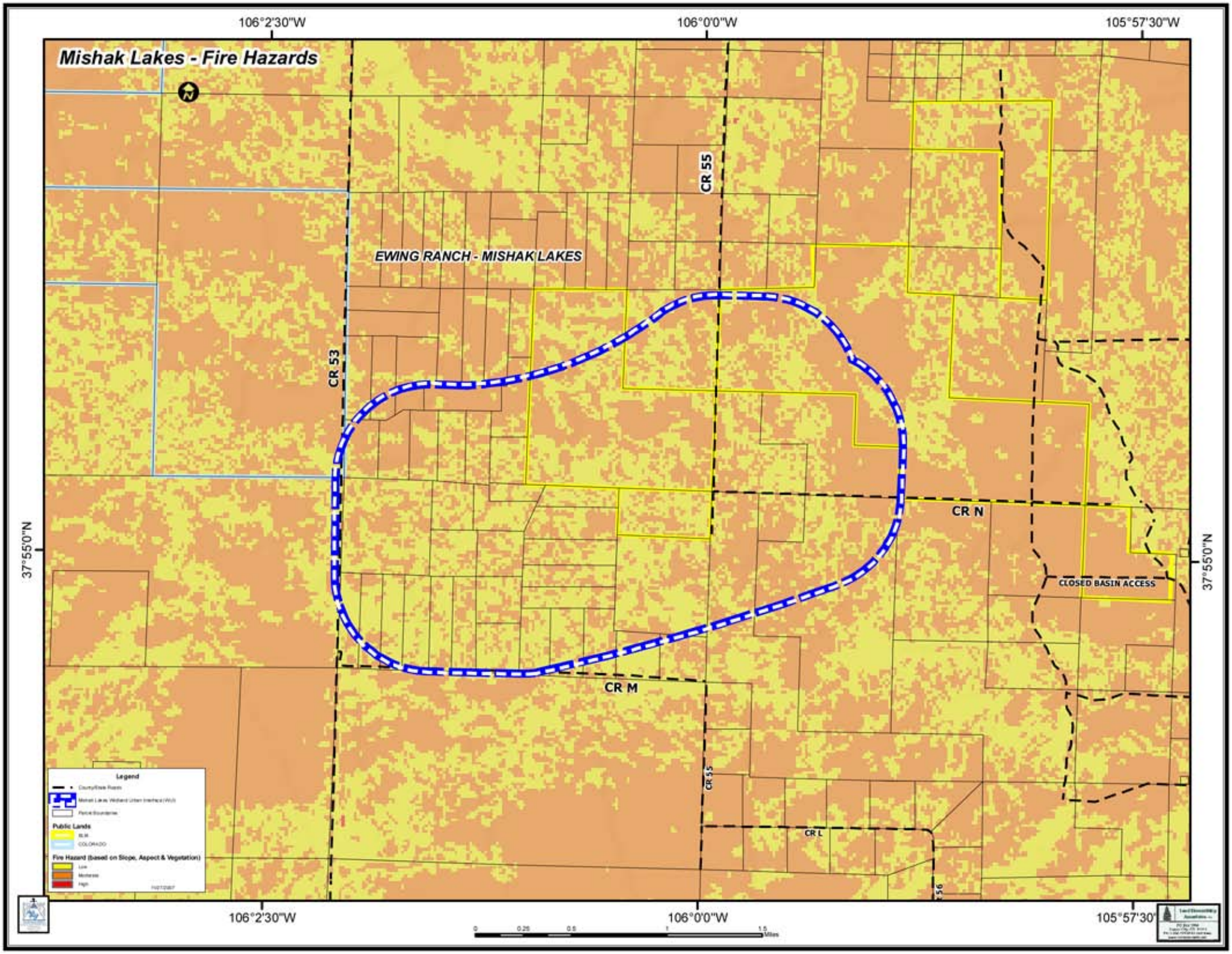
FSR 795
Legend
Public Lands
Fire Hazard (based on Slope, Aspect & Vegetation
Low
Moderate
High


Mishak Lakes
EWING RANCH - MISHAK LAKES
CR 53
CR 55
CR N
CR M
CR L
CR 55
CR 56
CLOSED BASIN ACCESS
106°2'30"W
106°0'0"W
105°57'30"W
37°55'0"N
Legend
Public Lands
BLM
COLORADO
0
0.25
0.5
1
1.5
Miles


Mishak Lakes - Fire Hazards
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106°0'0"W
105°57'30"W
37°55'0"N
EWING RANCH - MISHAK LAKES
CR 53
CR 55
CR N
CR M
CR L
CLOSED BASIN ACCESS
Legend
Public Lands
Fire Hazard (based on Slope, Aspect & Vegetation)
Low
Moderate
High
0
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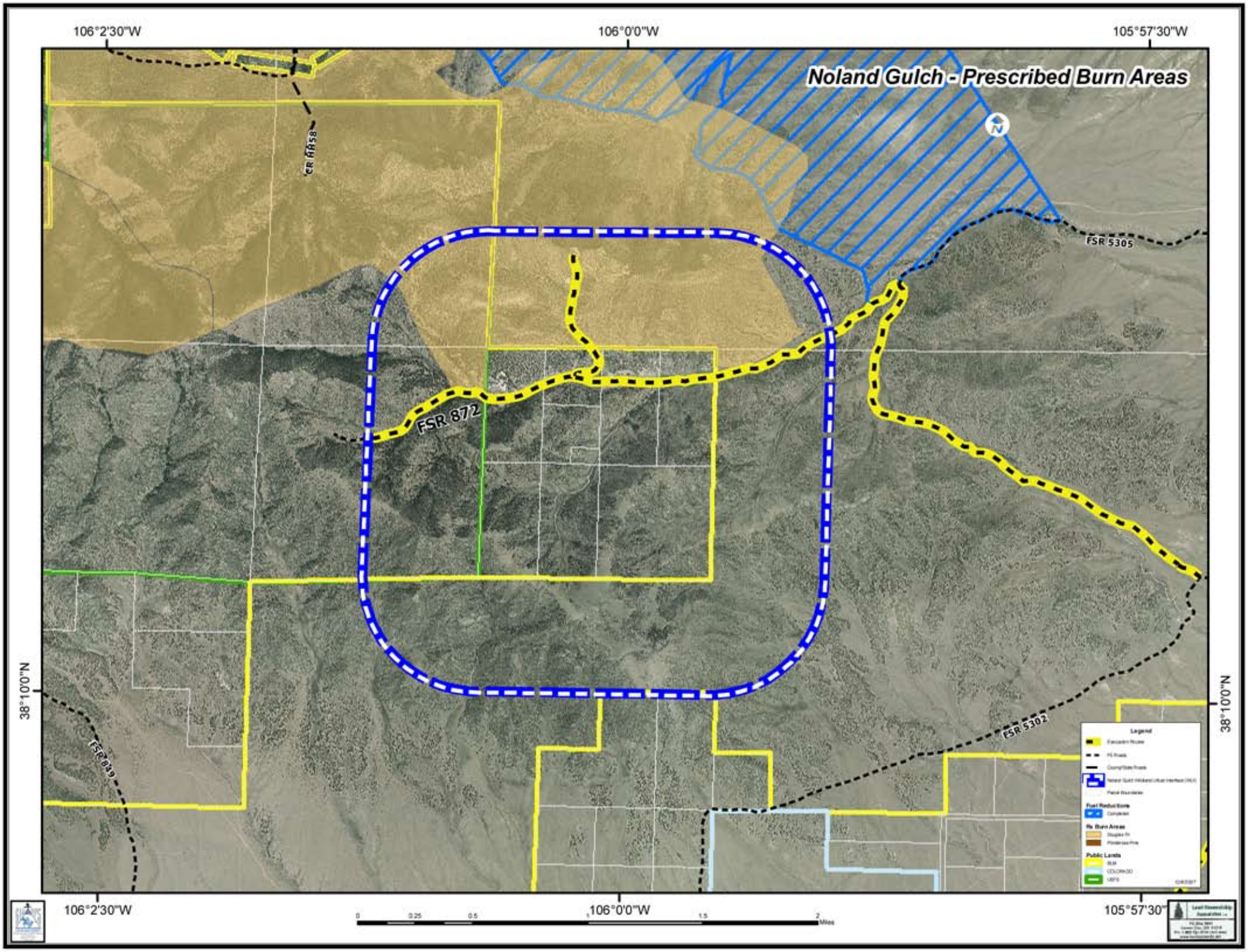
Miles


Noland Gulch - Prescribed Burn Areas
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Legend
Fuel Reductions
Rx Burn Areas
Public Lands
0
0.25
0.5
1
1.5
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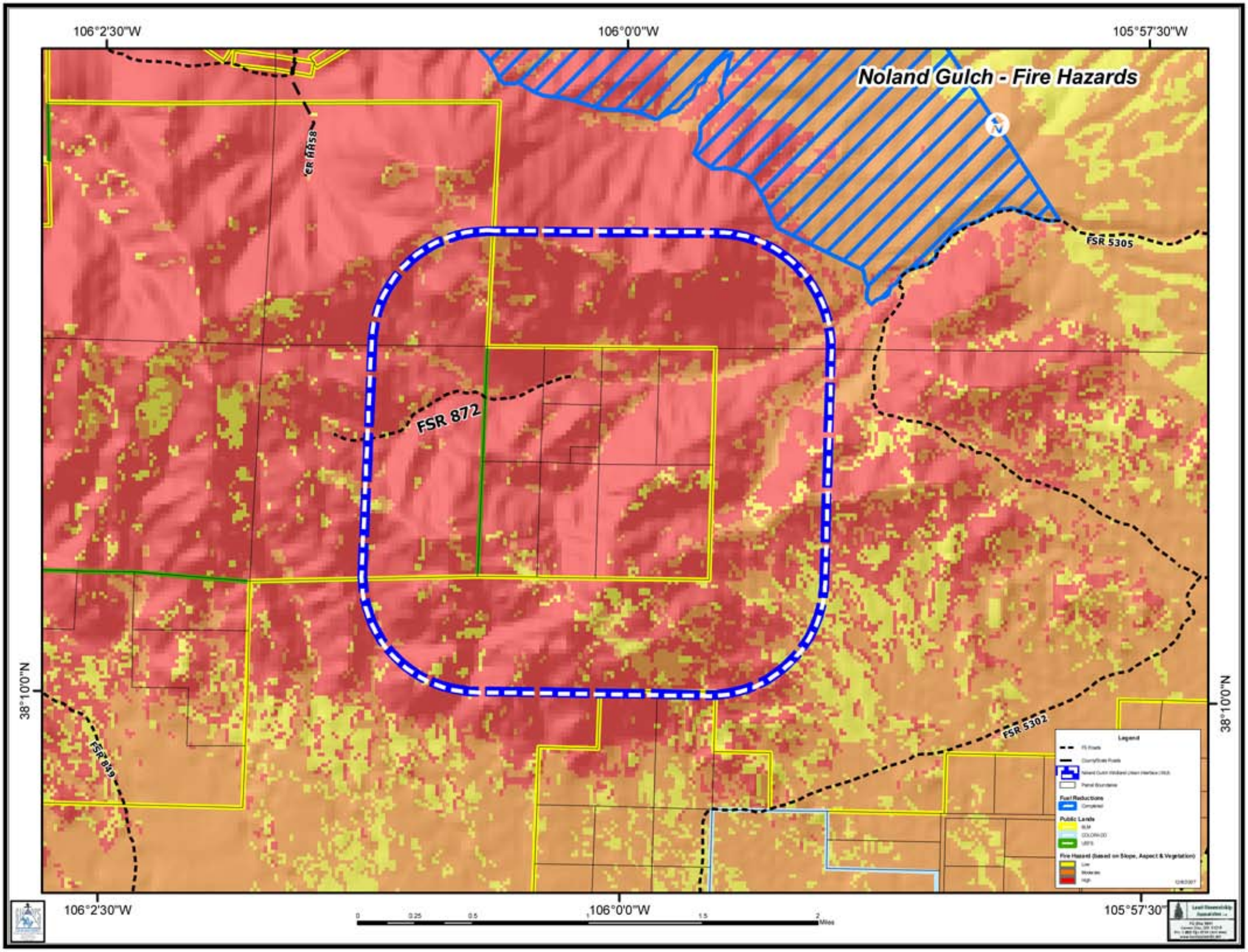
Miles


Noland Gulch - Fire Hazards
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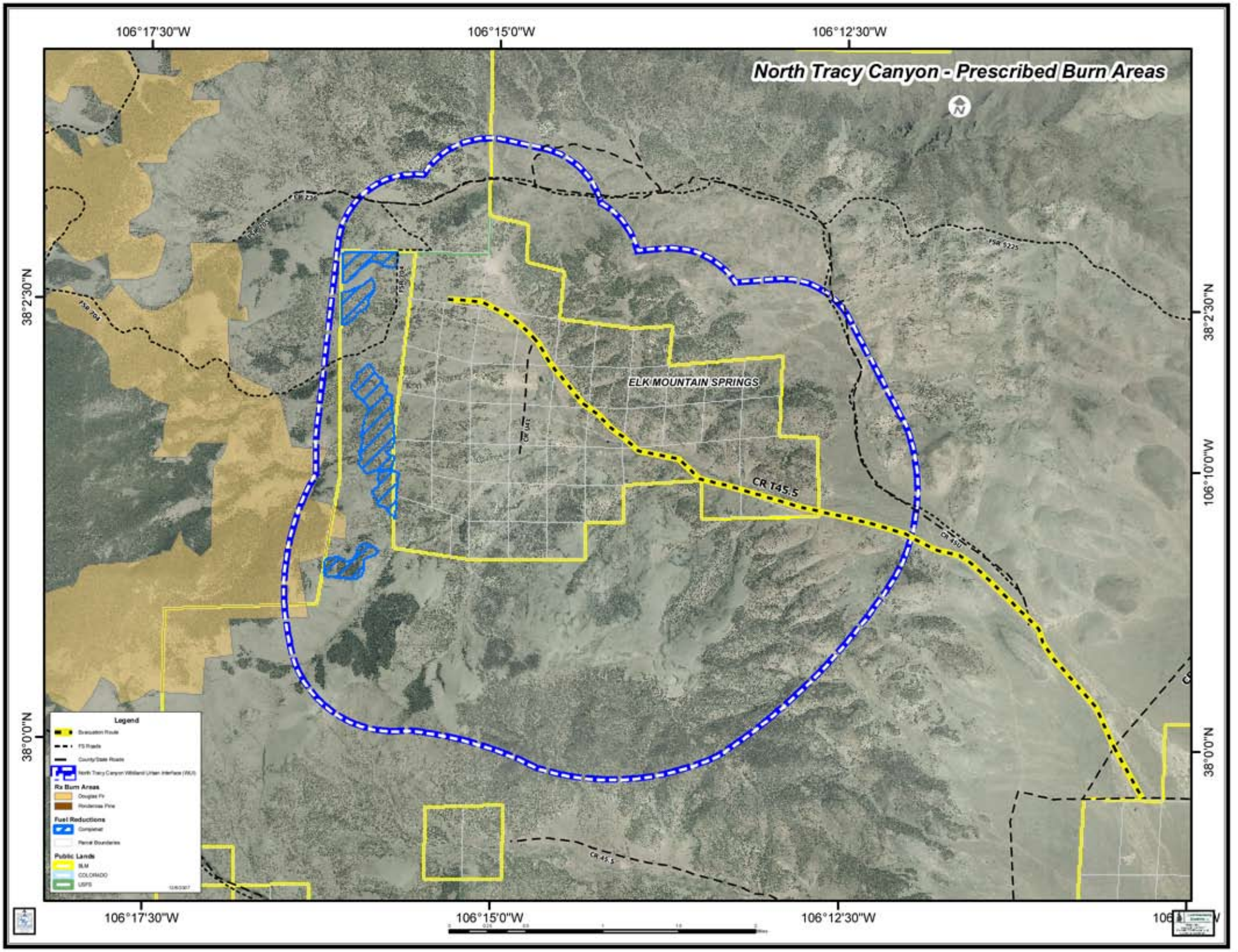
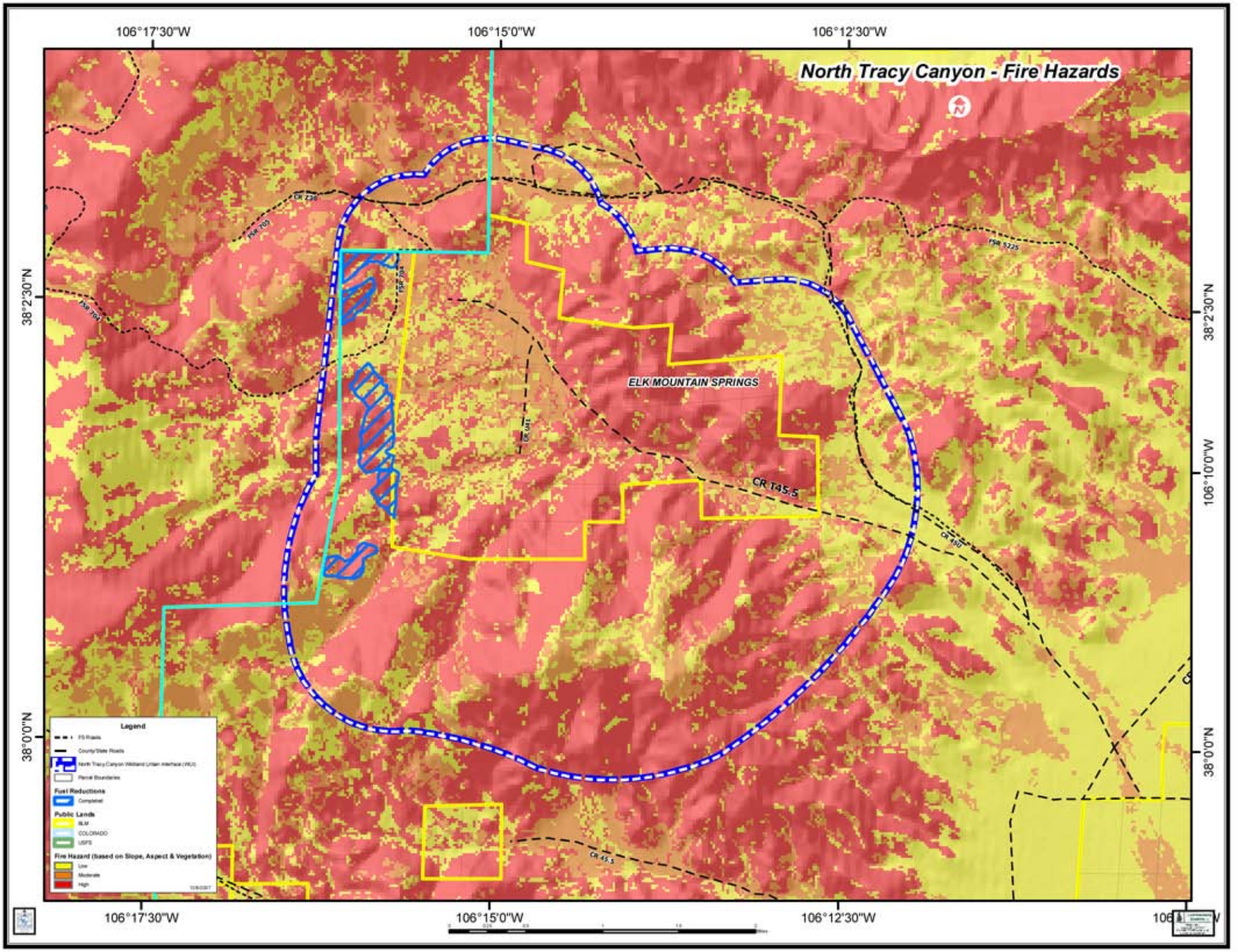
FSR 872
FSR 5305
FSR 5302
FSR 849
CR 11458
Legend
Fuel Reductions
Public Lands
Fire Hazard (based on Slope, Aspect & Vegetation)
0
0.25
0.5
1
1.5
2
Miles


North Tracy Canyon - Prescribed Burn Areas
106°17'30"W
106°15'0"W
106°12'30"W
38°2'30"N
38°0'0"N
ELK MOUNTAIN SPRINGS
CR T45.5
CR 45.5
FSR 235
FSR 204
FSR 5225
Legend
Evacuation Route
FS Roads
County/State Roads
Rx Burn Areas
Douglas Fir
Ponderosa Pine
Fuel Reductions
Completed
Parcel Boundaries
Public Lands
BLM
COLORADO
USFS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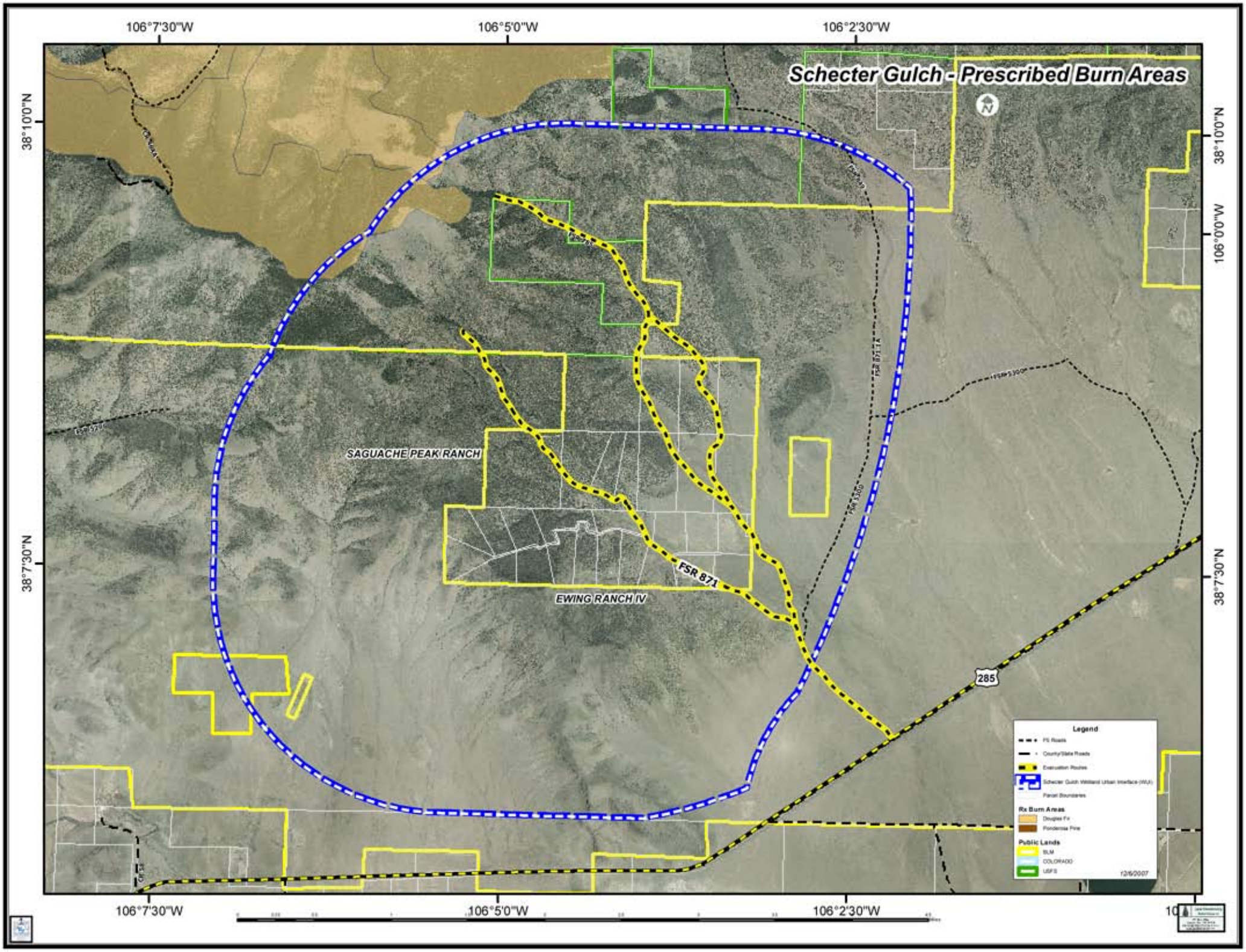
106°15'0"W
106°12'30"W
38°2'30"N
38°0'0"N
106°10'0"W
ELK MOUNTAIN SPRINGS
CR T45.5
CR 45.5
CR 230
FSR 705
FSR 704
FSR 9225
Legend
FS Roads
County/State Roads
Parcel Boundaries
Fuel Reductions
Completed
Public Lands
BLM
COLORADO
USFS
Fire Hazard (based on Slope, Aspect & Vegetation)
Low
Moderate
High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106°5'0"W
106°2'30"W
38°10'0"N
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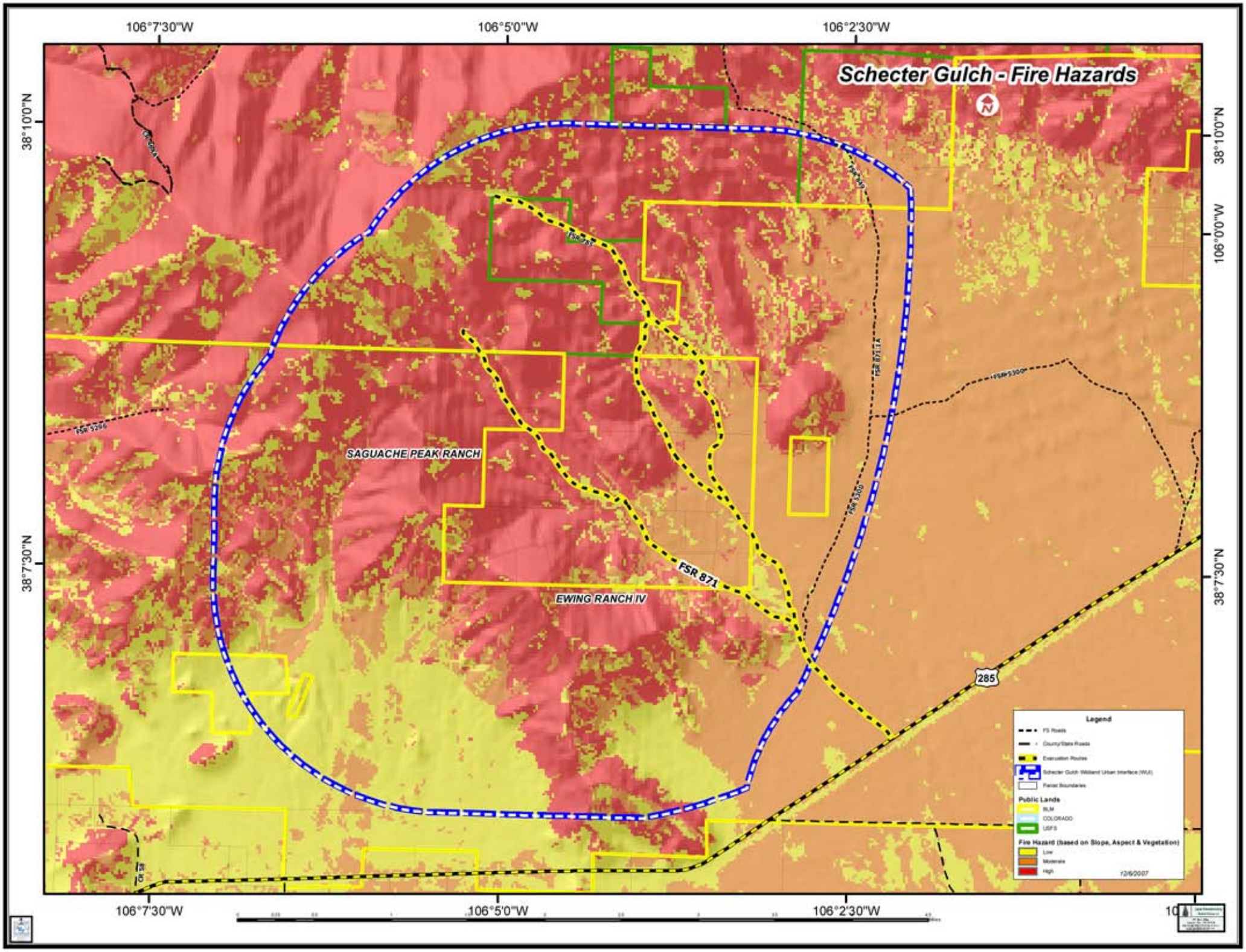
SAGUACHE PEAK RANCH
EWING RANCH IV
FSR 871
285
Legend
FS Roads
County/State Roads
Evacuation Routes
Schecter Gulch Wildland Urban Interface (WUI)
Parcel Boundaries
Rx Burn Areas
Douglas Fir
Ponderosa Pine
Public Lands
BLM
COLORADO
USFS
12/6/2007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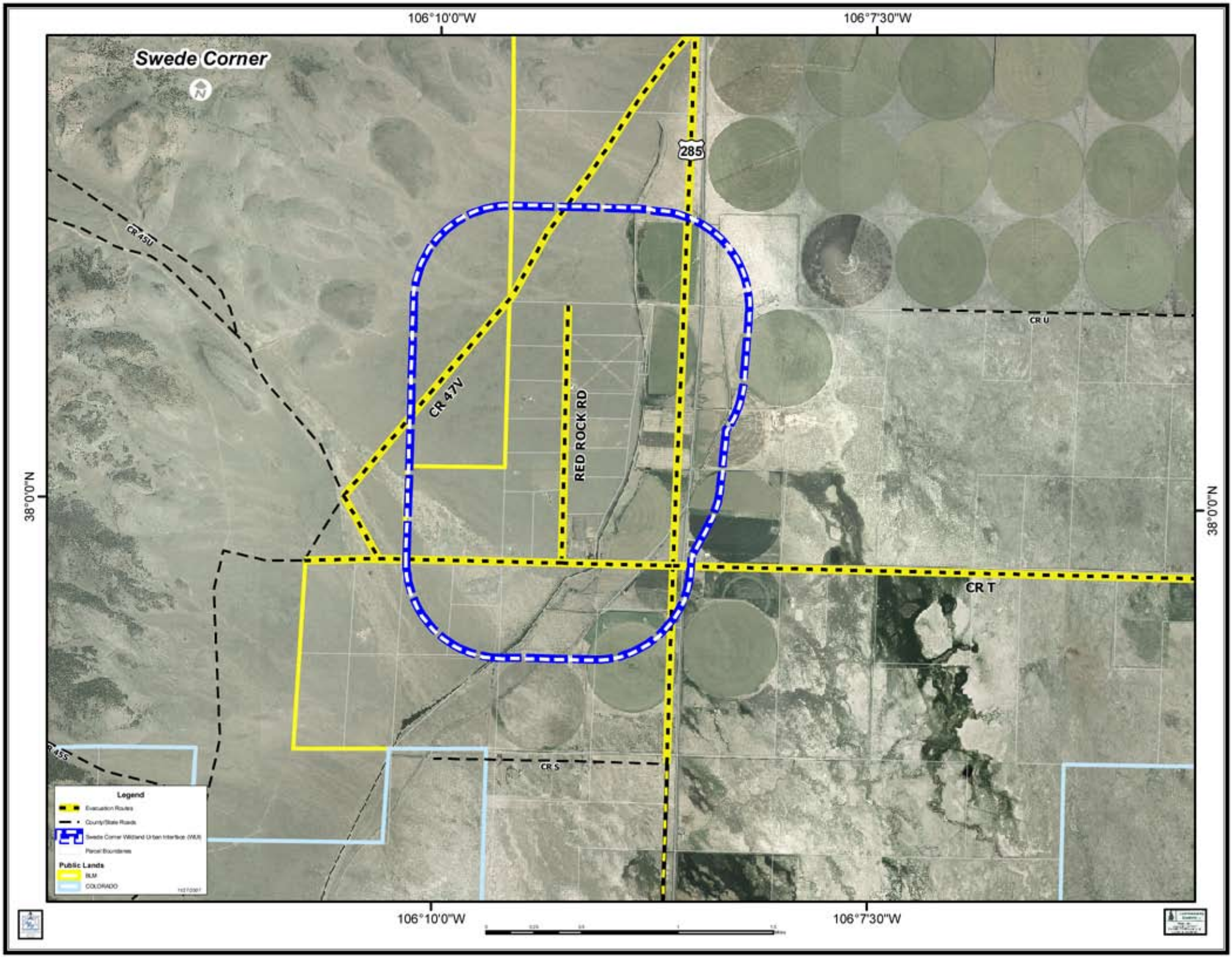
38°7'30"N
106°0'0"W
SAGUACHE PEAK RANCH
EWING RANCH IV
FSR 871
FSR 5296
FSR 5300
FSR 871.1A
285
Legend
FS Roads
County/State Roads
Evacuation Routes
Schecter Gulch Wildland Urban Interface (WUI)
Parcel Boundaries
Public Lands
BLM
COLORADO
USFS
Fire Hazard (based on Slope, Aspect & Vegetation)
Low
Moderate
High
12/6/2007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38°0'0"N
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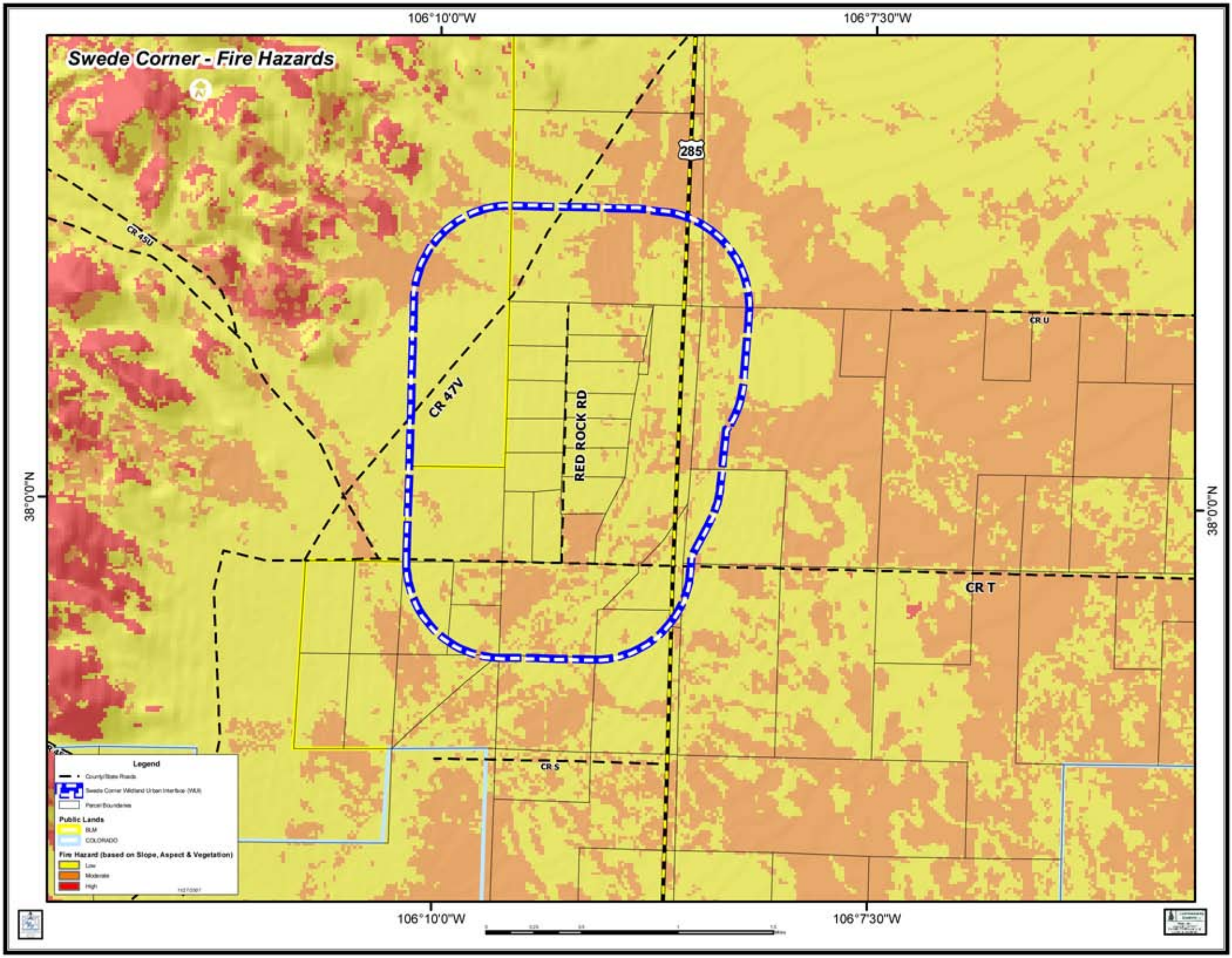
CR 45U
CR 47V
RED ROCK RD
CR U
CR T
CR S
CR 45S
Legend
Evacuation Routes
County/State Roads
Swede Corner Wildland Urban Interface (WUI)
Parcel Boundaries
Public Lands
BLM
COLORADO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38°0'0"N
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CR 47V
RED ROCK RD
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CR T
CR S
Legend
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Swede Corner Wildland Urban Interface (WUI)
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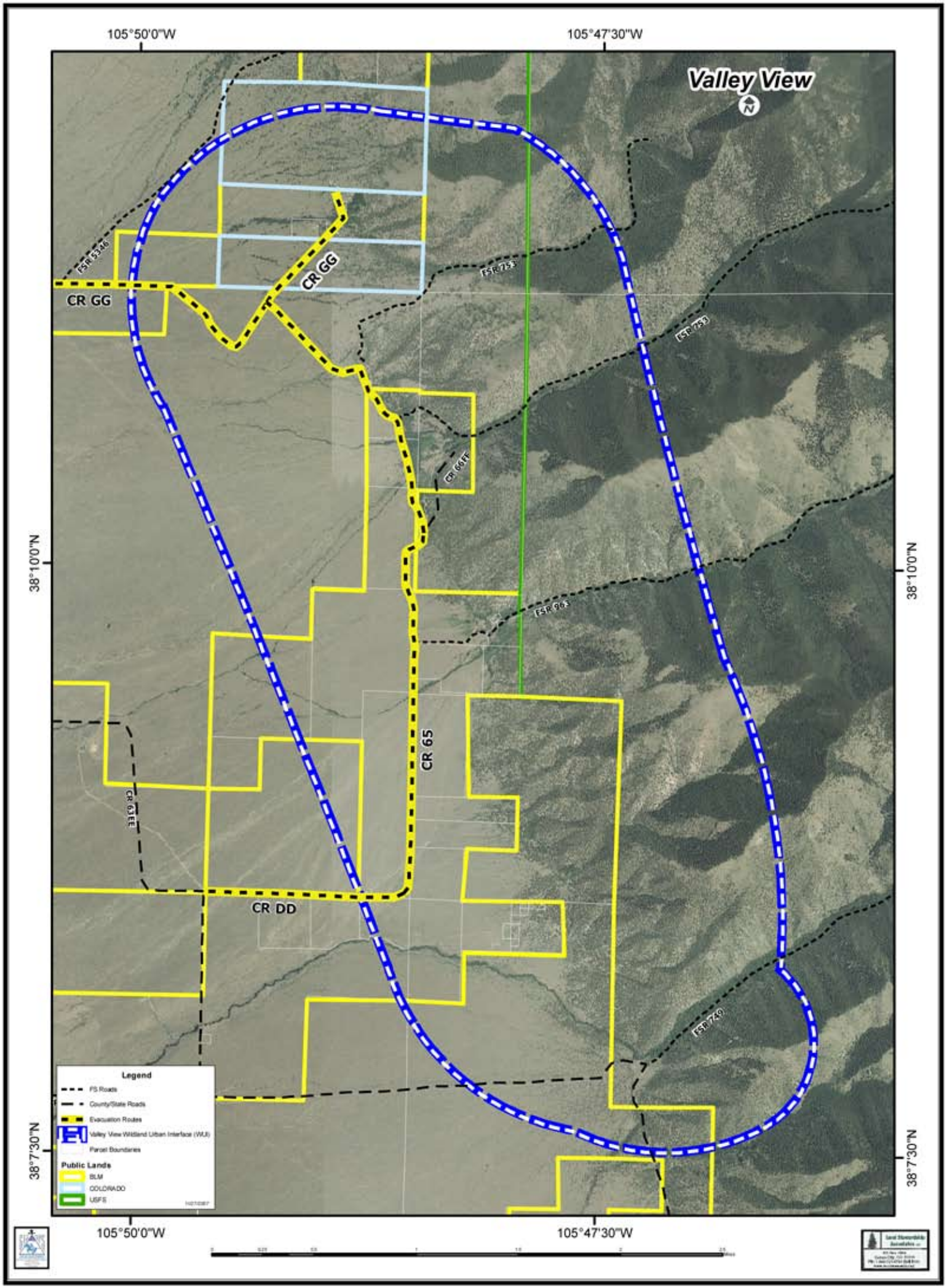
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105°47'30"W
Valley View
N
38°10'0"N
38°7'30"N
CR GG
CR 65
CR DD
CR 64E
CR 63E
FSR 5346
FSR 753
FSR 759
FSR 963
FSR 749
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County/State Roads
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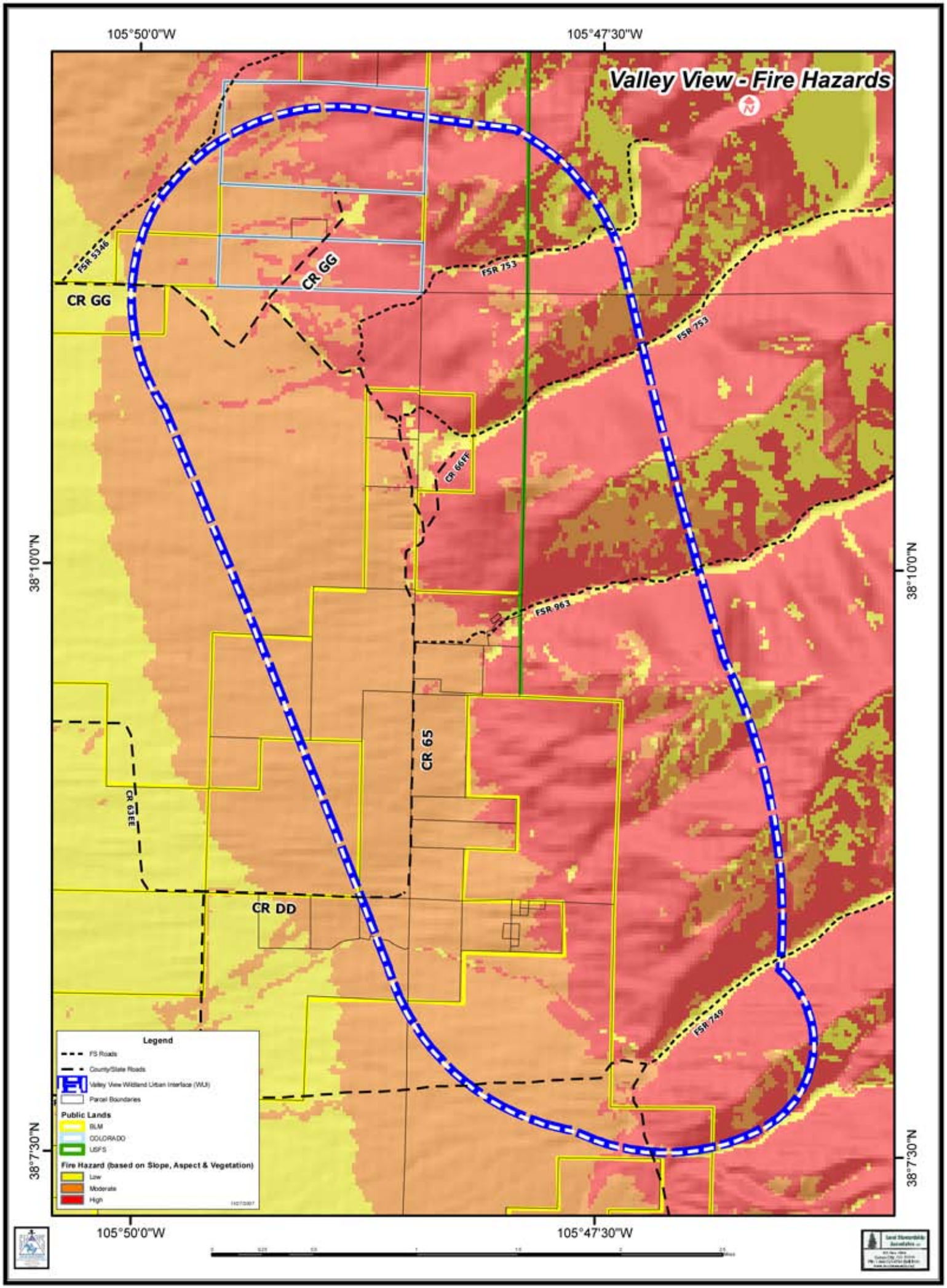
Parcel Boundaries
Public Lands
BLM
COLORADO
USFS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105°47'30"W
38°10'0"N
38°7'30"N
CR GG
FSR 5346
FSR 753
CR 66F
FSR 963
CR 65
CR 65E
CR DD
FSR 749
Legend
FS Roads
County/State Roads
Valley View Wildland Urban Interface (WUI)
Parcel Boundaries
Public Lands
BLM
COLORADO
USFS
Fire Hazard (based on Slope, Aspect & Vegetation)
Low
Moderate
High

APPENDIX B – Fuel Model Descriptions

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

Fuel Model 1
Fire spread is governed by the fine, very porous, and continuous herbaceous fuels that have cured or are nearly cured. Fires are surface fires that move rapidly through the cured grass and associated material. Very little shrub and timber is present, generally less than one third of the area.

Fuel Model 101
Is also a grass fuel model but it has much sparser and shorter grass than a typical Fuel Model 1.

Fuel Model 2
Fire spread is primarily through the fine herbaceous fuels, either curing or dead. These are surface fires where the herbaceous material, in addition to litter and open sagebrush contribute to the fire intensity. Open shrub lands that cover one-third to two thirds of the area may generally fit this model; such stands may include clumps of brush that generate higher intensities and that may produce firebrands.

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

Fuel Model 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.

APPENDIX C – Fuel Hazard Reduction Guidelines

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

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

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

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

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

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

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

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

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

APPENDIX 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 Northern Saguache Fire Protection District, in consultation with the county sheriffs, fire suppression teams and land managing agencies, may recommend that residents evacuate to a safe area. Prior evacuation planning is essential to implement this action effectively.

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

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

Critical Contacts

Saguache County Sheriff		719-655-2525
Saguache County Emergency Manager		719-588-4527
Colorado State Patrol		719-589-5807
Colorado State Forest Service		719-587-0915
Colorado Division of Wildlife		719-587-9600
Rio Grande National Forest, Saguache Ranger District		719-655-2547
Pueblo Interagency Fire Center/Fire Dispatch Center		719-553-1600
		719-553-1613
Federal Emergency Management Agency		303-235-4900
Local News Media	KSLV Radio	719-852-3581
	KGIW Radio	719-589-6644
	KRZA Radio	719-589-8844

KSPK	Radio	719-589-2666
Red Cross		719-589-4567
Local Towing Services	Center	719-754-3963
	Salida	719-539-7251
Great Sand Dunes National Park		719-587-0916

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_____

Check List When Potential for Evacuation Exists

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

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

Emergency Evacuation Routes

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

WUI COMMUNITY	WAYS IN & OUT	ROAD IDENTIFIERS
Bonanza	1	CR LL56
Carnero Creek	2	CR 41G north or south
Crestone	1	CR T
Jacks Creek	1	Ward Gulch to CR 38EE
Kelly Creek	1	CR LL56
Kerber Creek	1	CR LL56
Lazy KV Corridor	Many	Hwys. 17 & 285 plus other county roads
Lime Creek	1	CR 42K
Little Kerber Creek	1	CR 46AA to HH50 to LL56
Mishak Lakes	Many	County section line roads
Noland Gulch	1	
North Tracy Canyon	1	CR T or CR T45.5?
Schecter Gulch	1	
Swede Corner	3	Hwy. 288, CR T & CR 44.8
Valley View	2	CR GG or 65
Silver Lakes	1	

Estimated Time to Implement an Evacuation

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

Fire Behavior and Evacuation Timing

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

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

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

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

Remember the lessons of some Colorado fires:

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

Timing

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

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

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

Travel Time for Evacuation Routes

Beginning Point	Ending Point	Time Required	Miles Traveled	Average Speed

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

Feature	GPS Location

Recommendations

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

Is Your Home Protected From Wildfire Disaster?

A Homeowner's Guide to Wildfire Retrofit

acknowledgments

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

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Courtesy National Interagency Fire Center, Boise, Idaho

Cover and page 1: Bitterroot National Forest, Montana
Courtesy National Interagency Fire Center, Boise, Idaho

Cover and page 2: Pine Barrens
© J Smalley, NJ

Opposite Table of Contents: Florida Wildfire
© AP/Wide World Photos

Disclaimer

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

"Nature...she pardons no mistakes."

Ralph Waldo Emerson

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.

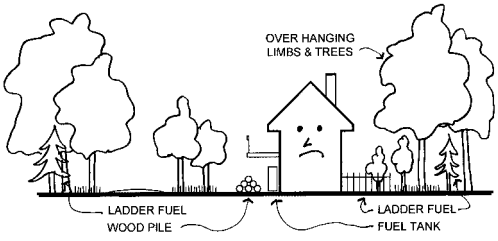
Consequently, you must take action before a fire starts.

© J Smalley, NJ • Pine Barrens

Just the Right Conditions

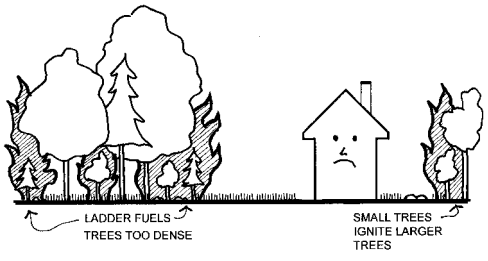
Conditions must be just right for a wildfire to start and spread. Specifically, fuel, weather and topography work together to determine how quickly a wildfire travels and at what intensity.

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



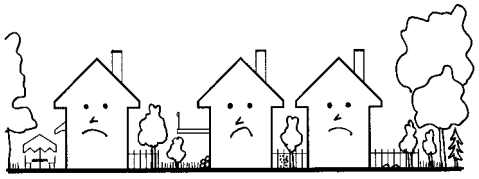
FUELS

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.

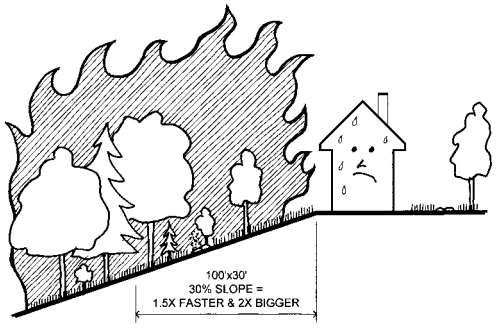


STRUCTURAL DENSITY

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.

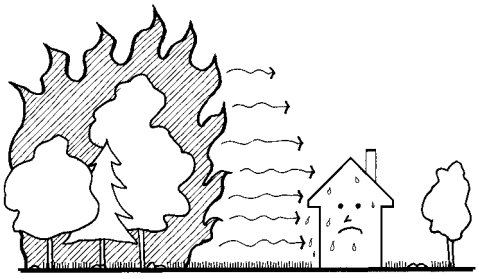


UP SLOPE

How Your Home Catches Fire

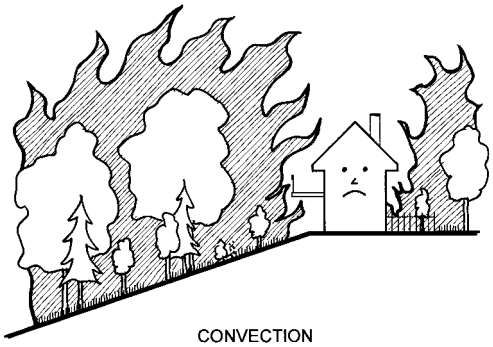
There are three ways that the wildfire can transfer itself from the natural vegetation or other burning homes to your home – through radiation, convection or firebrands.

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.



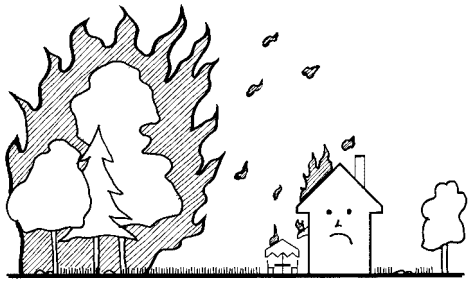
RADIATION

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:

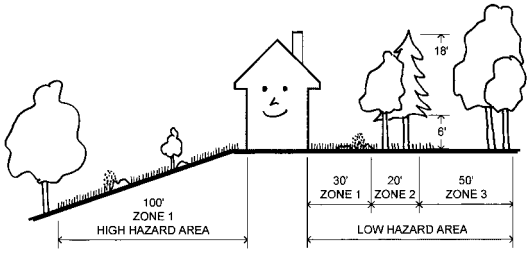
- History of nearby wildfires
- Dry climate with a dry season more than 3 months
- Steep terrain (grades average over 20%)
- Forested wildland within 100 feet of your home
- Native vegetation has not been incorporated into your landscape
- Trees are crowded within 30 feet of your home
- Manmade fuels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

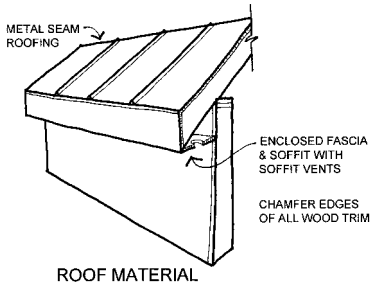
Examine your home's construction and materials. Use the following as a checklist.

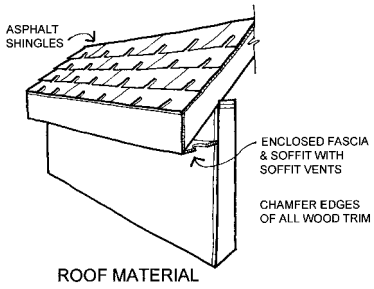
- ☐ What type of roof covering do you have? Asphalt, wood, concrete, tile or metal?
- ☐ How are your eaves, fascias and soffits constructed? Are they made from vinyl, wood or metal?
- ☐ What are your home's exterior walls covered with? Are they wood, aluminum or vinyl siding, stucco, brick or concrete 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.



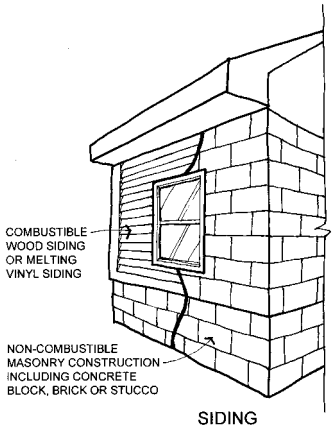


The best way to avoid this situation is to make sure your roof is fire-resistant. The two main fire resistance tests used today include: ASTM E108 and UL 790. There are three levels of classification awarded under the test protocol, A, B, and C, with A being the most fire resistant. Some treated wood shake shingle products have ratings of Class C or better. Over time, the effectiveness of this chemical is reduced by weathering before the end of the product's useful life and may leave your roof unprotected.

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

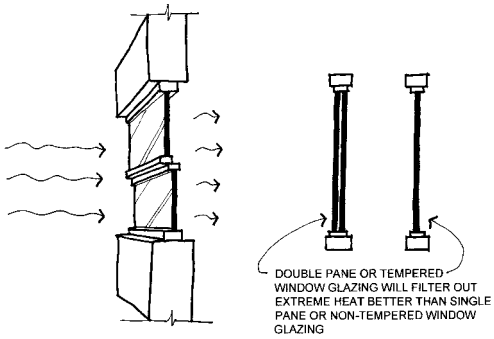
Exterior Walls: Exterior walls are susceptible to a wildfire's radiant and convective heat. Although a fire on an exterior wall may not penetrate inside your home, the fire can 'bridge' to more vulnerable areas such as eaves, soffits, vents and windows.

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



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

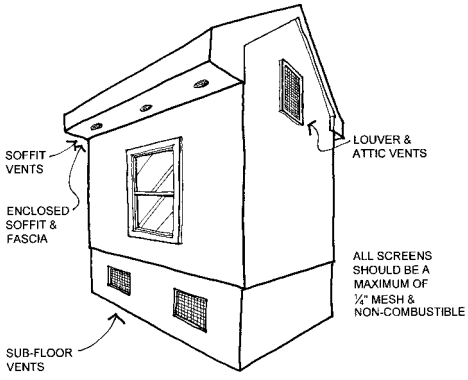
On the other hand, single or double pane tempered glass windows, doors and skylights typically fracture at higher exposures, well above the radiant heat exposures capable of igniting the surrounding wood.



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.



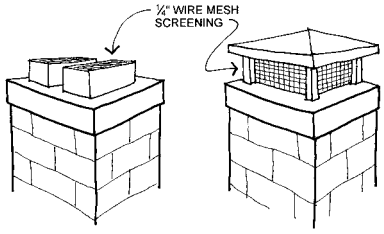
SCREENS AT VENTS

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.

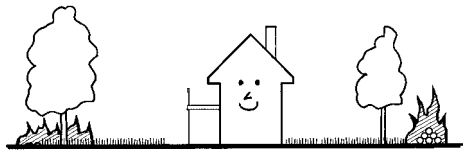


CHIMNEY SCREENS

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

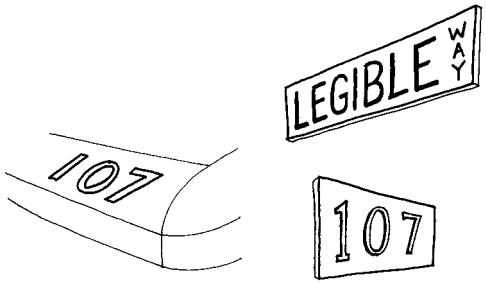
Even if you modify your home's landscape to incorporate the most fire-resistant materials and design into your home's construction, there is no guarantee that a wildfire will not threaten your home. It is important that your local fire department be able to find and defend your home.

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

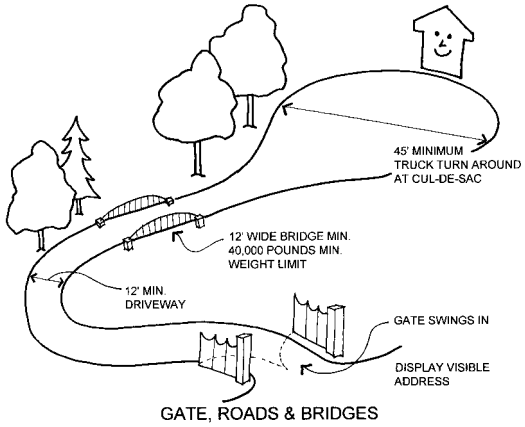
Street Signs and Numbers: If made from combustible materials, your street signs and numbers can ignite or melt, leaving the fire department with no ability to locate your home. It is critical that signs and numbers be noncombustible and visible from the road.

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.

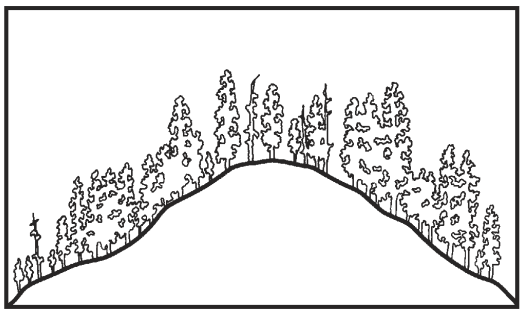
But with development inevitably comes a higher risk of wildfire as well as an ever-increasing potential for loss of life and property. Methods of fire suppression, pre-suppression needs, and homeowner and fire crew safety must all be considered in the planning and review of new developments as well as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

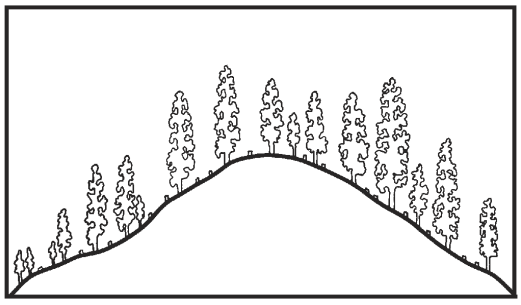
Fuelbreaks should be considered in fire management planning for subdivisions and developments; however, the following are guidelines **only**. They should be customized to local areas by professional foresters experienced in Rocky Mountain wildfire behavior and suppression tactics.

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

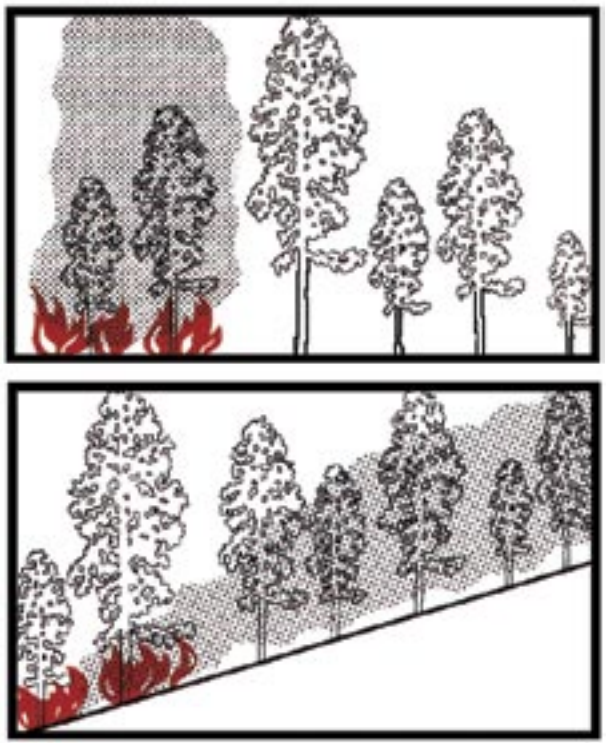
Legend: 5 – Problem may be crucial; 4 – Problem very likely;
3 – Exercise caution; 2 – Problem usually limited;
1 – No rating possible

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.

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

Chimney.

Saddle.

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

Flashover in V-shaped valley.

Crowning Potential

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

Crowning Potential Key

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

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

Ignition Sources

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

Fuelbreak Locations

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

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

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

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

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

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

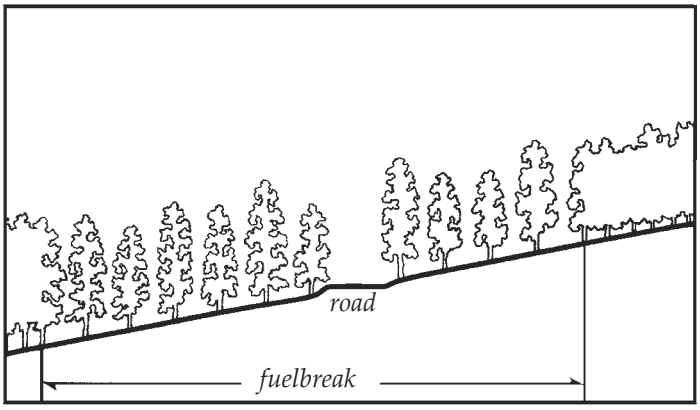
Aesthetics

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

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

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

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



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

Constructing the Fuelbreak

Fuelbreak Width and Slope Adjustments

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

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

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

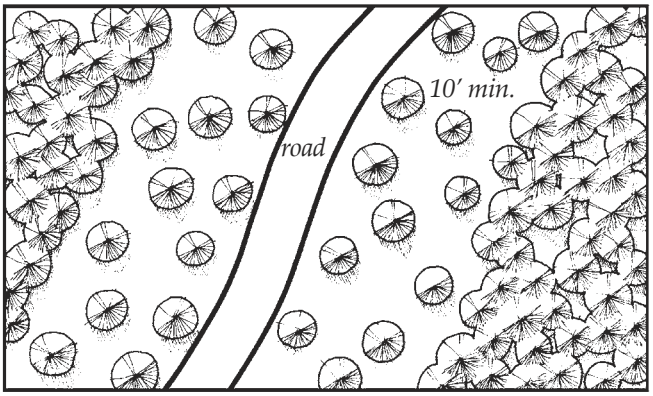
Fuelbreak Width/Slope

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

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

Stand Densities

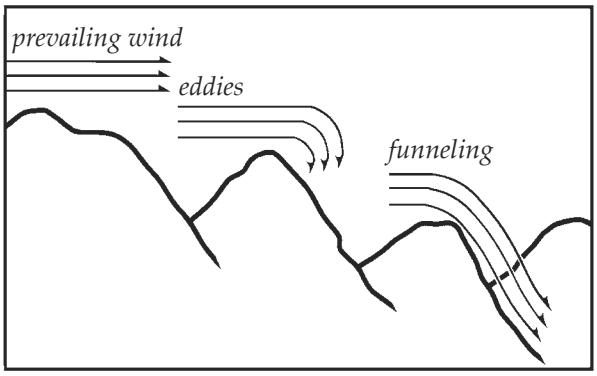
Crown separation is a more critical factor for fuelbreaks than a fixed tree density level. A *minimum* 10-foot spacing between the edges of tree crowns is recommended on level ground. As slope increases, crown spacing should also increase. However, small, isolated groups of trees may be retained for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



Plan view of fuelbreak showing minimum distance between tree crowns.

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

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



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

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

Debris Removal

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

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

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

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

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

Fuelbreak Maintenance

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

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

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

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

Conclusion

An image of well-designed communities for Colorado includes:

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

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

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

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

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

SUBDIVISION FIRE HAZARD RATING

NAME_____ **DATE**_____
SIZE (acres)_____ **# LOTS or HOMES**_____
RATING_____ **COMMENTS**_____

A. Home Site Development Area Design

1. Ingress/Egress
   - Two of more primary roads 1__
   - One road 3__
   - One-way in, one-way out 5__

2. Width of primary road
   - 20 feet or more 1__
   - 20 feet or less 3__

3. Accessibility
   - Road grade 5% or less 1__
   - Road grade 5% or more 3__

4. Secondary road terminus:
   - Loop roads, cul-de-sacs with outside turning radius of 45 feet or greater. 1___
   - Cul-de-sac turn-around radius less than 45 feet. 2__
   - Dead-end roads 200 feet or less in length 3__
   - Dead-end roads greater than 300 feet in length. 5__

5. Average lot size:
   - 10 acres or larger 1__
   -Larger than 1 acre, but less than 10 acres. 3__
   - 1 acre or less 5__

6. Street Signs:
   - Present 1__
   - Not Present 5__

B. Defensibility

1. Fuel Load Between Home Sites:
   - Light 1__
   - Medium 5__
   - Heavy 10__

2. Defensible Space for Individual Homes:
   - 70% or more of sites 1__
   - 30 % or more of sites 3__
   - Less than 30 % of sites 5__

C. Home Ignition Zone

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

D. Roofing Materials (prevalent within area**)**

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

E. Fire Protection - Water Source

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

F. Existing Building Construction Material (most common within subdivision)
- Noncombustible siding/decks 1__
- Noncombustible siding with combustible decks 5__
- Combustible siding and decks 10__

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

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

Total For Area _____

==========

Rating Scale:

Moderate Hazard	**40 - 54**
High Hazard	**55 - 74**
Extreme Hazard	**75+**

APPENDIX H – Saguache County Triage

STRUCTURE TRIAGE

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

Structure:

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

Defensible Space:

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

Current & Expected Fire Behavior?

Available Firefighting Resources?

Firefighter Safety:

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

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

Clearly communicate the priorities and firefighter evacuation criteria!

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

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

APPENDIX G – Road and Driveway Specifications for Emergency Access

Roads serving one dwelling unit shall meet the following:

A. Roadway shall be a total of 14’ in width, including a 10’ all-weather travel surface and 2’ shoulders (each side). Curves and turn a rounds should have a minimum of a 30’ radius at centerline.

B. Road grade should generally not be over 7 percent. A maximum grade 10 percent to 12 percent grade would be acceptable for short distances not over 150 feet.

C. If the driveway is less than 50’ the above (A and B) do not apply.

D. If the length of the road exceeds 150’, a turnaround shall meet (template 1 or 2) standards.

Roads serving more than one dwelling shall meet the following:

A. Roadway shall be a total of 20’ in width, including a 16’ all weather travel surface and 2’ shoulders (template 3) to 16 units, or a total width of 14’, including a 10’ travel surface, with 2’ shoulders on either side and pullouts at 150’ intervals in accordance with (template 4).

B. A total roadway width of 24’, including an 18’ paved surface and 3’ shoulders in accordance with (template 3) for roads serving 16 or more dwellings, or one or more non-residential units.

C. Grades shall be the same as for one dwelling roads/driveway identified above.

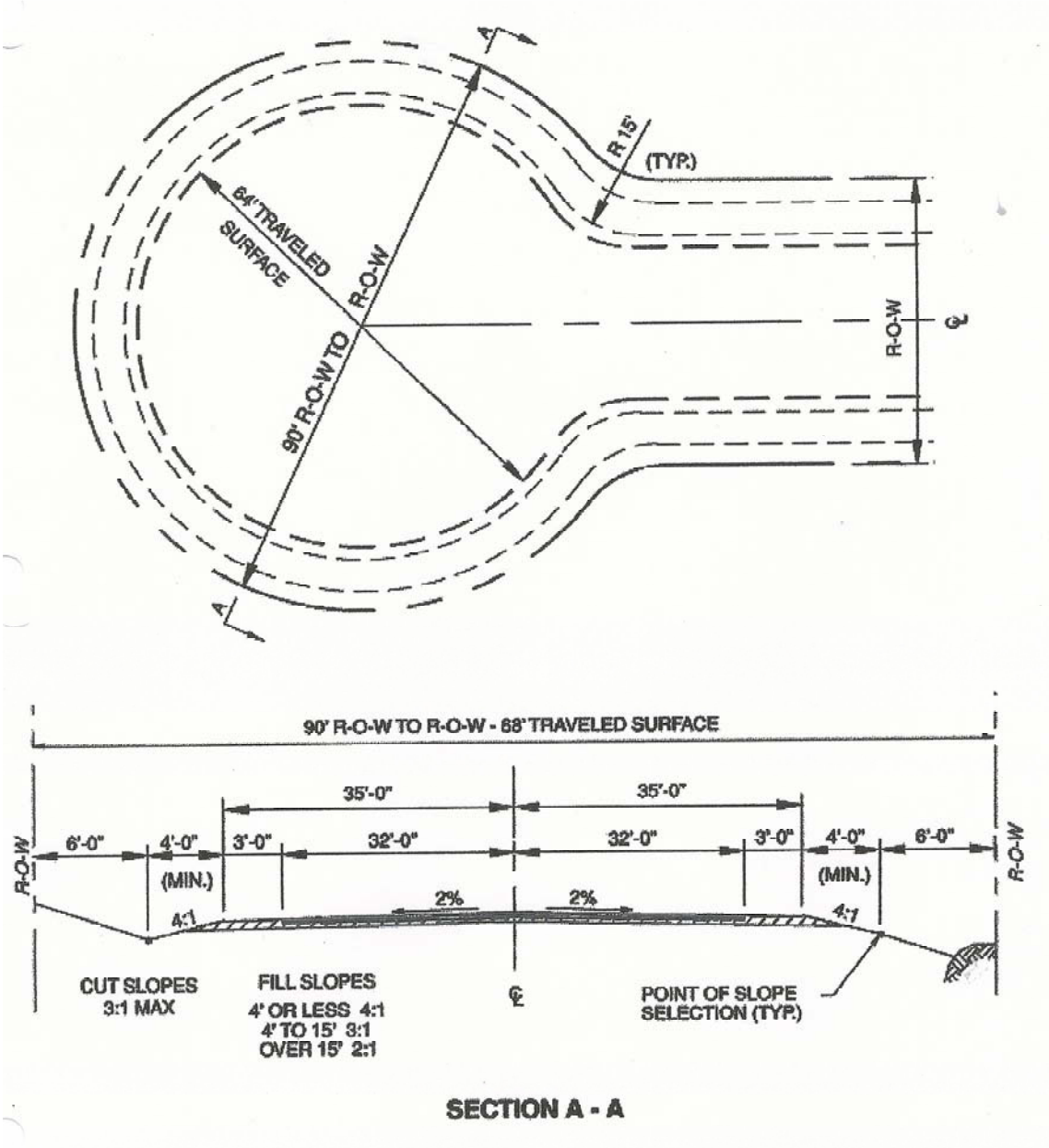
D. If the length of the driveway is less than 50’ then A and B above does not apply.

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

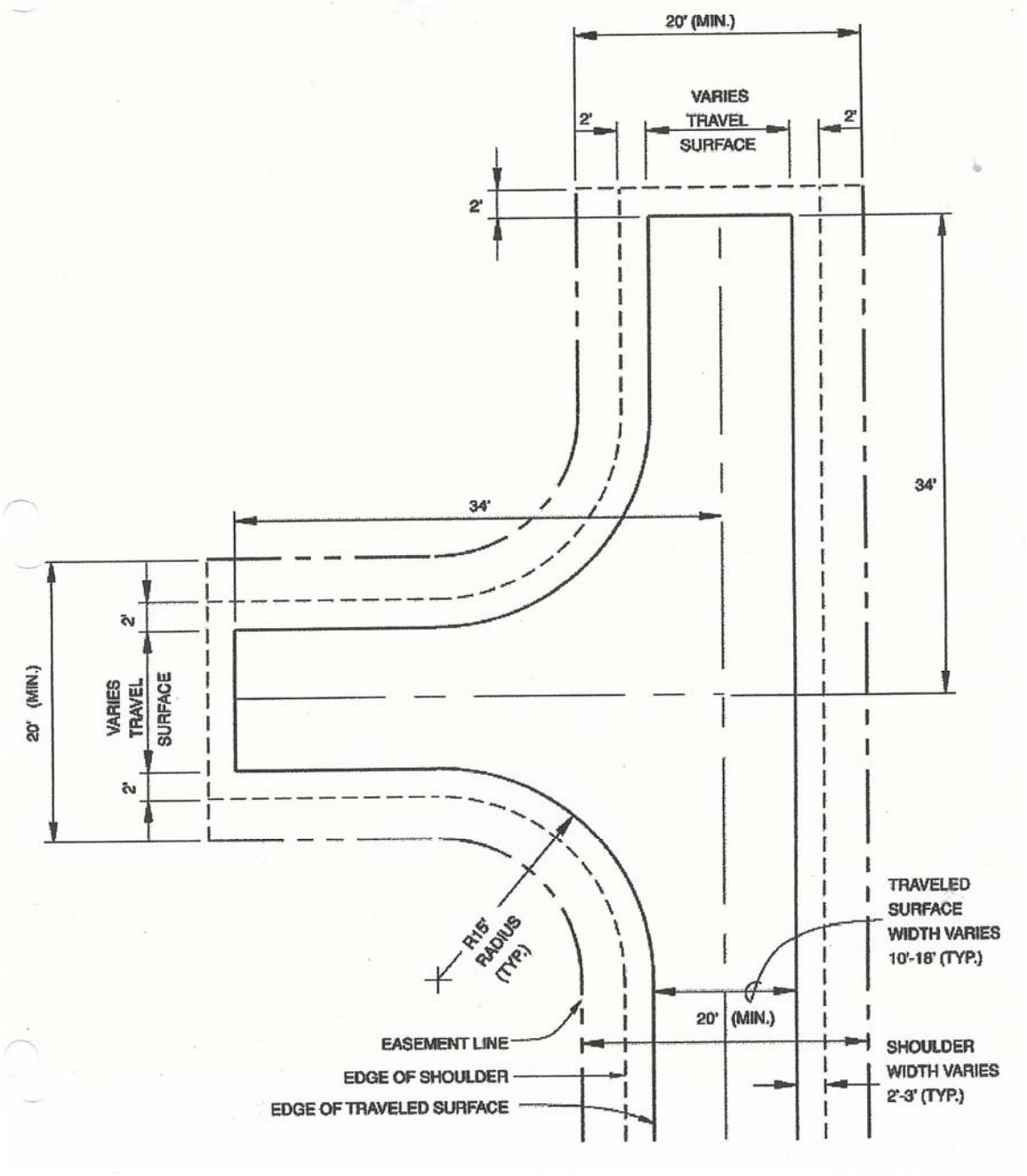
Driveway approaches and private road intersections with public roads shall meet the following:

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

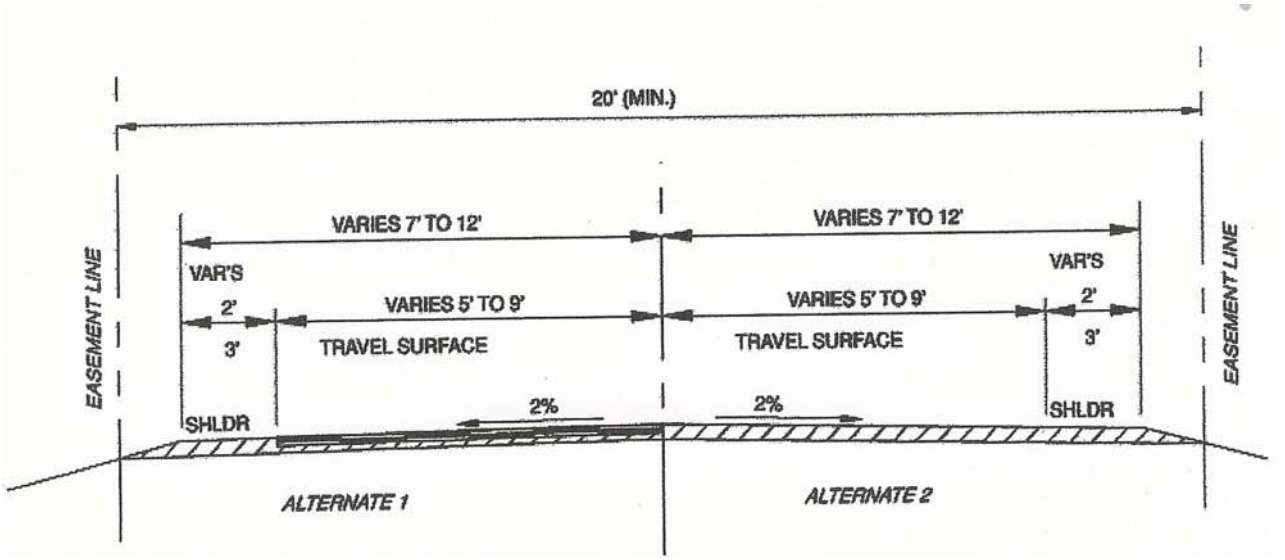
TEMPLATE 1 – Cul-de-sac



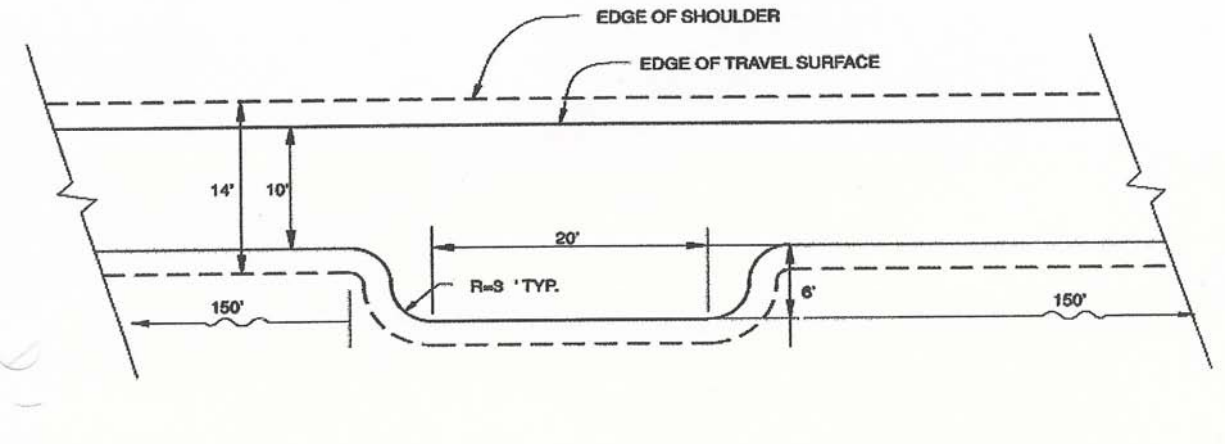
TEMPLATE 2 – Hammerhead Turnaround



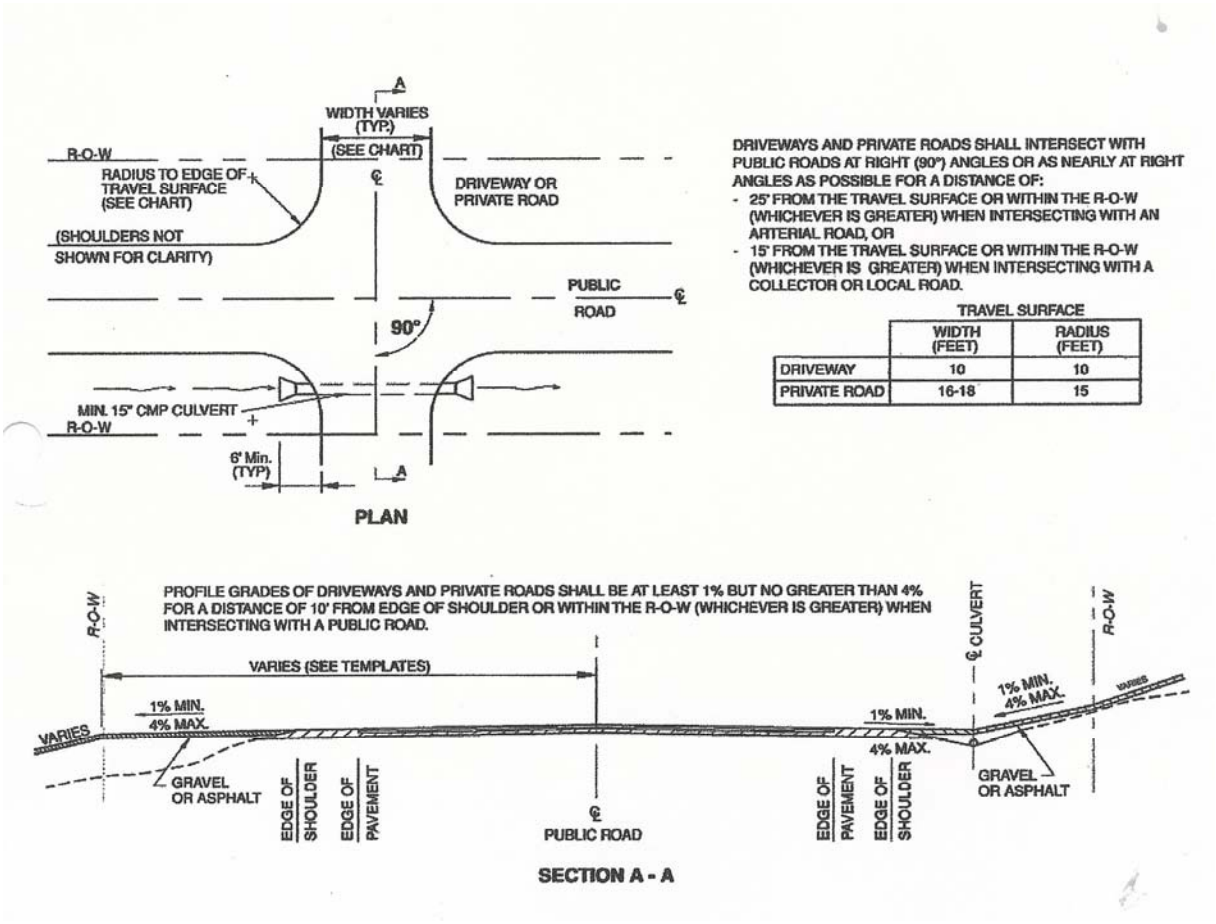
TEMPLATE 3 – Private Road



TEMPLATE 4 – Pull Out for Private Road



TEMPLATE 5 – Driveway Approaches for Roads



APPENDIX J – Definition of Terms

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Wildfire - An unwanted wildland fire.

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

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

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

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Comment: This should be 2005.