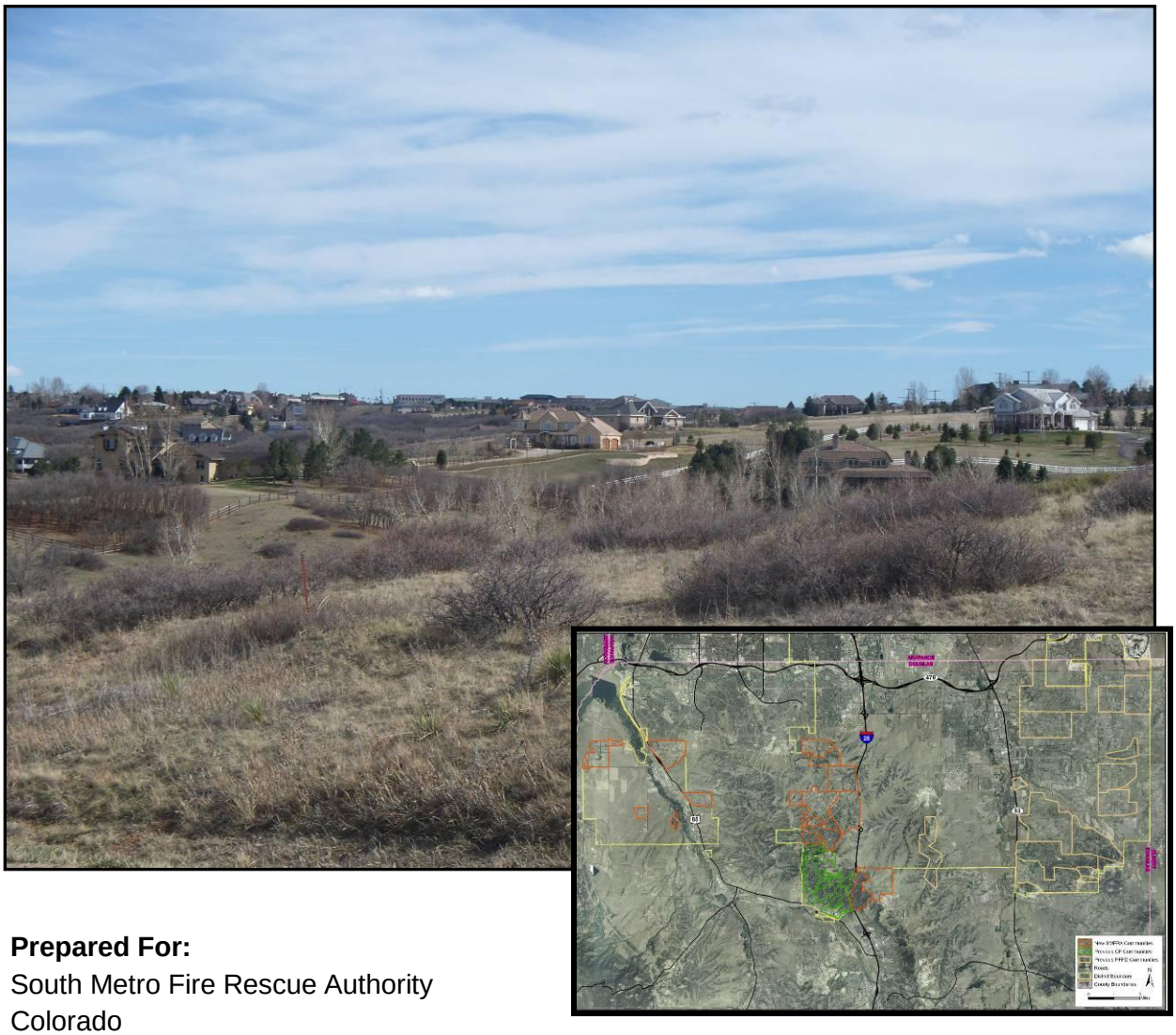
# SOUTH METRO FIRE RESCUE AUTHORITY COLORADO

## Wildland Urban Interface: Community Wildfire Protection Plan



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Colorado

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# EXECUTIVE SUMMARY

1. This document provides a comprehensive, scientifically based analysis of wildfire related hazards and risks in the Wildland-Urban Interface (WUI) areas of the South Metro Fire Rescue Authority (SMFRA) in Colorado. The analysis is delivered in the form of a Community Wildfire Protection Plan (CWPP), and strives to follow the standards for CWPPs that have been established by the Healthy Forests Restoration Act (HFRA) and the Colorado State Forest Service Minimum Standards for Community Wildfire Protection Plans (See ***Appendix F***).

2. Using the results of the analysis, recommendations have been generated that aid stakeholders in preventing and/or reducing the threat of wildfire to values in the study area. These recommendations are included throughout the report and the implementation is addressed in **Appendix D**.

3. This report complements local agreements and existing plans for wildfire protection to aid in implementing a seamless, coordinated effort in determining appropriate fire management actions in the study area.

The SMFRA CWPP is a guiding document that will facilitate the implementation of future mitigation efforts.

**This CWPP strives to meet the requirements of HFRA and the CSFS by:**

**Identifying and prioritizing fuels reduction opportunities across the landscape**

See Communities section of the main document and *Appendix D*

**Addressing structural ignitability**

See Defensible Space section in *Appendix B*

**Addressing local preparedness and firefighting capabilities**

See main document and *Appendix B*

**Collaborating with stakeholders**

See *Appendix C*

The SMFRA CWPP is the result of a area-wide fire protection planning effort that includes extensive field data, a compilation of existing documents, scientific analysis of the fire behavior potential of the study area (based on fuels, topography, and historical weather conditions), and collaboration with homeowners and officials from several agencies including Castle Pines North Metropolitan District, Colorado State Forest Service (CSFS), Douglas County Building Department, Douglas County Office of Emergency Management, Douglas County Open Space, SMFRA and various representatives from local home owners' associations.

This CWPP provides a comprehensive assessment of the wildfire hazards and risks in the study area. Its goal is to reduce hazards through increased education about wildfires, hazardous fuels reduction, and improved levels of fire suppression response. Detailed recommendations for specific actions are included herein. It is important to note that the SMFRA CWPP is a working document, and, as such, will need to be updated annually, and/or after a major "event" such as wildfire, flood, insect infestation or even significant new home development.

## Take Home Messages

The CWPP and associated appendices provide an overview of the Values at Risk on which a significant wildfire would have an impact. These areas include: life safety, homes and property values, infrastructure, recreation and lifestyle, and environmental resources.

Recommendations in the report address five broad categories, including: public education, structural ignitability/defensible space, water supply, access/evacuation, and street and home addressing. While many of the recommendations are general in nature, specific recommendations regarding landscape scale fuels treatments and evacuation routes are included in the Community Descriptions section of the report. In all, three additional evacuation routes, two landscape scale fuelbreaks, and four roadside thinning/mowing projects were recommended. Additional recommendations regarding evacuation include making roads with gates accessible during a wildfire. Recommendations in this CWPP should be brought to the local community for involved with the project to ensure that the project is valuable and viable for the area. If a community has an existing approved CWPP, these recommendations should also be followed, especially since the evaluation is conducted at a finer scale. Adding fuels reduction projects is also encouraged, especially as previous recommendations are completed.

***Because of the nature of the vegetation and topography combined with the majority of homes situated on medium sized parcels, an aggressive program of evaluating and implementing defensible space for all homes will do more to limit fire-related property damage than any other single recommendation in this report.***

# HOW TO USE THIS DOCUMENT

This plan incorporates the existing Parker Fire Protection District (PFPD) CWPP and parts of the Castle Pines Village, Happy Canyon, Hidden Village, and Pine Ridge CWPPs in an attempt to create a single resource for citizens, policy makers, and public agencies. Because of the variation in format, some differences may be noticed in the Community Assessment section of the report.

The SMFRA is a more coarse-scale document than the localized CWPPs listed above. As a result, parcel-level recommendations are not included, and not all of the communities have large fuels reduction projects recommended. Fuels reduction projects are specific to communities that are impacted by the treatment, but not the individual homeowners. This does not mean that this smaller-scale work cannot or should not be done; in fact, the opposite is true. It is recommended that a more in-depth and detailed approach be conducted and included when possible.

Because much of the information contained in the report is extensive and/or technical in nature, detailed discussions of certain elements are contained in appendices:

**Appendix A:** *Fire Behavior Potential Analysis Methodology*
*Appendix A* describes the methodology used to evaluate the threat represented by physical hazards such as fuels, weather, and topography to Values at Risk in the study area, by modeling their effects on fire behavior potential. A detailed description of each standardized, nationally recognized fuel model found in the study area is included.

**Appendix B:** *Solutions and Mitigation*

**Appendix C:** *Project Collaboration*
One of the main requirements of HFRA is to assure community participation. A summary of the collaborative process undertaken for this project are found here.

**Appendix D:** *Stakeholder input on CWPP Implementation*
In order to implement the projects outlined in the CWPP, the core stakeholder group worked together to prioritize recommendations. The details of their decisions on where to conduct work and in what order are in this appendix.

**Appendix E:** *Maps*
Many of the maps referenced in the text are displayed on the same or next page for quick viewing. Larger 11x17 fold-out maps are available in this appendix, allowing the reader to fold out these maps while reading the text to see a more detailed map.

**Appendix F:** *Colorado State Forest Service Minimum Standards for Community Wildfire Protection Plans*

While the graphics provide general information regarding the overall hazard and risk rating for specific communities, they are not adequate to describe fully the specific information that went towards forming the rating. At a minimum, it is necessary to review the individual community write-ups and recommendations near the end of the document. The rating alone may not capture the mitigation needs of the community. As an example, some communities may have a low or moderate rating, but may have a few specific areas that require attention. True understanding can only be captured by reading the accompanying text, in addition to looking at the graphics.

A CWPP is a living document; it should change based on the needs of the communities as projects are completed or additional projects are added. It is recommended that the core stakeholder group involve the communities to identify projects and implement the CWPP.

# PURPOSE

This document has the following primary purposes:

1. Provide a comprehensive, scientifically-based analysis of wildfire related hazards and risks in the WUI areas of the SMFRA.
2. Using the results of the analysis, generate recommendations designed to prevent and/or reduce the damage associated with wildfire to WUI values in the study area.
3. Create a CWPP document which conforms to the standards for CWPPs established by HFRA and also meets Colorado State Forest Service (CSFS) requirements.

# INTRODUCTION

The SMFRA CWPP is the result of a community-wide planning effort that included extensive field data gathering, compilation of existing documents and GIS data, and scientifically-based analyses and recommendations designed to reduce the threat of wildfire related damages to Values at Risk. This document incorporates new and existing information relating to wildfire which will be valuable to citizens, policy makers, and public agencies in Douglas County, Colorado. Participants in this project include SMFRA officials, homeowners, Douglas County, Colorado and the CSFS.

The assessment portion of this document estimates the hazards and risks associated with wildland fire in proximity to WUI areas. This information, in conjunction with identification of the Values at Risk, defines areas of special interest and allows for prioritization of mitigation efforts (see *Appendix D*). From the analysis of this data, solutions and mitigation recommendations are offered that will aid homeowners, land managers, and other interested parties in developing short-term and long-term planning efforts.

Wildfire hazard data is derived both from the Community Wildfire Hazard Rating system (WHR) and from the analysis of Fire Behavior Potential, which are extensive and/or technical in nature. Detailed findings and methodologies for these analyses are included in their entirety in appendices rather than the main report text. This approach is designed to make the plan more readable, while establishing a reference source for those interested in the technical elements of the SMFRA wildfire hazard and risk assessment.

*For the purposes of this report the following definitions apply:*

**Risk** is considered to be the likelihood of an ignition occurrence. This is primarily determined by the fire history of the area.

**Hazard** is the combination of the WHR ratings of the WUI neighborhoods and the analysis of Fire Behavior Potential, as modeled from the fuels, weather, and topography of the study area. Hazard attempts to quantify the severity of undesirable fire outcomes to the Values at Risk.

**Values at Risk** are the intrinsic values identified by citizens as being important to the way of life in the study area (e.g., life safety, property conservation, access to recreation, cultural sites, and wildlife habitat).

# THE NATIONAL FIRE PLAN AND THE HEALTHY FORESTS RESTORATION ACT

In 2000, more than eight million acres burned across the United States, marking one of the most devastating wildfire seasons in American history. One high-profile incident, the Cerro Grande fire at Los Alamos, NM, destroyed more than 235 structures and threatened the Department of Energy's nuclear research facility.

Two reports addressing federal wildland fire management were initiated after the 2000 fire season. The first report, prepared by a federal interagency group, was titled "Review and Update of

the 1995 Federal Wildland Fire Management Policy" (2001). This report concluded, among other points, that the condition of America's forests had continued to deteriorate.

The second report, titled "Managing the Impacts of Wildfire on Communities and the Environment: A Report to the President in Response to the Wildfires of 2000," was issued by the Bureau of Land Management (BLM) and the United States Department of Agriculture Forest Service (USFS). It became known as the National Fire Plan (NFP). This report, and the ensuing Congressional appropriations, ultimately required actions to:

- Respond to severe fires
- Reduce the impacts of fire on rural communities and the environment
- Ensure sufficient firefighting resources

Congress increased its specific appropriations to accomplish these goals. 2002 was another severe season: more than 1,200 homes were destroyed and over seven million acres burned. In response to public pressure, Congress and the Bush administration continued to designate funds specifically for actionable items such as preparedness and suppression. That same year, the Bush administration announced the Healthy Forests Initiative, which enhanced measures to restore forest and rangeland health and reduce the risk of catastrophic wildfires. In 2003, the Healthy Forests Restoration Act was signed into law.

Through this piece of legislation, Congress continues to appropriate specific funding to address five main sub-categories through the NFP: preparedness, suppression, reduction of hazardous fuels, burned-area rehabilitation, and state and local assistance to firefighters. The general concepts of the NFP blend well with the established need for community wildfire protection in the study area. The spirit of the HFRA and NFP is reflected in the SMFRA CWPP.

*This CWPP strives to meet the requirements of HFRA and the CSFS by:*

1. Identifying and prioritizing fuels reduction opportunities across the landscape
2. Addressing structural ignitability
3. Assessing community fire suppression capabilities
4. Collaborating with stakeholders

# GOALS AND OBJECTIVES

Goals for this project include the following:

1. Enhance life safety for residents and responders.
2. Mitigate undesirable fire outcomes to property and infrastructure.
3. Mitigate undesirable fire outcomes to the environment, watersheds, and quality of life.

To accomplish these goals, the following objectives have been identified:

1. Establish an approximate level of risk (the likelihood of a significant wildfire event in the study area).
2. Provide a scientific analysis of the fire behavior potential of the study area.
3. Group Values at Risk into "communities" that represent relatively similar hazard factors.

4. Identify and quantify factors that limit (mitigate) undesirable fire effects on the Values at Risk (hazard levels).
5. Recommend specific actions that will reduce hazards to the Values at Risk.

### Other Desired Outcomes

1. Promote community awareness: Quantifying the community's hazards and risk from wildfire will facilitate public awareness and assist in creating public action to mitigate the defined hazards.
2. Improve wildfire prevention through education: Community awareness, combined with education, will help to reduce the risk of unplanned human ignitions. This type of education can also limit injury, property loss, and even unnecessary death.
3. Facilitate and prioritize appropriate hazardous fuel reductions: Organizing and prioritizing hazard mitigation actions will provide stakeholders with the tools and understanding to bring these projects to ensure that they are valuable and viable for the local community.
4. Promote improved levels of response: The identification of specific community planning areas and their associated hazard and risk rating, will improve the focus and accuracy of pre-planning and facilitate the implementation of cross-boundary, multi-jurisdictional projects.

# COLLABORATION: COMMUNITY & AGENCIES

The names of the representatives involved in the development of the SMFRA CWPP are included in the **Table 1**, along with their organizations and various roles and responsibilities, both currently and in the future. This is a complete list of all the involved stakeholders. For more information on the collaborative process, see **Appendix C**, *South Metro Fire Rescue Authority CWPP Collaborative Effort*.

**Table 1. CWPP Development Team**

| Name | Organization | Roles / Responsibilities |
|---|---|---|
| Mike Dell'Orfano, Assistant Chief<br>Cheryl Poage, Program Administrator<br>Ted Christopoulos, Wildland Team Coordinator<br>Andy Lyon, Public Information Officer<br>Einar Jensen, Life Safety Educator | South Metro Fire Rescue Authority | Local information and expertise, including community values. Development of community protection priorities. Implementation of fuels treatment project areas and methods. |
| Kristin Garrison, District Forester | Colorado State Forest Service | Facilitation of planning process and approval of CWPP minimum standards. Provided expertise on forestry, fire and fuels, and Fire Wise concepts. |

| | | |
|---|---|---|
| Jill Alexander<br>Joshua Keown<br>Steve Dwyer | Douglas County Building Division | Local information and expertise, including water supplies. Implementation of fuels treatment project areas and methods. Fire behavior assessment assistance. |
| Fran Santagata, Director, Emergency Management | Douglas County Sheriff's Office | County-level oversight |
| Tom Welle | Douglas County Parks and Open Space | Provided local information and expertise regarding open space land management in Douglas County. Collaborates on cross-boundary mitigation projects. |
| A.J. Tripp-Addison | Denver Mountain Parks | Denver Mountain Parks liaison |
| Charlie Fagan | Castle Pines North Metropolitan District Parks and Open Space | Metro District liaison |
| Maureen Shul, Mayor<br>Kim Hoffman, Council Member<br>David Neely, Council Member<br>Barbara Saenger, Safety Committee | Castle Pines North | Castle Pines North liaisons |
| Gayle Scaramuzzi | Happy Canyon HOA | Happy Canyon liaison |
| Lois McCormick | Plum Valley HOA | Plum Valley liaison |
| Mark Larson | Castle Pines Village | Castle Pines liaison |
| Rod Moraga, Fire Behavior Analyst and Managing Partner<br>Kerry Malm, WUI Project Specialist<br>Mark McLean, GIS Project Manager | Anchor Point Group LLC Consultants | Development of the CWPP document. Scientific analysis of fire behavior, community hazard and risk. Development of hazard mitigation actions and priorities. Establishment of fuels treatment project areas and methods. |

# STUDY AREA OVERVIEW

The SMFRA was formed May 1, 2008 by intergovernmental agreement between South Metro Fire Rescue and the Parker Fire Protection District. It is the intent of that agreement to operate as a fire authority while working towards a full legal merger of the two fire districts. The district covers an area of approximately 176 square miles, and has more than 198,000 residents. The study area is defined by the WUI area of the authority, which includes the lands inside district boundaries west of Highway 85, south of the Arapahoe County Line (inside Douglas County), north of the Franktown FPD boundary, and west of the Rattlesnake FPD boundary.

For the purposes of this report, communities have been assessed for the hazards and risks occurring inside the WUI study area. In some areas, GIS work for this project has been extended to a project boundary beyond the WUI study area. Unless noted otherwise, rankings and descriptions of communities, as well as hazard and risk recommendations, pertain only to the portions of those areas that lie within the boundaries of the study area. While recommendations were not made outside of the study area, fire behavior and potential fire spread into the communities from these areas was considered when forming recommendations.

The study area is located within the upper elevation range of the Plains life zone (4,000'-6,000') and the lower range of the foothills life zone (6,000'-8,000'). Although it is geographically close to the eastern slope of the northern Colorado Rocky Mountains, the study area topography and vegetation share some characteristics with the mountainous areas of Colorado. The area is referred to as xeric woodlands.[1] Grasses are the dominant vegetation type with shrubs and hardwoods occurring in riparian areas, drainages and also in drier areas. Ponderosa pine (*Pinus ponderosa*) occurs as open stands growing in stringers and patches with small stands of heavier growth occurring occasionally in isolated areas, especially within the communities of Castle Pines Village, Happy Canyon, The Timbers and The Pinery. Small-diameter one-seed juniper trees (*Juniperus monosperma*) and Rocky Mountain Juniper (*Juniperus scopulorum*) are also present. A well-developed shrub layer of Gambel oak (*Quercus gambelii*), mountain mahogany (*Cercocarpus montanus*) and skunkbrush sumac (*Rhus triloba*), are common in open areas and as an understory component to the ponderosas. Gambel oak is a large shrub or small tree and is probably the best known of the mountain shrubs in Colorado. Gambel oak is extremely fire tolerant; it re-sprouts vigorously from stem bases or from underground tubers and rhizomes following fire. It can recover to original heights from a fire in 30 to 40 years. A healthy stand of Gambel oak contains shrubs of varying heights and has robust native bunchgrasses and forbs growing between them, with relatively little bare ground. Gamble oak is more commonly found south of Denver than it is to the north.

For this project, the most densely populated areas were divided into 42 communities. Each community represents certain dominant hazards from a wildfire perspective. Communities in the study area were rated for hazard, i.e., the likelihood and severity of fire outcomes (fire effects) that result in damage to people, property, and/or the environment. Although there are numerous homeowners' associations throughout the study area, the determination of communities was based more on fuels and similarities in infrastructure rather than HOA boundaries. The methodology for this assessment uses the WHR community hazard rating system that was developed specifically to evaluate communities within the WUI for their relative wildfire hazard.[2] Construc-

[1] Peet, R.K. 1978. Latitudinal variation in Southern Rocky Mountain Forests. *Journal of Biogeography.* 5, 275-289.
[2] White, B.C., "Community Wildfire Hazard Rating Form." *Wildfire Hazard Mitigation and Response Plan*. Colorado State Forest Service. 1986. Ft. Collins, CO.

tion type, condition, age, the fuel loading of the structure/contents, and position are contributing factors in making homes more susceptible to ignition.

Hazard ratings are also influenced by factors related to the likelihood of rapid fire growth and spread such as fast-burning or flashy fuel components, and topographic features contributing to channeling winds and promotion of intense fire behavior. Further, these communities are rated relative to what is customary for this type of interface (high plains grasslands with areas of a high timber component) and may bear little similarity to communities with the same rating in other areas, such as mountain/sub-alpine conifer forests or southern hardwood forests. The WHR model combines physical infrastructure such as structure density and roads, and fire behavior components like fuels and topography, with the field experience and knowledge of wildland fire experts. **Figure 1** (also in Appendix E) shows the communities that define the WUI study area. For more information on the WHR methodology, see the Community Hazard and Risk Rating section of the document.

Unlike many interface communities in the west where homes are primarily found in clusters of development, often with relatively unbroken native fuel beds separating them, South Metro has a significant number of fill-in homes and other scattered properties not related to a defined community. As a result of the nature of the area, many of these homes will have hazard levels similar to homes within evaluated communities. It will be important to prioritize parcel-level hazard surveys of these individual properties along with parcel-level surveys of the surrounding interface communities.

As a reference for the rest of this document, see **Figures 2** and **3** (also in Appendix E)**,** which show the general topography of the area. These graphic representations of the landforms within the study area (elevation and slope) will be helpful in interpreting other map products in this report.

**Figure 1. Hazard Ranking of Communities in the Study Area**

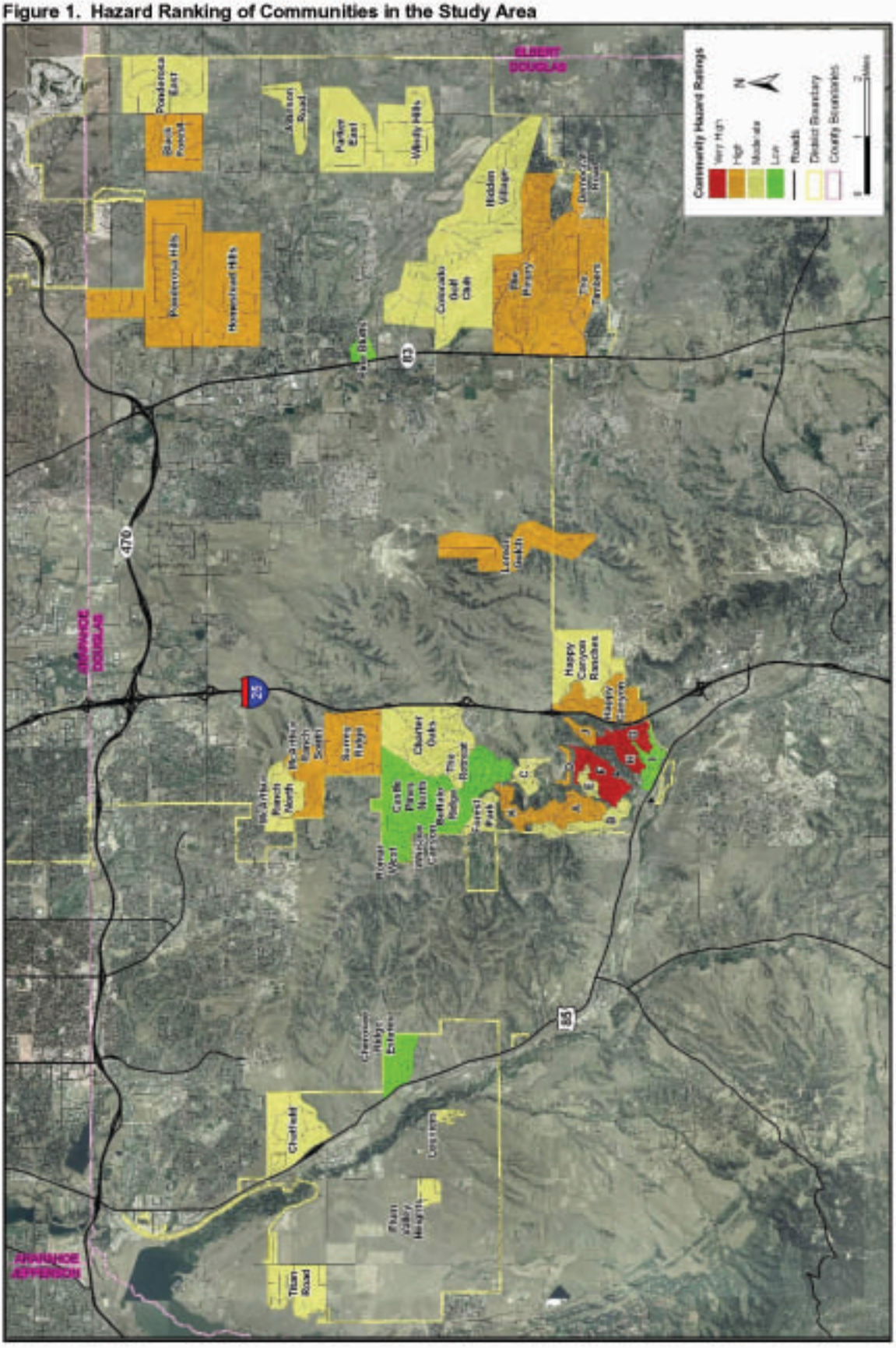


**Figure 2. Slope**

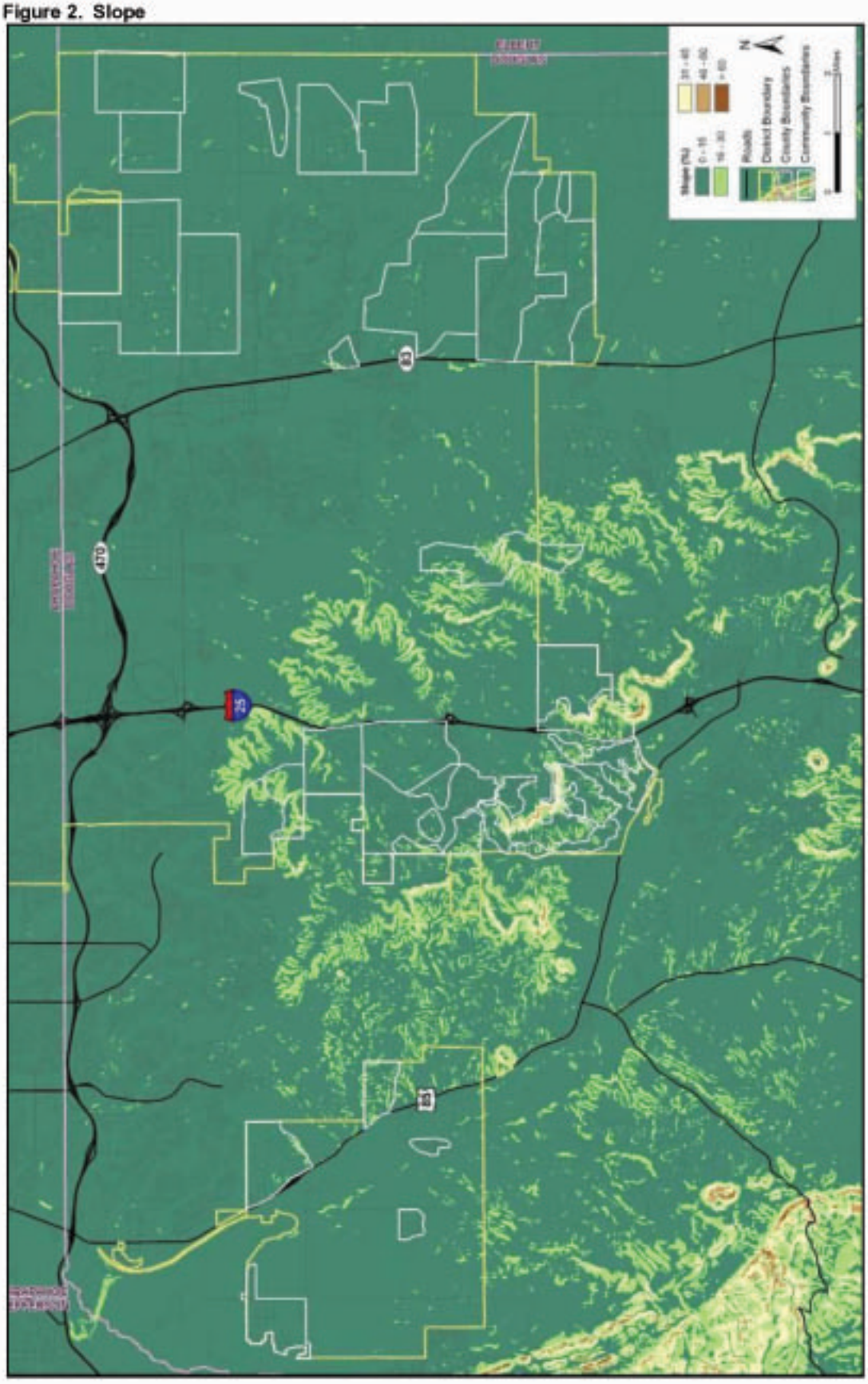
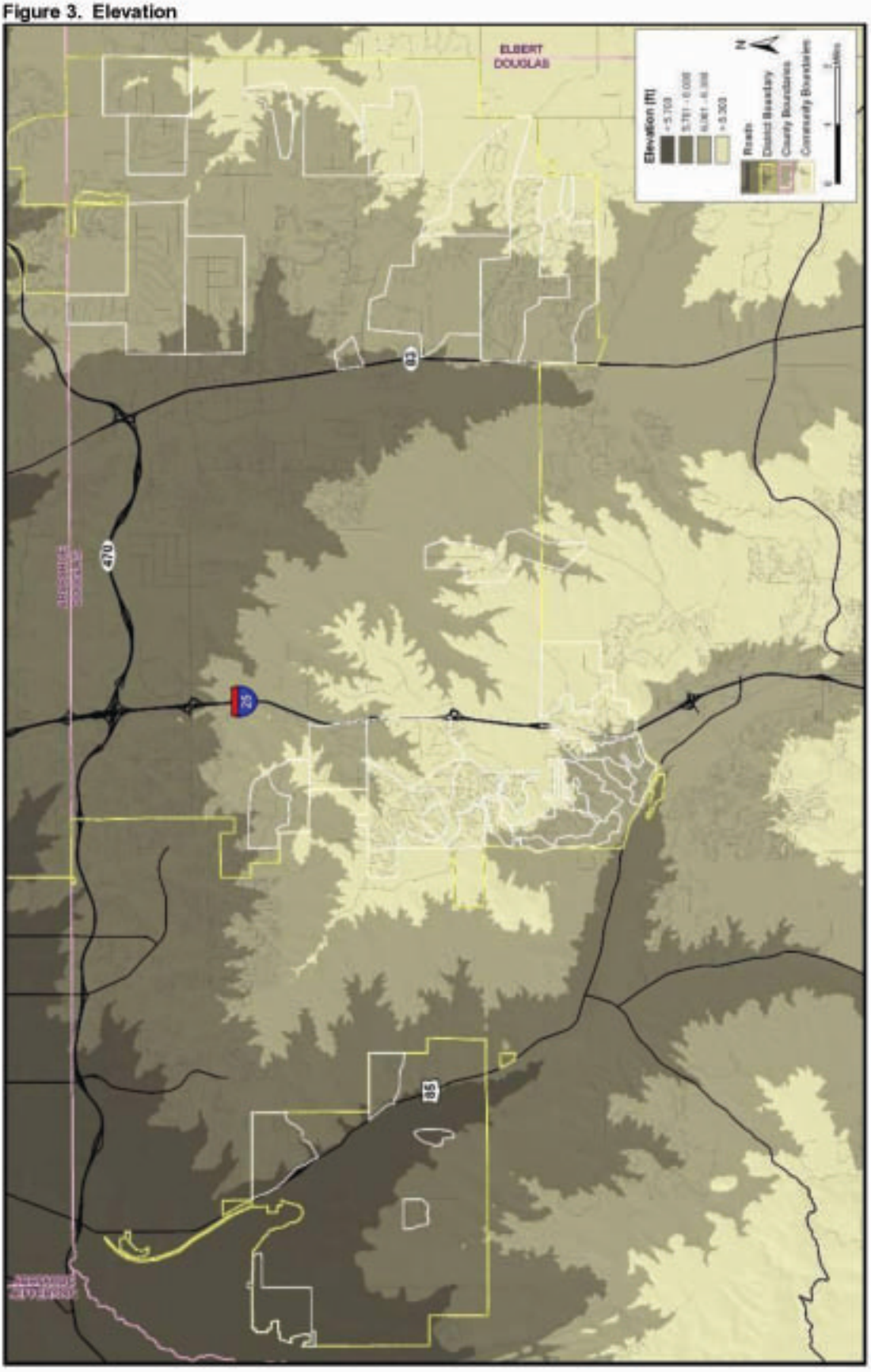


**Figure 3. Elevation**



# VALUES

## Life Safety and Homes

The hazard assessment identified 16 of the 42 communities in the study area to be very high or high hazard areas. Hazard ratings are influenced by factors related to the likelihood of rapid fire growth and spread, such as fast-burning or flashy fuel components, and topographic features contributing to channeling winds and promotion of intense fire behavior. Construction type, condition, age, the fuel loading of the structure/contents, and position are contributing factors in making homes more susceptible to ignition. It is important to remember these communities are rated relative to what is customary for this type of interface and may bear little resemblance to similarly rated communities in other geographic locations. For example, a high rating in a mountain/sub-alpine conifer forests is not comparable to a high rating for a community in a southern hardwood forest. Under extreme burning conditions, there is a likelihood of rapid increases in fire intensity and spread in these communities. These areas may also represent a serious threat to life safety, as a result of poor egress, the likelihood of heavy smoke, heat, and/or long response times.

Most of Douglas County is vulnerable to some form of natural disturbance, and wildland fire is one of the primary concerns. Recent national disaster events have focused increased attention at both local and state government levels on the need to mitigate such events where possible, and to prepare to cope with them when unavoidable.

## Commerce and Infrastructure

### Economic Values

As of 2007, retail trade was the largest of twenty major economic sectors with 16,841 jobs, which is 17.7% of all Douglas County jobs. From 2001 to 2007 retail trade employment increased by 4,262 jobs. Service industries, real estate and wholesale trade also represent large sectors of the local economy. A wildfire could cause damage to major power lines within the study area, limiting retail business from conducting business. Road closures could also prevent customers from reaching businesses. Within the study area there are several agricultural, recreation-based or other businesses that are especially sensitive to damage from wildfire, such as horse and cattle ranches, alpaca farms, and crops.

In addition to the economic impact on retail businesses and agriculture, property values are of concern. On an annual basis, Douglas County residential sales volume was 21% lower in 2007 than in 2006.[3] Combined with the current economic situation, a wildfire could further diminish property values. Quality of view-sheds, lands becoming undevelopable and decreased pasture land could all be influenced by a wildfire in the area.

[3] http://www.douglas.co.us/demographics/Population_and_Development_Report.html; referenced 07-23-09

## Critical Infrastructure

Critical utility infrastructure such as water treatment plants, electric power supply lines, substations, and natural gas lines are essential to supply residents and businesses with services that are in some cases critical to health and life safety. If these infrastructure elements are susceptible to damage from wildfire, the highest priority should be to mitigate this hazard, since the impact of damage from fire would be enormous. The portion of the study area's infrastructure whose continued functioning is critical to life safety is therefore discussed below. This is not, however, meant to constitute a comprehensive list of all the infrastructure values existing in the study area.

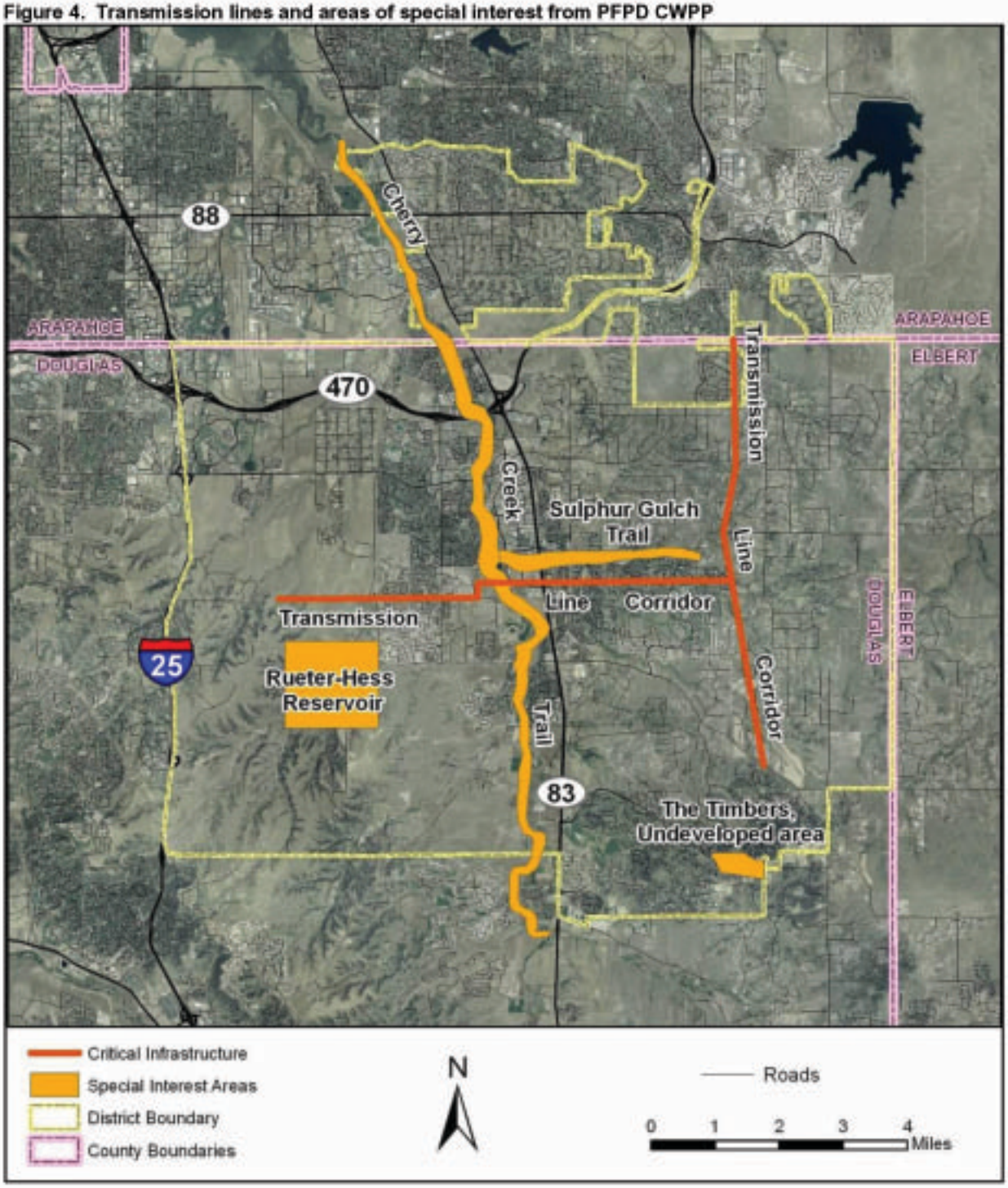
### Electric Transmission Lines

In many parts of the study area, electric power is needed to power pumps for the domestic water supply, and to provide heating and lighting. Wildfire could be a threat to the electric utility supply. The critical transmission line shown in **Figure 4**, originally identified in the PFPD CWPP, is one of the several lines necessary to maintain a reliable power supply to the study area. This transmission line is only one example of many, where, if damaged by a wildland fire, and depending on the extent of the damage, rebuilding could take several months. It needs to be determined whether a single failure point exits within the WUI. Back-up grids should be investigated if these transmission lines are lost.

In addition to the transmission line there are several natural gas metering stations and electrical sub-stations in the study area that should be evaluated individually for threat from wildfire and treated for fuels reduction as necessary.

An additional fuels treatment was recommended for a transmission line along the east boundary of the Retreat community. See the Retreat community section for full details.

**Figure 4. Transmission lines and areas of special interest from PFPD CWPP**



### Cultural Sites

The Louviers Village Club, located at 7885 Louviers Boulevard, was originally built in 1917 by E.I. du Pont de Nemours and Company. The town was established around the factory that was making dynamite, and some live components are still believed to exist. Douglas County used $658,609 in grants from the State Historical Fund to repair and restore the building to its original grandeur.[4]

Other historical sites listed with the county, state, or nationally within or close proximity of the SMFRA response area include: Daniel's Park, Hilltop School, Pretty Woman Ranch, Ruth Memorial Methodist Episcopal Church, Schweiger Ranch, and Tall Man - Newlin House. Detailed information on all of the historic preservation going on within Douglas County can be found at: http://www.douglas.co.us/historic/.

### Recreation and Life Style

Residents who live in the SMFRA district have a keen appreciation for their natural environment. Established and developing parks and open space areas have taken advantage of the natural settings in the area. Recreation and the natural beauty of the area, values that can be seriously damaged by wildfire, are frequently quoted as reasons local residents have chosen to live there.

### Rueter-Hess Reservoir

The Rueter-Hess Reservoir project is one of the largest current projects of its kind in the Western U.S. (**Figure 5**). In addition to alleviating long-term water-supply concerns for residents, the water in the reservoir will replenish the underground aquifer, and function as a reserve for better water management during times of drought.

The plans for Rueter Hess include many recreation elements such as parks, trails, fishing and non-motorized boats. While the Parker Water and Sanitation District (PWSD) may not ultimately construct all of the planned improvements, trails are a requirement of both the Federal permit and the County permit. At a minimum, the Rueter-Hess Reservoir area will have trails that connect to other regional trails.

The expansion for Rueter-Hess Reservoir has been approved, and completion of the dam is anticipated in late 2010. The expansion will add an additional 60 feet to the current dam.

[4] Noel, Thomas Jacob. "Guide to Colorado Historic Places." Colorado Historical Society, Colorado. State Historic Fund.

**Figure 5. Rueter-Hess Reservoir Project**

### Cherry Creek Trail

The Cherry Creek Trail is approximately 10 miles long, making it the most significant trail resource in the Town of Parker. It extends from the Norton Farms Open Space in the north to Stroh Ranch Park in the south. It includes a 10-foot wide concrete pedestrian/bicycle path and an adjacent unpaved equestrian trail. Over the next several years, this trail will be extended to Cherry Creek State Park to the north and to Castlewood Canyon State Park to the south.

### Sulphur Gulch Trail

The Sulfur Gulch Trail is approximately four miles long, connecting to the Cherry Creek Trail within Bar Triple C Park, and extending east with an undercrossing of Parker Road and continuing along the south side of Main Street through the Town of Parker. An 8-foot wide concrete path connects several Town parks such as Bar Triple C, O'Brien Park and Town Hall Park. Several community trails are accessible from the Sulphur Gulch Trail including Tallman Gulch Trail, located within the Rowley Downs Subdivision, and various trails located within the Canterberry Crossing community.

### High Line Canal Trail

In total, the High Line Canal Trail is 66 miles. Owned by Denver Water, there is a book, *Guide to the High Line Canal Trail* that covers the canal mile-by-mile. The canal was originally built in 1883 to provide water from the South Platte River to the eastern plains. It has been open to the public since 1970. The entire 66-mile trail does not fall within the SMFRA district, but some sections do. This trail has historical significance in addition to the recreational values it offers to residents.[5]

### Castle Pines North Metropolitan District

The Metro District owns and maintains the District's parks, trails and open space in Castle Pines North. The majority of open space in the community is owned by the Metro District. Open space corridors and recreational trails weave throughout the community. The 14 miles of trails are 8-feet wide and paved with concrete to accommodate a variety of recreational and athletic needs including in-line skating, jogging, bicycling, and families with infant strollers. Open space corridors create natural buffers and native habitat for an abundant variety of wildlife for the en-

[5] http://denver.yourhub.com/Littleton/Stories/Outdoors/Story~135449.aspx; referenced 8-06-09

joyment of nature enthusiasts. There are approximately 560 acres of open space within the Castle Pines North community, of which the CPNMD owns and maintains 351 acres.

### Golf Courses

There are over 20 golf courses within Douglas County. Several of these lay within the study area boundary, including Canterberry Golf Course, Castle Pines, the Pinery Country Club, The Ridge at Castle Pines North, and Sanctuary Golf Course. These golf courses provide world-renowned places to play and are a primary reason why many people live in the area. Damage to the courses or the vegetation surrounding the greens could have a significant impact on recreation, life style valued by the residents, and the local economy.

## Environmental Resources

Fire has the potential to cause numerous deleterious effects to environmental resources. However, fire is also a natural component of this ecosystem and cannot be excluded from the landscape without consequence.

### Watershed Concerns

There are streams and reservoirs in the study area that are augmented by watersheds outside of the study area. In the study area, Plum Creek is an example of one of the watershed concerns. The two major tributaries of Plum Creek are East and West Plum Creeks. East Plum Creek originates in Teller County. From this forested area of the watershed, East Plum Creek drains approximately 13 miles to its confluence with Carpenter Creek, which is approximately ¼ mile south of Larkspur. From there, East Plum Creek drains mostly north to northwest running parallel with the Highway 85 corridor. East Plum Creek joins West Plum Creek approximately one half mile southwest of Sedalia and forms Plum Creek, which flows northwest to Chatfield Reservoir. East Plum Creek is a major drainage way serving as the principal means of conveying runoff from southern to northern Douglas County. The contributing area of the watershed from the upper reaches of East Plum Creek to the downstream limits of the Town boundary is approximately 122 square miles. West Plum Creek originates in Douglas County south of Perry Park in the Pike National Forest. Three of its tributaries include Jackson, Stark and Gove Creeks. They weave easterly through the forest and meet above Perry Park where the tributaries become West Plum Creek.[6] The water systems and streams within the study area are not at a high risk from a wild fire event. While localized sedimentation may occur, significant erosion and dead fuel accumulation that would be expected with a large timber fire. A grass fire would not have the same impacts like hydrophobic soils, which is more common with higher intensity crown fires. As a result, the impact of wildfire on watersheds is not of great concern within the study area.

[6] http://www.douglas.co.us/water/Plum_Creek.html; referenced 8-21-09

# CURRENT RISK SITUATION

The study area is at moderate risk for WUI fires. This assessment is based on the analysis of the following factors:

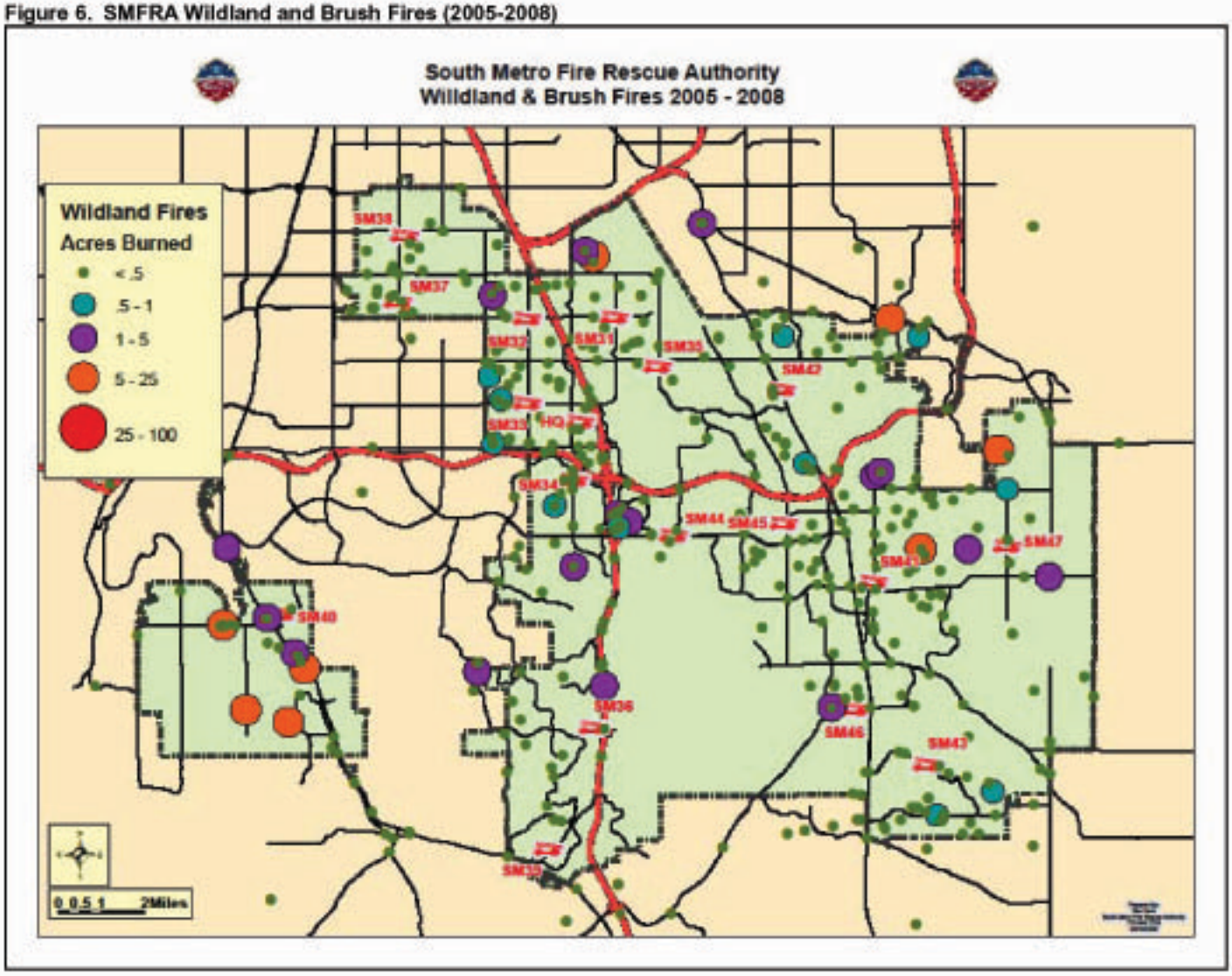
1. Parker and neighboring Franktown and Elizabeth are not listed in the Federal Register as communities at risk from wildfire.[7] However, the study area is shown in both the Douglas County and the Colorado State Forest Service WUI Hazard Assessment maps to be an area of high Hazard Value (an aggregate of Hazard, Risk and Values Layers).
2. SMFRA responded in excess to 400 wildland ignitions from 2002 to 2007. This reflects a high level of recent fire activity (approximately 80 fires per year). Although most of these fires were contained on initial attack, the high incidents of starts suggests that under severe burning conditions, there is an elevated risk of a fire occurrence that could escape initial attack. **Figure 6** provides a map of the locations of all wildland and brush fires, and their size between 2005 and 2008. Response data were provided by SMFRA, as well as the map of brush fires. Graphical representation is not available before 2005.

**It is important to note that there are multiple fire departments in Douglas County with mutual aid agreements in place. Jefferson, El Paso, Elbert, and other Front Range counties also support Douglas County with equipment and personnel through mutual aid agreements. In general, the south Denver metro area and Douglas County have a large number of well-trained resources. Ignitions in this area attract a rapid, professional response.**

3. No major fires (fires greater than 100 acres) have been reported in the study area since 2003. In the past few years, major fires have occurred in the less densely populated areas of Douglas County, including a number of large grass fires (greater than 100 acres) in the winter of 2006. The Cherokee Ranch Fire occurred on October 29, 2003. High wind speeds, high temperatures, and low relative humidity allowed the fire to grow to over 1,000 acres in one day. The fire jumped Daniel's Park Road and threatened numerous homes in Douglas County. Over 3,000 residents were evacuated.[8]
4. The nearest federal lands are located more than five miles from the study area; and because of land use, topography, fuel types, and natural and man-made barriers, the probability of a wildfire originating on federal lands and then affecting the SMFRA is very low. Therefore, no federal fire data was included in the risk analysis.

[7] http://www.forestsandrangelands.gov/resources/documents/351-358-en.pdf; referenced 7-23-09
[8] http://cms.firehouse.com/web/online/Photo-Stories/Cherokee-Ranch-Fire-in-Douglas-County--Colorado/45$21046; referenced 7-23-09

Figure 6. SMFRA Wildland and Brush Fires (2005-2008)



# PUBLIC EDUCATION

## Previous and Current Efforts

Building on the efforts of the Parker Fire Protection District (PFPD) and South Metro Fire Rescue, the personnel of South Metro Fire Rescue Authority are committed to developing and implementing comprehensive solutions to the comprehensive challenge of wildland urban interface fires. Prior to their 2008 merger, both entities had a history of addressing that risk to prevent deaths, injuries and property loss through life safety education.

PFPD, for example, responded to a string of small fires in the 1990s by developing a juvenile fire-setter intervention program and working with the Colorado State Forest Service (CSFS) to promote defensible space and consistent addressing among its residents. Working with PFPD and other local fire departments, Douglas County adopted standards largely based on NFPA 299, *Wildfire Mitigation Standard*, to address wildfire mitigation during the construction process instead of waiting until after a home was built. PFPD personnel also assisted HOAs with grant writing, sharing the costs of chippers and coordinating demonstration sites to show homeowners that defensible space can be aesthetically pleasing and cost effective.

Similarly, South Metro assisted the Happy Canyon subdivision with developing a CWPP by conducting individual home assessments and creating demonstration sites to educate homeowners about the roles defensible space has with improving ecosystem health and resident safety. A partnership with Douglas County and the CSFS resulted in community symposia that educated residents, realtors, insurance agents and other stakeholders about wildfire and its consequences.

Both agencies also committed resources for federal deployments, which provided opportunities for our personnel to learn from other communities and share those mitigation and planning ideas with our community.

Since the merger, the SMFRA is taking a broader approach, integrating the efforts of its life safety educators, water supply technicians, life safety technicians, public information officers, grant manager, wildland firefighters and other personnel. SMFRA hired a fourth life safety educator in August 2008 to coordinate that aspect of its innovative community outreach. The agency's current programs include:

- Presentations about WUI fire mitigation for HOAs and civic groups
- Information booths at community events such as Parker Country Festival, Arapahoe County Fair and Parker Family Fair
- Home ignition zone assessments that identify parcel-level mitigation strategies
- Campaigns to encourage subdivisions to identify their own fuel treatment priorities
- Strengthening partnerships with Douglas County and the CSFS to provide consistent messages
- Deploying resources for federal incidents to maintain that information sharing

Additional information about SMFRA's current mitigation programs is available at www.southmetro.org or by contacting the life safety education unit at 720-989-2271.

# HOME MITIGATION

Community responsibility for self-protection from wildfire is essential. Educating homeowners is the first step in promoting shared responsibility. Part of the educational process is defining the hazard and risks both at the community level and the individual parcel level.

Communities in the study area were rated for hazard – that is, the likelihood and severity of fire outcomes (fire effects) that result in damage to people, property, and/or the environment. The community-level assessment identified none of the communities in the study area to be at extreme or very high hazard. However, 16 of the 42 communities were rated at very high or high hazard. Construction type, condition, age, the fuel loading of the structure/contents, and position are contributing factors in making homes more susceptible to ignition. Community hazard ratings are also influenced by factors related to the likelihood of rapid fire growth and spread due to fast-burning or flashy fuel components, and other topographic features contributing to channeling winds and promotion of intense fire behavior. It is important to remember that these communities are rated relative to what is customary for this type of interface and may bear little resemblance to similarly rated communities in other areas such as mountain/sub-alpine conifer forests or southern hardwood forests.

All of the communities, especially those with high hazard ratings, should implement a parcel-level analysis as soon as possible. Unlike many interface communities in the west where homes are primarily found in clusters of development, often with relatively unbroken native fuel beds separating them, SMFRA has a significant number of fill-in homes and other scattered properties not related to a defined community. Because of the nature of the area, many of these homes most likely have hazard levels similar to homes within near-by evaluated communities. It will be important to prioritize parcel-level hazard surveys of these individual properties along with parcel-level surveys of the surrounding interface communities. See the *Community Ignitibility Analysis* section in the main report for more detailed information regarding individual community recommendations and the *Defensible Space* section of ***Appendix B*** for details on how to implement defensible space.

# LOCAL PREPAREDNESS AND FIRE DEPARTMENT CAPABILITIES

Fire suppression services for the study area are provided by SMFRA. Automatic aid is available from Cunningham, Elizabeth, Franktown, Littleton, Castle Rock, and Rattlesnake fire departments. Mutual aid agreements are in place with Aurora, Denver, West Metro, Brighton, Edgewater, Englewood, North Washington, Pleasant View, Sable-Altura, Skyline, Wheat Ridge, South Adams County, Southwest Adams County, Sheridan, West Douglas, and all other Douglas County fire agencies not otherwise listed for automatic aid. Additional resources are available through the United States Forest Service (USFS), the Colorado State Forest Service (CSFS), the State of Colorado mutual aid system, The Douglas County mutual aid system, and the Interstate mutual aid system.

All firefighters are certified to the National Wildfire Coordinating Group (NWCG) S-130/190 (basic wildland firefighter) level in SMFRA's Fire Academy and maintain currency through required annual trainings that are specific to wildland/urban interface fire fighting strategy and tactics, as

well as incident command and management strategies in compliance with federal guidelines. Additionally, the fire authority maintains a 55-member wildland fire fighting team that hold advanced NWCG wildland fire fighting qualifications in suppression and supervisory positions. These team members assist in staffing the authority's various wildland firefighting apparatus on a daily basis, and are available for call-back during major wildland fire emergencies.

SMFRA currently operates 17 fire stations, strategically located throughout the fire authority. From these 17 stations, the Authority staffs 17 engine/quint companies (two of which that have compressed air foam capability (CAFS), 7 brush trucks, 2 CAFS brushes (heavy brush trucks with compressed air foam systems), 1 CAFS water tender, and 4 water tenders, in addition to other medical and support units. These stations are well equipped with both fire suppression apparatus in additional to medical and special team units (dive, hazmat, technical rescue, aircraft rescue, and wildland). The combination of firefighter training, equipment, and apparatus form a fully prepared department, ready and able to respond to wildland fire and almost any other emergency that may occur. While the department is well-trained and equipped, grass fires can spread rapidly. It is possible that a fire could impinge upon homes and outbuildings before the department has time to respond.

# FIRE BEHAVIOR POTENTIAL

From the fire behavior potential analysis carried out as a part of this study (see ***Appendix A***), the fire behavior potential of the study area was mapped. These maps can be combined with the WHR and Values at Risk information to generate current and future areas of concern, which are useful for prioritizing mitigation actions.

**Figures 7** and **9** (also in Appendix E) show fire behavior potential maps for moderate burning conditions. They graphically display potential flame length and rate of spread generated by the fire behavior model. These maps were generated with FlamMap 3.0 fire behavior modeling software (see ***Glossary***). Weather observations for a 15 year period (1994-2009) from the Fort Carson Remote Automated Weather Station (RAWS) site were used to derive relevant wind and fuel moisture variables for inclusion in FlamMap. The moderate conditions class ($16^{th}$ to $89^{th}$ percentile) was calculated for each variable (1-hour, 10-hour, and 100-hour fuel moisture, woody fuel moisture, herbaceous fuel moisture, and wind speed) using the Fire Family Plus (see ***Glossary***) computer software package. This weather condition class most closely represents an average fire season day.

The extreme conditions maps, **Figures 8** and **10** (also in Appendix E), were calculated using $97^{th}$ percentile weather data. This means that the weather conditions of the most severe fire weather days (sorted by Spread Component) in each season for the thirteen-year period were used for this analysis. It is reasonable to assume that similar conditions may exist on at least three to five days of the fire season during an average year. In fact, during extreme years such conditions may exist for significantly longer periods. Even these calculations may be conservative compared to observed fire behavior. For a more complete discussion of the fire behavior potential methodology, see ***Appendix A***.

## Fire Behavior Modeling Limitations and Interpretation

This evaluation is a prediction of likely fire behavior, given a standardized set of conditions and a single point-source ignition in every cell (each 30 x 30 meter area). It does not consider cumulative impacts of increased fire intensity over time and space. The model does not calculate the probability that a wildfire will occur. It assumes an ignition occurrence for every cell. These calculations may be conservative (under-predict) compared to observed fire behavior.

Fine-scale fire behavior and effects are not considered in the model because the scale is too coarse. Additionally, weather conditions are extremely variable, and not all combinations are accounted for. The fire behavior prediction maps are best used for pre-planning and not as a stand-alone product for tactical planning. If this information is used for tactical planning, fire behavior calculations should be done with actual weather observations during the fire event. For greatest accuracy, the most current Energy Release Component (ERC) values should be calculated and distributed during the fire season to be used as a guideline for fire behavior potential.

## Flame Length

**Figures 7** and **8** (also in Appendix E) display the flame length predictions for the two weather scenarios. Flame length is a proxy for fire intensity. It is important to note that flame length is considered to be the entire distance from the base of the flame to the tip, irrespective of angle, and not simply the flame height above the ground. It is possible in high wind conditions to have very intense flames (high flame lengths) that are relatively close to the fuel bed.

The legend boxes display flame length in ranges that are meaningful to firefighters. Flame lengths of four feet and less are deemed low enough intensity to be suitable for direct attack by hand crews, and therefore represent the best chances of direct extinguishment and control. Flame lengths of less than eight feet are suitable for direct attack by equipment such as bulldozers and tractor plows. Flame lengths of eight to 12 feet are usually attacked by indirect methods and aircraft. In conditions where flame lengths exceed 12 feet, the most effective tactics are fuel consumption ahead of the fire by burnouts, or mechanical methods. Although indirect fire line and aerial attack are also used for fires with flame lengths of greater than 12 feet, as flame lengths increase the effectiveness of these tactics decrease and their use is generally designed to slow rates of spread and reduce fire intensity, especially in areas where Values at Risk are concentrated.

In the moderate fire weather scenario, the model predicts that fires in most of the populated portions of the WUI could be attacked directly by either hand crews or equipment. However, it is important to note there is no significant transition zone between low flame lengths and high/extreme flame lengths. In areas where shrub fuels could become the primary carrier of the fire, firefighters should expect sporadic but significant increases in flame lengths and fire line intensity, as pockets of heavier fuels are consumed. Suppression resources working in shrub fuels or shrub fuels with a timber overstory should be alert to these increases and be prepared to disengage and employ alternative tactics to direct attack.

Under the extreme fire weather scenario, high to extreme flame lengths are predicted in most of the areas where the WUI communities are found. Throughout the interface communities, the predicted flame lengths indicate that fires are likely to be too intense for direct attack by hand crews. However, hand crews would be vital for structure preparation, triage, and the construction of indirect fire line. Under extreme weather and fuel moisture conditions, the combination of high rates of spread and high fire intensity in many of the WUI communities will most likely make fire control difficult to establish and maintain.

## Rate of Spread

**Figures 9** and **10** (also in Appendix E) show the predicted rates of spread for the moderate fire weather and extreme fire weather scenarios respectively. Rates of spread (ROS) are expressed in chains/hour (CPH). A chain is a unit of measure commonly used by natural resource professionals and firefighters. It is equal to 66 feet. Therefore, one mile equals 80 chains. Rates of fire spread are influenced primarily by the wind, slope grade, fuel type/continuity, and fuel sheltering from the wind. Fire is the only force of nature that moves faster uphill than downhill. When all other factors are equal, fire moves twice as fast uphill on a slope of 30% than it does on flat terrain. In areas where high to extreme rates of spread are predicted (ROS of >40 CPH or half a mile per hour) it is possible fires could spread faster than humans can escape, creating extremely dangerous conditions for firefighters and evacuating residents. High rates of spread also make suppression efforts less effective and increase the tactical complexity of the incident.

In the moderate fire weather scenario, low to moderate rates of spread are predicted throughout the study area. However, there are pockets in all of the interface communities where higher (up to 80 CHP) rates of spread are expected resulting from the dominance of continuous grass fuels and the lack of sheltering from the wind. Even under moderate burning conditions, firefighters should expect rates of spread to increase by as much as double in unsheltered areas where there is a continuous bed of fine fuels.

In the extreme fire weather scenario, high to extreme rates of spread will be encountered in all of the communities of the study area. Under extreme burning conditions, control efforts will be more difficult, and suppression tactics will need to be implemented further ahead of the fire. During a steady westerly wind (the prevailing wind direction in the study area) fires sparked in any of the communities east of Highway 85 or between Highway 85 and the nearby communities, could burn all the way to the district boundary in less than five hours. Firefighter safety will be an important consideration in planning suppression tactics as crews and apparatus could become over run or cut off easily by these fast-moving fires.

## Crown Fire Activity

Because of the nature of fuels in the study area, predictions of crown fire were not included as part of the fire behavior model. In most of the communities there is not enough of a continuous canopy to develop or sustain crown fire runs in the fire behavior model. A limitation of FlamMap is that it cannot calculate crown fire for shrub models. The best method of determining the probability of crown fire in shrubs is to look at the flame length outputs and assume that if the flame length is greater than half the height of the plant it will likely torch and/or crown. The exception to this limitation is the undeveloped area between Castle Pines Village, Happy Canyon, Forest Park, the Pinery, and the Timbers, where there is a significant conifer canopy. Under extreme burning conditions this area could experience limited fire runs though the canopy, which could be a significant hazard to firefighters and adjacent properties. It can also be assumed that flame lengths of 12 feet or greater will torch trees. In areas where stringers or patches of trees exist there is a potential for small crown runs (group torching). Individual and group tree torching could be a significant problem for suppression resources, especially in high-density communities where torching could contribute significantly to structure damage and loss.

Shrub fuels will not technically crown, but from a practical standpoint, the shrub fuels in the study area could, under extreme burning conditions, exhibit runs that fully engulf continuous areas of plants and move across and above the canopy. This is especially true when late spring frost kills the leaves that can cause extreme fire behavior later in the summer. This phenome-

non should be considered when planning tactical operations in areas dominated by shrub fuels under extreme burning conditions. Gambel oak does not always burn readily; high temperatures, wind and low relative humidity are generally precursors to oak igniting and carrying fire. However, an oak stand that has fire spread through the oak can cause it to cure, thus increasing the potential to re-burn during a second pass of the fire. Additionally, oak acts as a ladder fuel, allowing fire to spread into the canopies of the trees above.

**Figure 7. Flame length predictions (moderate weather conditions)**

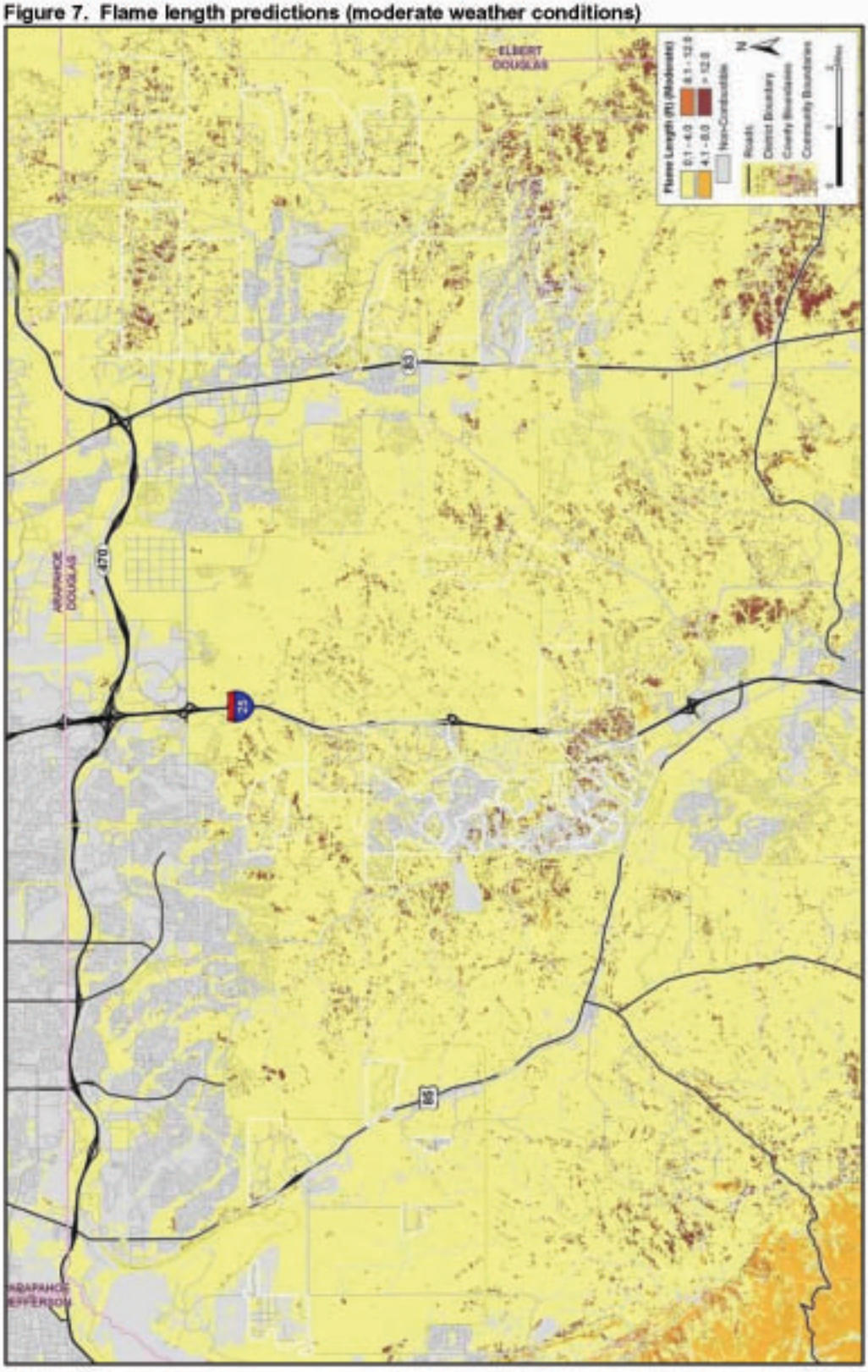


**Figure 8. Flame length predictions (extreme weather conditions)**

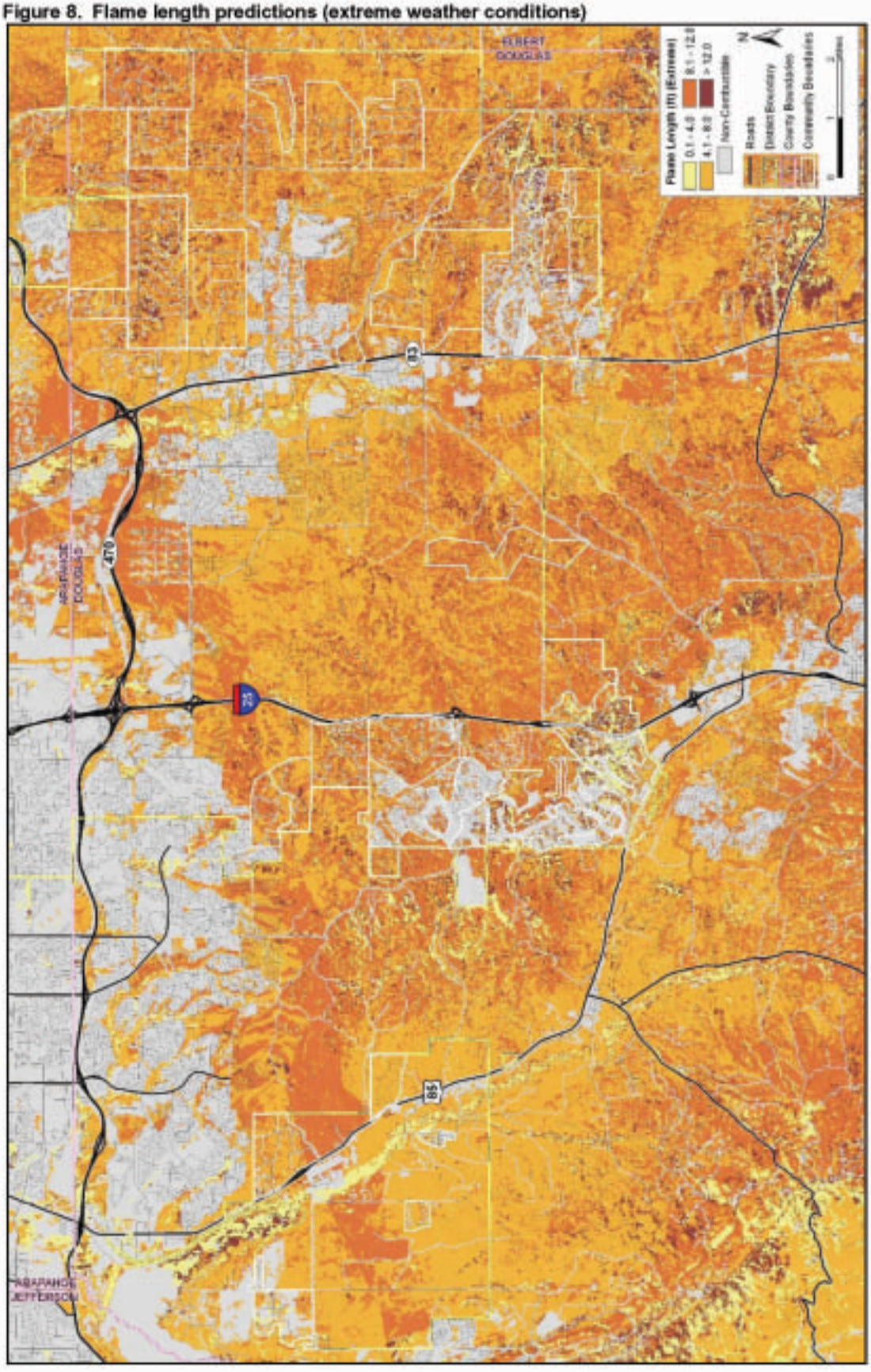


**Figure 9. Rate of spread predictions (moderate weather conditions)**

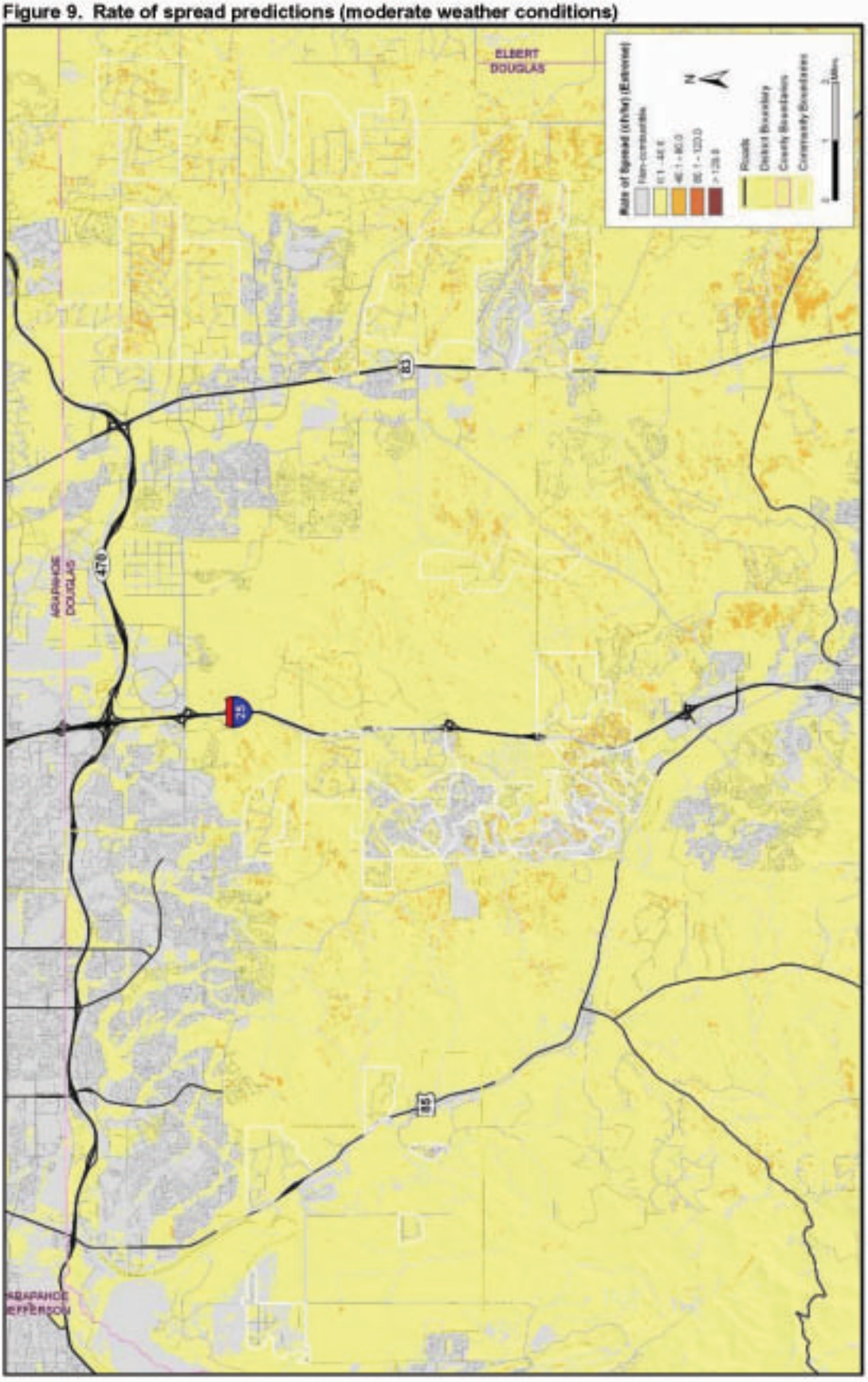
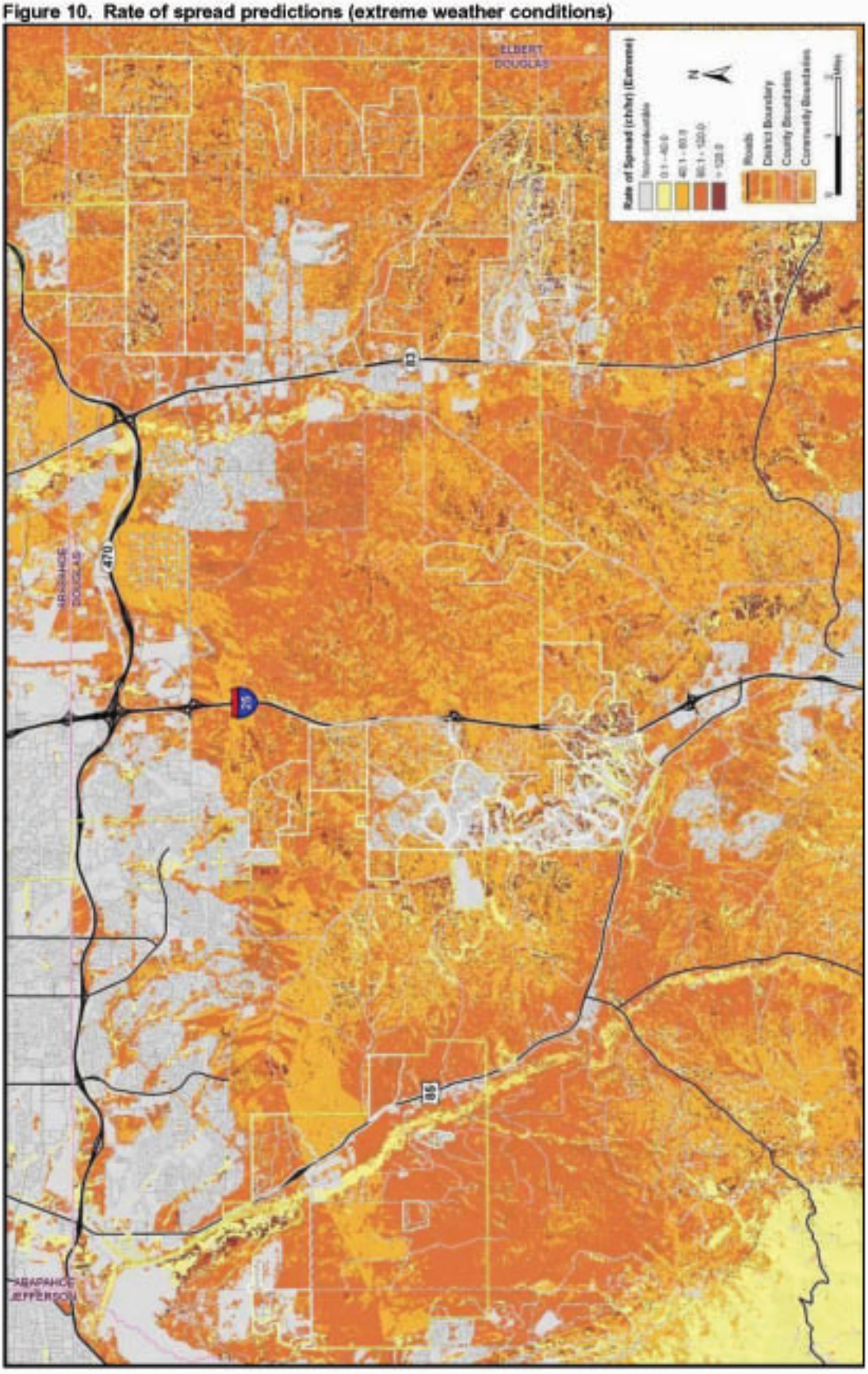


**Figure 10. Rate of spread predictions (extreme weather conditions)**



# COMMUNITY IGNITABILITY ANAYSIS AND RECOM-MENDATIONS

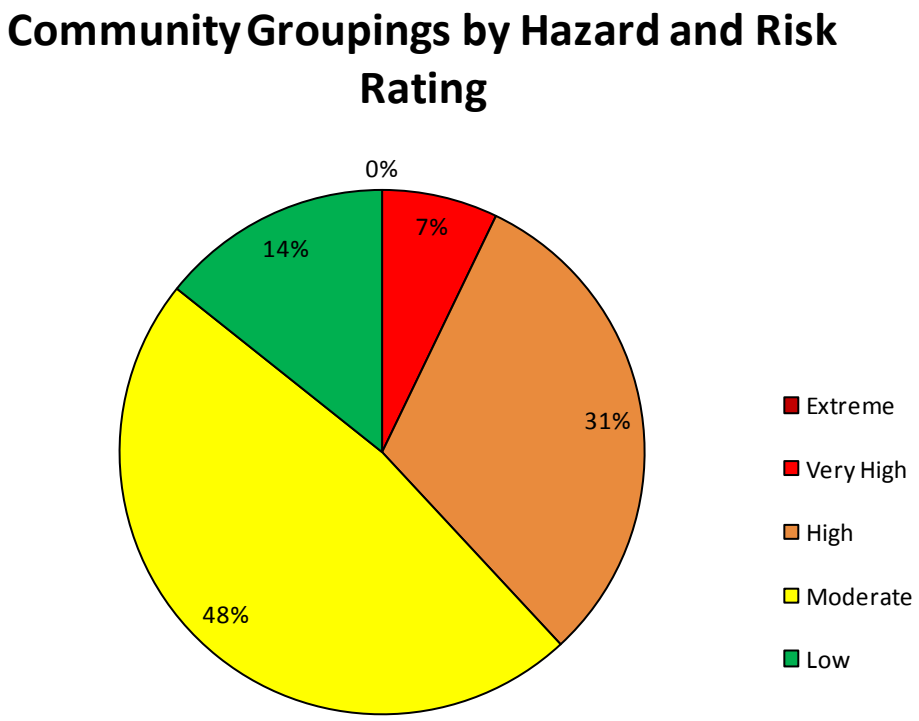
## Purpose

The purpose of this section is to examine the communities in greater detail. Of the 42 WUI communities in the SMFRA response area, none were found to represent an extreme hazard. Three were rated as very high hazard, 13 were rated as high hazard; 20 as moderate hazard; six as low hazard (**Table 2** and **Figure 11**). It is important to remember these communities are rated relative to what is customary for this specific type of interface. While adhering to proven methodology, an attempt is made to approach each community as a unique entity with its own characteristics, so that the most accurate, safe, and useful assessments possible are provided.

**Table 2. SMFRA community hazard and risk ratings**

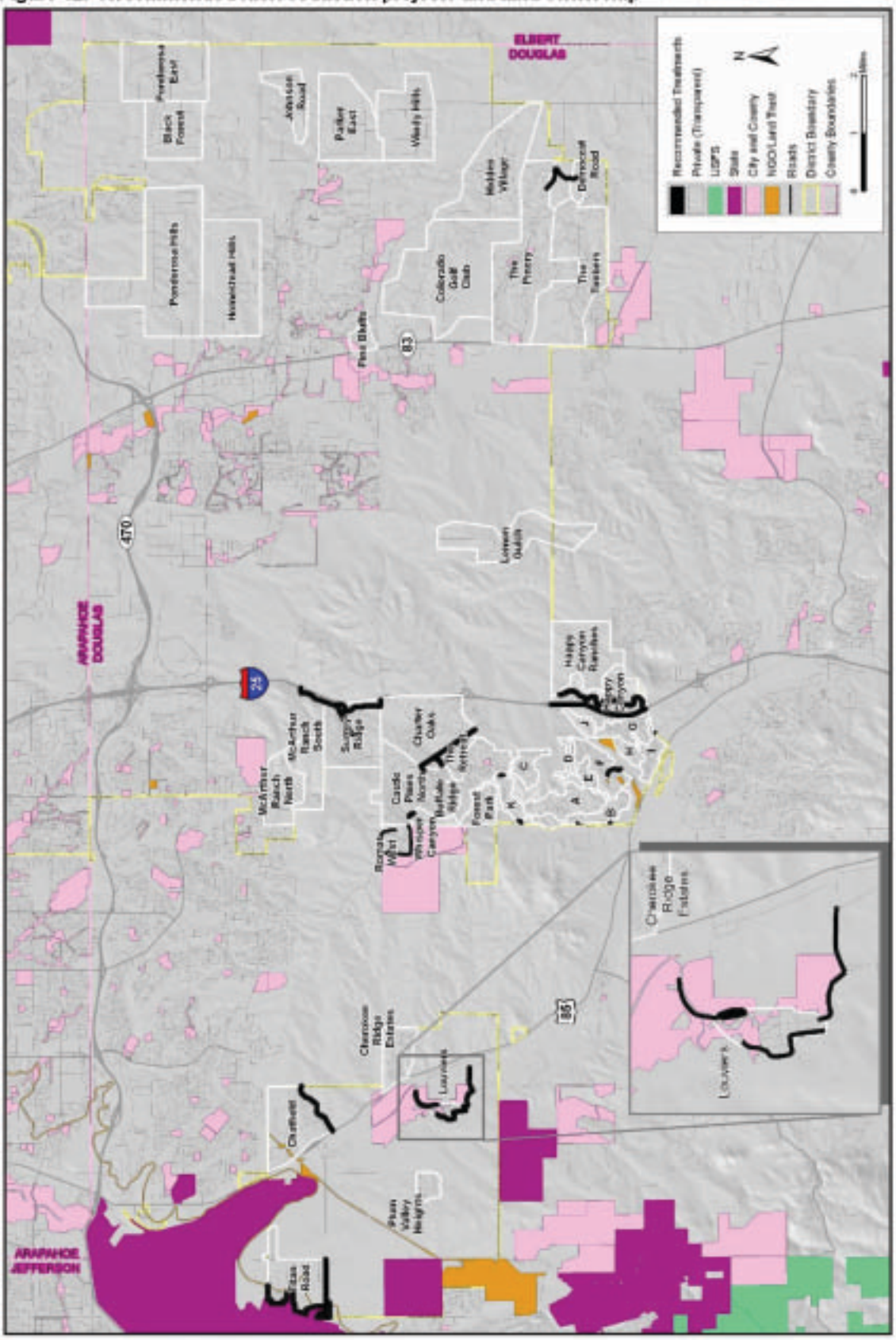
| | |
|---|---|
| CPV F – Very High | Ponderosa Hills - Moderate |
| CPV G – Very High | The Retreat – Moderate |
| CPV H – Very High | Windy Hills – Moderate |
| Homestead Hills - High | CPV B - Moderate |
| The Pinery – High | CPV C – Moderate |
| Democrat Road - High | CPV E - Moderate |
| Lemon Gulch – High | Buffalo Ridge – Moderate |
| Black Forest – High | Charter Oaks – Moderate |
| The Timbers – High | Chatfield – Moderate |
| CPV A – High | Forest Park – Moderate |
| CPV D – High | Happy Canyon Ranches – Moderate |
| CPV J – High | Louviers – Moderate |
| CPV K – High | McArthur Ranch North - Moderate |
| Happy Canyon – High | Plum Valley Heights - Moderate |
| McArthur Ranch South – High | Titan Road – Moderate |
| Surrey Ridge – High | Cherokee Ridge Estates - Low |
| Colorado Golf Club – Mod- | Castle Pines North – Low |
| Hidden Village - Moderate | Pine Bluffs – Low |
| Johnson Road - Moderate | Romar West – Low |
| Parker East – Moderate | Whisper Canyon – Low |
| Ponderosa East - Moderate | CPV I – Low |

**Figure 11. Break down of community hazard and risk ratings for the study area**




When beginning a fuels project, knowing the ownership of the land is critical in implementing the project. Being aware of the adjacent state, county, or private land that may be involved is the first step in getting a project started. If a recommended fuelbreak involves county and private land, individuals may be able to partner with the county to work on these projects. Additionally, projects near federal land may also benefit from some sort of funding. Recommendations do not take land ownership into consideration, so an ownership map is provided to guide residents and public land managers collaborate when executing projects (**Figure 12** and also in Appendix E).

**Figure 12. Recommended fuels reduction projects and land ownership**



## General Community Recommendations

A combination of adequate access, ignition-resistant construction, and fuels management will help create a safer environment for emergency service personnel and citizens, and it will provide better protection to structures in the event of a wildfire. These techniques should also significantly reduce the chances of a structure fire becoming an ignition source to the surrounding wildlands.

In addition to the suggested mitigations listed for the individual communities, several general measures can be taken to improve fire safety. The following recommendations should be noted and practiced by anyone living in the WUI:

1. Stay aware of the current fire danger in the area.

2. Clean your roof and gutters at least twice a year especially begin to cure in the autumn.

3. Stack firewood uphill or on a side contour, at least 30 feet away from structures.

4. Don't store combustibles or firewood under decks.

5. Maintain and clean spark arresters on chimneys.

6. When possible, maintain an irrigated greenbelt around the home.

7. Connect, and have available, a minimum of 50 feet of garden hose.

8. Post reflective house numbers so that they are clearly visible from the main road. Reflective numbers should also be visible on the structure itself.

9. Trees along driveways should be limbed and thinned as necessary to maintain a minimum 15' vertical and horizontal clearance for emergency vehicle access, as per Douglas County standards. This includes removing ladder fuels, which are low lying branches that allow a fire to climb from the ground into tree canopies at least 8 feet above the ground.

10. Maintain your defensible space constantly:
    - Mow grass and weeds to a low height (<6 inches).
    - Remove any branches overhanging the roof or chimney.
    - Remove all trash, debris, and cuttings from the defensible space.

**Note:** All communities regardless of hazard level were recommended for a parcel-level analysis. The information gathered by a parcel-level analysis could be used to generate a noticeable improvement in almost any community's defensibility.

## Community Assessment Methodology

The community level methodology for this assessment uses a Wildfire Hazard Rating (WHR) that was developed specifically to evaluate communities within the Wildland Urban Interface (WUI) for their relative wildfire hazard.[9] The WHR model combines physical infrastructure such as structure density and roads, and fire behavior components like fuels and topography, with the field experience and knowledge of wildland fire experts. It has been proven and refined by use in rating thousands of neighborhoods throughout the United States. Much of NFPA 1144 has been integrated into this methodology to ensure compatibility with National standards. Additionally, aspects of NFPA 1142 regarding water supply for rural and suburban firefighting are included in the assessments by looking at proximity and capacity of the water supply.

Many knowledgeable and experienced fire management professionals were queried about specific environmental and infrastructure factors, and wildfire behavior and hazards. Weightings within the model were established through these queries. The model was designed to be applicable throughout the western United States.

The model was developed from the perspective of performing structural triage, also known as prioritizing, on a threatened community in the path of an advancing wildfire with moderate fire behavior. The WHR survey and fuel model ground truthing are accomplished by field surveyors with WUI fire experience.

The rating system assigns a hazard rating based on five categories: topographic position, fuels and fire behavior, construction and infrastructure, suppression factors, and other factors, including frequent lightning, railroads, campfires, etc.

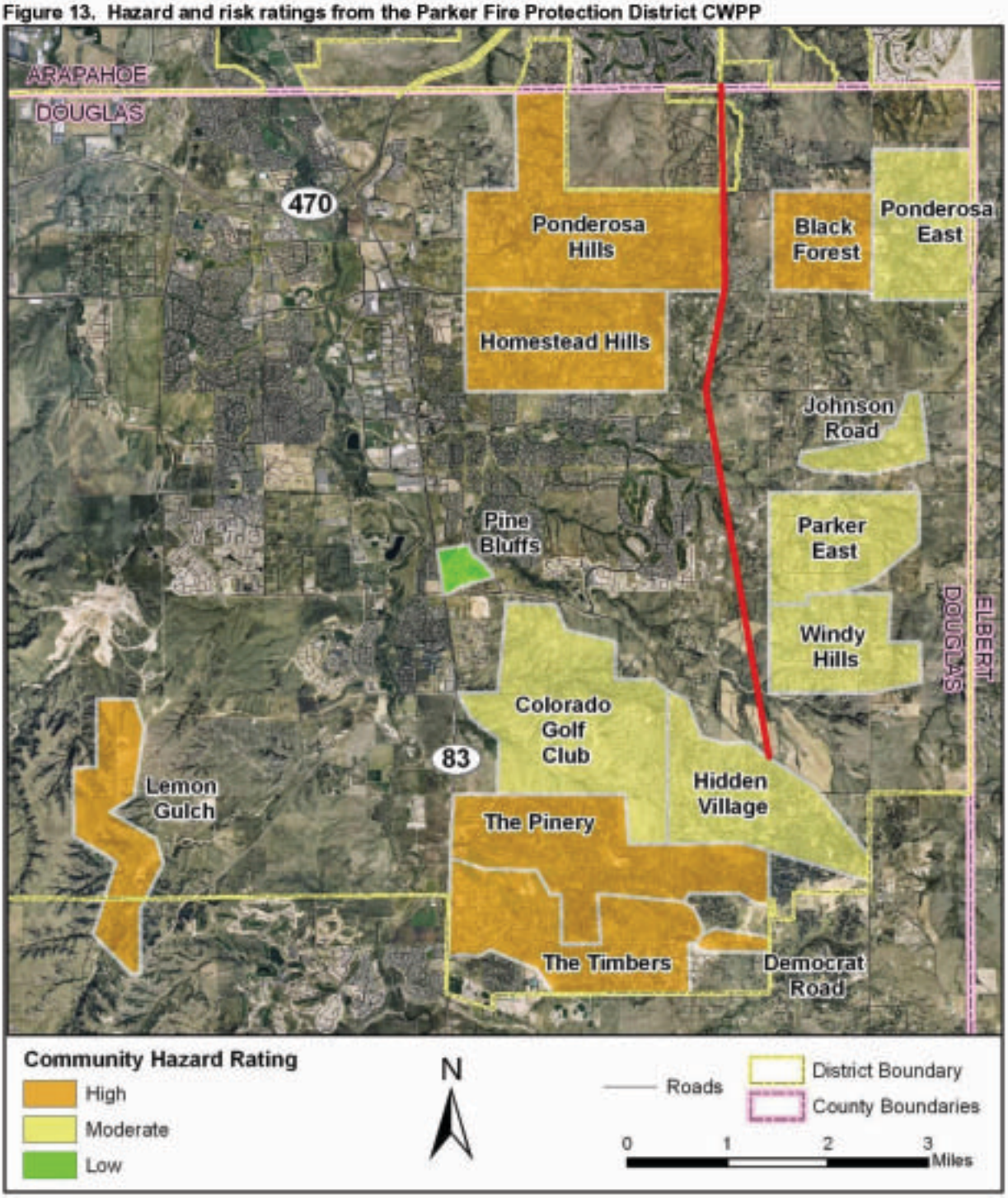
It is important to note that every hazard rating does not necessarily occur in every geographic region. There are some areas with no low hazard communities, just as there are some areas with no extreme communities. The rankings are also related to what is customary for the area. For example, a high hazard area on the plains of Kansas may not look like a high hazard area in the Sierra Nevada. The system creates a relative ranking of community hazards in relation to the other communities in the study area. It is designed to be used by experienced wildland firefighters who have a familiarity with structural triage operations and fire behavior in the interface.

[9] White, C. "Community Wildfire Hazard Rating From" *Wildfire Hazard Mitigation and Response Plan*, Colorado State Forest Service, 1986. Ft. Collins, CO.

## Communities from the Parker Fire Protection District CWPP

The hazard and risk ratings from the PFPD CWPP are presented in **Figure 13**.

**Figure 13. Hazard and risk ratings from the Parker Fire Protection District CWPP**



## The Pinery

| Hazard Rating: | High |
|---|---|
| **Does the neighborhood have dual access roads?** | Yes |
| **Are there road grades > 8%?** | No |
| **Are all access roads of adequate width?** | Yes |
| **Average lot size:** | **<**1Acre |
| **Fuel models found in the neighborhood:** | 5 |
| **Water supply:** | Hydrants |
| **Hazards:** | Ravines, inadequate water supply, wooden roofs, a hazardous undeveloped area |

**Description:** This is a large, high-density community of small to mid-size homes on small to mid-size lots. The dominant construction is older (1970s) wood siding with a mix of asphalt and wood shake roofs. Flammable decks and projections are common. There are approximately 5,000 residents in the Pinery and approximately 600-700 of the homes have only one way in and out. Few homes have any defensible space and there are many homes with flammable native and/or ornamental vegetation growing right up to the structure. Roads are the minimum county specification for width. There are dead ends and many driveways that do not have turnarounds for apparatus. Some homes do not have any address marker and of those that do, most are markers on a mailbox mounted on a wooden pole. There are hydrants and at least one good dip pond for aircraft, but there are some homes that are a long distance from the nearest hydrant. There is a golf course in the Pinery, but native fuels run through it and it would not be an effective fuelbreak. There are trails running through heavier fuel beds in drainages that could increase the possibility of ignition. There is a large undeveloped area on the south side between this community and the Timbers that has heavier timber fuels and high use. Fuels are generally moderate loads of shrubs and grasses with conifers growing in stringers and patches, many near homes. The topography is gently rolling but complicated by ravines and drainages.

**The Pinery Recommendations**

- **The Pinery to Timbers Connection**: *Priority level **High***. There are currently several rough dirt roads in the undeveloped area between the Timbers and the Pinery communities. This area has a long history of illicit recreational use and as a result has a high potential for ignitions. This area also contains one of the heaviest fuel beds in the study area. It is recommended that North Powell Road be improved southeasterly to the junction with North Ponderosa Way (**Figure 14**). Also, North Ponderosa Way should be improved southerly to East Democrat Road. This would allow for access of emergency apparatus as well as a secondary escape route for citizens of the Pinery community. It can be gated to discourage recreational motor vehicle use.
- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B*).
- Extended defensible space is recommended for homes located in dangerous topography (saddles, above natural chimneys or mid-slope on steep slopes) with jackpots of heavier fuel loads near or below the home such as ponderosa stands or heavy shrubs.
- Discourage the use of combustible materials for decks, siding, and roofs, especially where homes are upslope from fuels. Replace any shake roofs on homes and outbuildings with non-combustible types such as metal or composite shingle.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers, and kept clean of flammable materials, especially where such openings are located on slopes above fuels.
- Clean leaf litter from roofs and gutters and away from foundations.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Wherever possible, on driveways and private roads longer than 300 feet, add pullouts for emergency apparatus. Turnarounds should be constructed at the end of all driveways and dead-end roads.
- Add reflective addressing to all driveways and homes.

**Figure 14. The Pinery to the Timbers Connection**

## Homestead Hills

| Hazard Rating: | High |
|---|---|
| **Does the neighborhood have dual access roads?** | No |
| **Are there road grades > 8%?** | No |
| **Are all access roads of adequate width?** | No |
| **Average lot size:** | 1-5 Acres |
| **Fuel models found in the neighborhood:** | 1, 5 |
| **Water supply:** | None |
| **Hazards:** | Ravines, inadequate roads, power lines, single access, wooden roofs |

**Description:** This is a large community of primarily small to mid-size homes on mid-size lots. There are some newer homes in this community, but the dominant construction type is older wood siding with asphalt or shake roofs. Many properties have flammable decks projections and/or outbuildings. Most homes do not have conforming defensible space and several have ornamental and native conifers too close to the structure. Flammable yard clutter is a hazard at some homes. Most homes do not have address markers and those that do are usually mail box markers on a wooden pole. Access is mostly on good dirt roads, but there are some long, narrow driveways and very few pullouts or turnarounds for large apparatus. There is only one way in and out of Homestead Hills. There are many horse properties, so animal evacuation may be an issue for fire fighters. There is no water for fire suppression. The primary fuels are grasses with scattered patches of shrubs and ponderosa pine. Riparian shrubs and hardwoods also grow in stringers along drainage bottoms. The topography varies from flat to rolling hills.

**Homestead Hills Recommendations**

- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B*).
- Extended defensible space is recommended for homes located in dangerous topography (saddles, above natural chimneys or mid-slope on steep slopes) with jackpots of heavier fuel loads near or below the home such as ponderosa stands or heavy shrubs.
- Discourage the use of combustible materials for decks, siding and roofs, especially where homes are upslope from pockets of heavier fuels. Replace any shake roofs on homes and outbuildings with non-combustible types such as metal or composite shingle.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers, and kept clean of flammable materials.
- Clean leaf and needle litter from roofs and gutters and away from foundations. Clear flammable vegetation away from power lines near homes. Clear weeds and flammable vegetation to at least 30 feet away from propane tanks.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Wherever possible, on driveways and private roads longer than 300 feet, add pullouts for emergency apparatus. Turnarounds should be constructed at the end of all driveways and dead-end roads.
- Add reflective addressing to all driveways and homes.
- Evaluate the water supply in the area to either improve existing hydrants, establish a stored watery supply, and how to use firefighting resources most effectively.

## Ponderosa Hills

| Hazard Rating: | High |
|---|---|
| **Does the neighborhood have dual access roads?** | Yes |
| **Are there road grades > 8%?** | No |
| **Are all access roads of adequate width?** | No |
| **Average lot size:** | 1- 5 Acres |
| **Fuel models found in the neighborhood:** | 1, 5, 2, 6 |
| **Water supply:** | None |
| **Hazards:** | Ravines, inadequate roads, no water supply, power lines, wooden roofs |

**Description:** Most of the homes in this community are mid-size, built on mid-size lots. This community is very much like Homestead Hills. There is a mix of older and newer construction, but wood siding with asphalt roofs is dominant. Flammable decks and projections are common and there are some wooden shake roofs in this community. Many homes do not have conforming defensible space and several have ornamental and native conifers too close to the structure. Some homes do not have address markers and those that do are usually mail box markers. Access is mostly on good dirt roads, but there are some long narrow driveways with none or inadequate turnarounds for large apparatus. There is no water for fire suppression. There are overhead power lines that may present a hazard to firefighters. Also, a major transmission line runs through this community. The primary fuels are light to moderate loads of grasses and open stands of ponderosa pines with a grass understory. Riparian shrubs also grow in stringers along drainage bottoms. The topography is generally flat.

**Ponderosa Hills Recommendations**

- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B*).
- Replace any shake roofs on homes and outbuildings with non-combustible types such as metal or composite shingle.
- Discourage the use of combustible materials for decks, siding and roofs, especially where homes are upslope from heavy fuels. Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers and kept clean of flammable materials, especially where such openings are located on slopes above heavy fuels.
- Flammable wooden fencing should be replaced with a noncombustible type under eaves and anywhere fencing is attached directly to wooden siding on homes.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Clear vegetation away from flammable outbuildings and mow grasses within 15 feet.
- Clean leaf and needle litter from roofs and gutters and away from foundations. Clear flammable vegetation away from power lines near homes.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Evaluate the water supply in the area to either improve existing hydrants, establish a stored watery supply, and how to use firefighting resources most effectively.
- Add reflective addressing to all driveways and homes.

## Democrat Road

| | |
|---|---|
| **Hazard Rating:** | **High** |
| **Does the neighborhood have dual access roads?** | Yes |
| **Are there road grades > 8%?** | No |
| **Are all access roads of adequate width?** | No |
| **Average lot size:** | >5 Acres |
| **Fuel models found in the neighborhood:** | 1, 2, 5 |
| **Water supply:** | None |
| **Hazards:** | Inadequate roads, ravines, no water supply, gasoline tanks, other man-made hazards |

**Description:** This is a small community on the north side of Democrat Road east of the Timbers. Homes are large to mid-size, on large lots. Most of the homes are located on a poorly marked common driveway running north from Democrat Road. The dominant construction type is older wood siding construction with asphalt roofs. Some homes have cluttered yards and flammable decks, projections and/or outbuildings. There are some gated properties. There are no defensible spaces and most homes have vegetation growing right up to the structure. Some homes do not have address markers and some only have mailbox markers or wooden signs on trees or posts. Most of the homes are located on narrow dirt driveways and private roads with few, if any, pullouts or turnarounds for apparatus. There is no water for fire suppression in this community. There are overhead power lines, gasoline tanks, and propane tanks, all of which may be present hazards to firefighters. Livestock evacuation may be an issue. Fuels are moderate loads of ponderosa pine with grass and shrubs in the understory. This community also has a moderate to heavy load of ladder fuels, primarily conifer regeneration. The topography is mostly flat, but complicated by drainages and small rolling hills.

**Democrat Road Recommendations**

- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B*).
- Extended defensible space is recommended for homes located above drainages or any other dangerous topographic feature with heavy fuel loads near or below the home.
- Discourage the use of combustible materials for decks, siding and roofs, especially where homes are upslope from heavy fuels.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers and kept clean of flammable materials, especially where such openings are located on slopes above heavy fuels.
- Clean leaf and needle litter from roofs and gutters and away from foundations. Mow grasses away from homes and outbuildings for at least 30 feet. Clear flammable vegetation away from power lines near homes. Clear weeds and flammable vegetation to at least 30 feet away from propane tanks or other hazardous materials storage, such as gasoline tanks.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Clear vegetation away from flammable outbuildings and mow grasses within 15 feet.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Wherever possible, on driveways and private roads longer than 300 feet, add pullouts for emergency apparatus. Turnarounds should be constructed at the end of all driveways and dead-end roads.
- Evaluate the water supply in the area to either improve existing hydrants, establish a stored watery supply, and how to use firefighting resources most effectively.
- A marker should be placed at the entrance to the community driveway. This marker should be reflective and have all of the addresses located on the driveway. Additional markers should be used to indicate every place where the driveway divides and an individual driveway leaves the community driveway.
- Add reflective addressing to all driveways and homes.

## Lemon Gulch

| Hazard Rating: | High |
|---|---|
| **Does the neighborhood have dual access roads?** | No |
| **Are there road grades > 8%?** | No |
| **Are all access roads of adequate width?** | No |
| **Average lot size:** | >5 Acres |
| **Fuel models found in the neighborhood:** | 5, 1, 2 |
| **Water supply:** | Tender shuttle from one hydrant at the pump house |
| **Hazards:** | Ravines, steep slopes, not all have adequate access roads for the FD, inadequate water supply, single access |

**Description:** This is a large community of large to mid-size homes on large lots. There is a mix of new and older homes, but the dominant construction is wood or masonry siding with asphalt roofs. Some of the homes with wood siding have rock wainscoting, but flammable decks and projections are common in this community. There are lots still available and development is on-going. Few homes have any defensible space and there are many homes with flammable native and/or ornamental vegetation growing right up to the structure. Most roads are paved with adequate width, but there are some long, narrow dirt driveways. There are dead ends and many driveways that do not have turnarounds for apparatus. Some homes do not have any address marker and of those that do, most are markers on a mail box or mounted on a wooden pole or fence. The only water supply is from a single pumped hydrant whose location would limit its use to the refilling of water tenders. There are a number of gated properties and horse properties. Animal evacuation may be an issue for fire fighters. Fuels are generally moderate loads of shrubs, primarily oak brush and mountain mahogany, and grasses with conifers growing in stringers and patches. The topography is moderately steep and complicated by ravines and drainages.

**Lemon Gulch Recommendations**

- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B*).
- Extended defensible space is recommended for homes located in dangerous topography (saddles, above natural chimneys, mid-slope on steep slopes or summits) with heavy fuel loads near or below the home.
- Discourage the use of combustible materials for decks, siding and roofs, especially where homes are upslope from heavy fuels.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers and kept clean of flammable materials, especially where such openings are located on slopes above heavy fuels.
- Clean leaf and needle litter from roofs and gutters, and away from foundations.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Wherever possible, on driveways and private roads longer than 300 feet, add pullouts for emergency apparatus. Turnarounds should be constructed at the end of long driveways and dead-end roads.
- Evaluate the water supply in the area to either improve existing hydrants, establish a stored watery supply, and how to use firefighting resources most effectively.
- Add reflective addressing to all driveways and homes.

## Black Forest

| Hazard Rating: | High |
|---|---|
| **Does the neighborhood have dual access roads?** | Yes |
| **Are there road grades > 8%?** | No |
| **Are all access roads of adequate width?** | No |
| **Average lot size:** | 1-5 Acres |
| **Fuel models found in the neighborhood:** | 1, 5, 2 |
| **Water supply:** | None |
| **Hazards:** | Ravines, dirt roads, no water supply, power lines, propane tanks |

**Description:** The Black Forest Community is similar in character to Homestead Hills. Homes are small to mid-size, built on small to mid-size lots. Most are older wood siding construction with an asphalt roof. Flammable decks and projections are common. Most homes do not have conforming defensible space and several have ornamental and native conifers too close to the structure. Flammable yard clutter is a hazard at some homes. Most homes do not have address markers and those that do are usually mail box markers. Access is mostly on good dirt roads, but there are some long, narrow driveways and few pullouts or turnarounds for large apparatus. There are many horse properties; animal evacuation may be an issue for fire fighters. There is no water for fire suppression. There are overhead power lines and propane tanks, which may present a hazard to firefighters. The primary fuels are grasses with scattered patches of shrubs and ponderosa pine. Riparian shrubs and hardwoods also grow in stringers along drainage bottoms. The topography varies from flat to rolling hills.

**Black Forest Recommendations**

- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B*).
- Extended defensible space is recommended for homes located in dangerous topography (saddles, above natural chimneys or mid-slope on steep slopes) with jackpots of heavier fuel loads near or below the home such as ponderosa stands or heavy shrubs.
- Discourage the use of combustible materials for decks, siding and roofs, especially where homes are upslope from heavy fuels.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers, and should be kept clean of flammable materials, especially where such openings are located on slopes above heavy fuels.
- Clean leaf and needle litter from roofs and gutters and away from foundations. Clear flammable vegetation away from power lines near homes. Clear weeds and flammable vegetation to at least 30 feet away from propane tanks.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Turnarounds should be constructed at the end of long driveways and dead-end roads.
- Evaluate the water supply in the area to either improve existing hydrants, establish a stored watery supply, and how to use firefighting resources most effectively.
- Add reflective addressing to all driveways and homes.

## The Timbers

| Hazard Rating: | High |
|---|---|
| **Does the neighborhood have dual access roads?** | Yes |
| **Are there road grades > 8%?** | No |
| **Are all access roads of adequate width?** | Yes |
| **Average lot size:** | 1-5 Acres |
| **Fuel models found in the neighborhood:** | 1, 5, 2 |
| **Water supply:** | Hydrants |
| **Hazards:** | Ravines, a hazardous undeveloped area |

**Description:** This is a community of large to mid-size homes on small to mid-size lots. The dominant construction is newer (most homes built in the last seven years) wood siding, some with rock wainscoting, with ignition-resistant roofs. There are some homes with ignition-resistant siding and roofing materials, but flammable decks and projections are common even on these. Few homes have any defensible space and there are many homes with flammable native and/or ornamental vegetation growing right up to the structure. Roads are generally good, but there are dead ends and many driveways that do not have turnarounds for apparatus. Addressing is inconsistent and most homes are not marked at the street. For many homes the only address marker visible from the street is a mail box marker. There is a good hydrant network in the Timbers. There is a large undeveloped area on the north side between this community and the Pinery that has heavier timber fuels and high use. Fuels are generally heavier than most of the communities in the study area, consisting or moderate to heavy loads of open canopy ponderosa pine with grasses and shrubs in the understory. There are also moderate to heavy shrub fuels growing in the drainages. The conifer fuel beds are broken by meadows and landscaping. The topography is gently rolling but complicated by ravines and drainages.

**The Timbers Recommendations**

- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B*).
- Extended defensible space is recommended for homes located in dangerous topography (saddles, above natural chimneys or mid-slope on steep slopes) with jackpots of heavier fuel loads near or below the home such as ponderosa stands or heavy shrubs.
- Discourage the use of combustible materials for decks, siding and roofs, especially where homes are upslope from heavy fuels.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers and kept clean of flammable materials, especially where such openings are located on slopes above heavy fuels.
- Clean leaf and needle litter from roofs and gutters and away from foundations.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Turnarounds should be constructed at the end of long driveways and dead-end roads.
- Add reflective addressing to all driveways and homes.

## Colorado Golf Club

| Hazard Rating: | Moderate |
|---|---|
| **Does the neighborhood have dual access roads?** | Yes |
| **Are there road grades > 8%?** | No |
| **Are all access roads of adequate width?** | Yes |
| **Average lot size:** | 1-5 Acres |
| **Fuel models found in the neighborhood:** | 1, 2, 5 |
| **Water supply:** | Hydrants |
| **Hazards:** | Ravines |

**Description:** This is a community of approximately 15-20 large to mid-size homes on mid-size lots and approximately undeveloped 135 platted lots. Most of the construction is newer, with ignition-resistant roofs and some with ignition-resistant siding. Many homes do not have defensible space and many of the native ponderosa pines have been relocated too close to homes. Some homes do not have address markers, but monument style markers are planned for all homes. There is dual access to this community, but both access roads are gated. Roads are generally good in this community with good turnarounds for apparatus. There is a good hydrant network. Fuels are heavier than most of the other communities in the study area, consisting primarily of ponderosa pine with a grass or shrub understory broken by meadows. Although there are two golf courses, native vegetation is interspersed, and the fairways do not offer a continuous fuelbreak. The topography consists of rolling hills (some of which are steep) cut by ravines.

**Colorado Gulf Club Recommendations**

- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B*).
- Extended defensible space is recommended for homes located in dangerous topography (saddles, above natural chimneys or mid-slope on steep slopes) with jackpots of heavier fuels near or below the home such as ponderosa stands or heavy shrubs.
- Discourage the use of combustible materials for decks, siding and roofs, especially where homes are upslope from heavy fuels.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers and kept clean of flammable materials, especially where such openings are located on slopes above heavy fuels.
- Clean leaf and needle litter from roofs and gutters and away from foundations.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Wherever possible, on driveways and private roads longer than 300 feet, add pullouts for emergency apparatus. Turnarounds should be constructed at the end of all driveways and dead-end roads if they do not exist already.
- Add reflective address markers to all homes and driveways.

## Hidden Village

| Hazard Rating: | Moderate |
|---|---|
| **Does the neighborhood have dual access roads?** | Yes |
| **Are there road grades > 8%?** | No |
| **Are all access roads of adequate width?** | No |
| **Average lot size:** | >5 Acres |
| **Fuel models found in the neighborhood:** | 5, 1, 2, 6, 9 |
| **Water supply:** | None |
| **Hazards:** | Ravines, wooden roofs, no water supply |

**Description:** This is a community of approximately 100 mid-size to large homes on large lots. Although there are some newer ignition-resistant homes, most of the homes are older wood siding construction. Asphalt and other ignition-resistant roof types are dominant, but there are a few wooden shake roofs in this community. There are few conforming defensible spaces and many homes have flammable native and/or ornamental vegetation growing too close to the structure. Flammable decks and projections are present on some homes and flammable yard clutter is a hazard at some. Roads are generally adequate, but there are some long, narrow driveways. Some mitigation work has been done on the conifer regeneration lining some of the access roads. This work will need to be evaluated and maintained on an annual basis to be effective. Some homes do not have address markers, and those that do are generally not reflective and inconsistent in type and placement. Street markers at most of the intersections are wooden and non-reflective. There is no water for fire suppression in this community. There are several horse properties; animal evacuation may be an issue for fire fighters. There are overhead power lines that may present a hazard to fire fighters. This community has a history of frequent lightening strikes. Fuels consist primarily of light to moderate loads or grasses, shrubs and conifers with a grass understory. The topography varies from flat to rolling hills cut occasionally by ravines.

**Hidden Village Recommendations**

- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B*).
- Extended defensible space is recommended for homes located in dangerous topography (saddles, above natural chimneys, mid-slope on steep slopes or summits) with heavy fuel loads near or below the home.
- Replace any shake roofs on homes and outbuildings with non-combustible types such as metal or composite shingle.
- Discourage the use of combustible materials for decks, siding and roofs, especially where homes are upslope from heavy fuels.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers and kept clean of flammable materials, especially where such openings are located on slopes above heavy fuels.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Clear vegetation away from flammable outbuildings and mow grasses within 15 feet.
- Clean leaf and needle litter from roofs and gutters and away from foundations. Clear flammable vegetation away from power lines near homes. Clear weeds and flammable vegetation to at least 30 feet away from propane tanks.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Evaluate and maintain the limbing and thinning of conifer fuels along the access roads that has already been done and evaluate access roads and driveways for additional treatment.
- Evaluate the water supply in the area to either improve existing hydrants, establish a stored watery supply, and how to use firefighting resources most effectively.
- Wherever possible on driveways and private roads longer than 300 feet, add pullouts for emergency apparatus. Turnarounds should be constructed at the end of all driveways and dead-end roads.
- Replace or supplement wooden street markers with non-combustible, reflective markers.
- Add reflective addressing to all driveways and homes.

As of 2008, Hidden Village has an approved CWPP for the community. In additional to the recommendations made above, the CWPP has more detailed, finer-scale projects proposed. The CWPP breaks the community into 11 different fuel compartments. In addition to addressing road right of ways and defensible space, page 48 of the CWPP gives specific recommendations for the fuel compartments. These projects should continue to be implemented as funding becomes available.

## Windy Hills

| Hazard Rating: | Moderate |
|---|---|
| **Does the neighborhood have dual access roads?** | No |
| **Are there road grades > 8%?** | No |
| **Are all access roads of adequate width?** | No |
| **Average lot size:** | >5 Acres |
| **Fuel models found in the neighborhood:** | 1, 5, 2 |
| **Water supply:** | None |
| **Hazards:** | Ravines, inadequate roads, no water supply, single access, power lines, propane tanks |

**Description:** Windy Hills is a low-density community of mid-size homes on large lots. Most of the homes are older wood siding construction with asphalt roofs, some with flammable decks and projections. Many homes do not have conforming defensible space and some have ornamental and native conifers too close to the structure. In most cases, however, all that is needed to create defensible space is to mow around the structure, out to a distance of 30 feet. Flammable yard clutter is a hazard on some properties. Addressing is poor and confusing. There are a few reflective address markers but most of the existing address markers are on mailboxes, and some of these occur in clusters, making it difficult to tell which home the box belongs to. Most of the street signs are non-reflective wooden markers on wooden poles. Roads are dirt, but generally good and of adequate width. However, this community is one way in and out with loops and dead ends. This community is a long way from the nearest SMFRA station and the first response would most likely be from Elizabeth FD Station 3. There are overhead power lines that may present a hazard to fire fighters. There is no water for fire suppression in this community, but there is a good cistern with an electric pump nearby in the Rattlesnake Fire Protection District. There are several horse properties; animal evacuation may be an issue for fire fighters. Fuels are light to moderate loads of grasses and shrubs with widely-scattered patches of ponderosa pine. The topography is gently rolling hills cut by some ravines.

**Windy Hills Recommendations**

- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B*).
- Extended defensible space is recommended for homes located in dangerous topography (saddles, above natural chimneys, mid-slope on steep slopes or summits) with jackpots of heavier fuels near or below the home.
- Discourage the use of combustible materials for decks, siding and roofs, especially where homes are upslope from heavy fuels.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers and kept clean of flammable materials, especially where such openings are located on slopes above heavy fuels.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Clear vegetation away from flammable outbuildings and mow grasses within 15 feet.
- Clean leaf and needle litter from roofs and gutters and away from foundations. Clear flammable vegetation away from power lines near homes.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Evaluate the water supply in the area to either improve existing hydrants, establish a stored watery supply, and how to use firefighting resources most effectively.
- Wherever possible on driveways and private roads longer than 300 feet, add pullouts for emergency apparatus. Turnarounds should be constructed at the end of all driveways and dead-end roads.
- Replace or supplement wooden street markers with non-combustible, reflective markers.
- Add reflective addressing to all driveways and homes.

## Johnson Road

| Hazard Rating: | Moderate |
|---|---|
| **Does the neighborhood have dual access roads?** | No |
| **Are there road grades > 8%?** | No |
| **Are all access roads of adequate width?** | Yes |
| **Average lot size:** | >5 Acres |
| **Fuel models found in the neighborhood:** | 1, 2, 5 |
| **Water supply:** | None |
| **Hazards:** | Ravines, no water supply, single access, power lines, propane tanks |

**Description:** Johnson Road is a low-density community of mid-size to large homes on large lots. Although the are some newer homes constructed with ignition-resistant siding and roofs, most of the homes are older wood siding construction with asphalt roofs, and some have flammable decks, projections and/or outbuildings. Some homes do not have conforming defensible space, and some have ornamental and native conifers too close to the structure. In most cases, however, all that is needed to create defensible space is to mow around the structure, out to a distance of 30 feet. Flammable yard clutter is a hazard at some homes. Addressing is poor and confusing. Although this area is known locally as Johnson Road, the homes have East Parker Road addresses and the address numbers do not follow the county system. There are some homes with no address marker and others with only a mail box marker or a wooden marker (some homemade) mounted to a wooden pole or fence. None of the existing markers are reflective. Roads are dirt and are rough and narrow in spots. There are few pullouts or turnarounds for apparatus. This community is one way in and out. There are overhead power lines that may present a hazard to fire fighters. There is no water for fire suppression in this community. There are several horse properties; animal evacuation may be an issue for fire fighters. Fuels are light loads of grasses with widely-scattered patches of shrubs and ponderosa pine. The topography is flat to gently rolling hills cut by some ravines.

**Johnson Road Recommendations**

- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B*).
- Discourage the use of combustible materials for decks, siding and roofs, especially where homes are upslope from heavy fuels.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers, and kept clean of flammable materials, especially where such openings are located on slopes above heavy fuels.
- Clean leaf and needle litter from roofs and gutters and away from foundations.
- Clear vegetation away from flammable outbuildings and mow grasses within 15 feet.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Evaluate the water supply in the area to either improve existing hydrants, establish a stored watery supply, and how to use firefighting resources most effectively.
- Wherever possible on driveways and private roads longer than 300 feet, add pullouts for emergency apparatus. Turnarounds should be constructed at the end of all driveways and dead-end roads.
- Work with Douglas County to create an address system for this community that conforms to the County standard.
- Add reflective addressing to all driveways and homes.

## Parker East

| Hazard Rating: | Moderate |
|---|---|
| **Does the neighborhood have dual access roads?** | No |
| **Are there road grades > 8%?** | No |
| **Are all access roads of adequate width?** | No |
| **Average lot size:** | >5 Acres |
| **Fuel models found in the neighborhood:** | 1, 5, 2 |
| **Water supply:** | None |
| **Hazards:** | Ravines, inadequate roads, no water supply, power lines, wooden roofs |

**Description:** Parker East is located north of Windy Hills, but the two communities do not connect. Like Windy Hills, Parker East is a community of mid-size homes on large lots. Most of the homes are older wood siding construction with asphalt roofs and some with flammable decks, projections and/or outbuildings. There are some homes with wooden roofs. Many homes do not have conforming defensible space and some have ornamental and native conifers too close to the structure, however in most cases all that would be needed to create defensible space is mowing for 30 feet from the structure. Flammable yard clutter is a hazard at some homes. Addressing is poor or missing for most properties and most of the address markers that are present are on mailboxes. Roads are dirt, but generally good and of adequate width; however there are some long narrow driveways. There are overhead power lines that may present a hazard to fire fighters. There is no water for fire suppression in this community, but there is a good cistern with an electric pump nearby in the Rattlesnake Fire Protection District. There are several horse properties; animal evacuation may be an issue for fire fighters. Fuels are light loads of grasses with scattered patches of ponderosa pine. Shrubs also grow in small stringers and patches primarily in drainages. The topography is gently rolling hills cut by some ravines.

**Parker East Recommendations**

- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B*).
- Replace any shake roofs on homes and outbuildings with non-combustible types such as metal or composite shingle.
- Discourage the use of combustible materials for decks, siding and roofs, especially where homes are upslope from heavy fuels.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers and kept clean of flammable materials, especially where such openings are located on slopes above jackpots of heavy fuels.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes; never downhill.
- Clear vegetation away from flammable outbuildings and mow grasses within 15 feet.
- Clean leaf and needle litter from roofs and gutters and away from foundations. Clear flammable vegetation away from power lines near homes.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Evaluate the water supply in the area to either improve existing hydrants, establish a stored watery supply, and how to use firefighting resources most effectively.
- Wherever possible on driveways and private roads longer than 300 feet, add pullouts for emergency apparatus. Turnarounds should be constructed at the end of all driveways and dead-end roads.
- Replace or supplement wooden street markers with non-combustible, reflective markers.
- Add reflective addressing to all driveways and homes.

## Ponderosa East

| Hazard Rating: | Moderate |
|---|---|
| **Does the neighborhood have dual access roads?** | Yes |
| **Are there road grades > 8%?** | No |
| **Are all access roads of adequate width?** | Yes |
| **Average lot size:** | > 5 Acres |
| **Fuel models found in the neighborhood:** | 5, 1, 2, 6 |
| **Water supply:** | None |
| **Hazards:** | Ravines, no water supply, power lines and wooden roofs |

**Description:** Although located next to the Black Forest community Ponderosa East is a low density community, more like Parker East. Homes are large to mid-size on large lots. Most of the homes are older wood siding construction with asphalt roofs and some with flammable decks, projections and/or outbuildings. Many homes do not have conforming defensible space and several have ornamental and native conifers too close to the structure. In most cases, however, all that is needed to create defensible space is to mow around the structure, out to a distance of 30 feet. Flammable yard clutter is a hazard at some homes. Addressing is poor or missing for most properties and most of the existing address markers are on mailboxes. Roads are dirt, but generally good and of adequate width, although there are some long, narrow driveways. There are overhead power lines that may present a hazard to fire fighters. There is no water for fire suppression in this community. There are several horse properties; animal evacuation may be an issue for fire fighters. Fuels are light to moderate loads of grasses and shrubs with patches of ponderosa pine. Conifer stands are heavier and more frequent here than in Parker East or Windy Hills. Shrubs also grow in small stringers and patches primarily in drainages. The topography is gently rolling hills cut by some ravines.

**Ponderosa East Recommendations**

- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in the report for details).
- Discourage the use of combustible materials for decks, siding and roofs, especially where homes are upslope from heavy fuels.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers and kept clean of flammable materials, especially where such openings are located on slopes above jackpots of heavy fuels.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes; never downhill.
- Clear vegetation away from flammable outbuildings and mow grasses within 15 feet.
- Clean leaf and needle litter from roofs and gutters and away from foundations. Clear flammable vegetation away from power lines near homes.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Evaluate the water supply in the area to either improve existing hydrants, establish a stored watery supply, and how to use firefighting resources most effectively.
- Wherever possible on driveways and private roads longer than 300 feet, add pullouts for emergency apparatus. Turnarounds should be constructed at the end of all driveways and dead-end roads.
- Add reflective addressing to all driveways and homes.

## Pine Bluffs

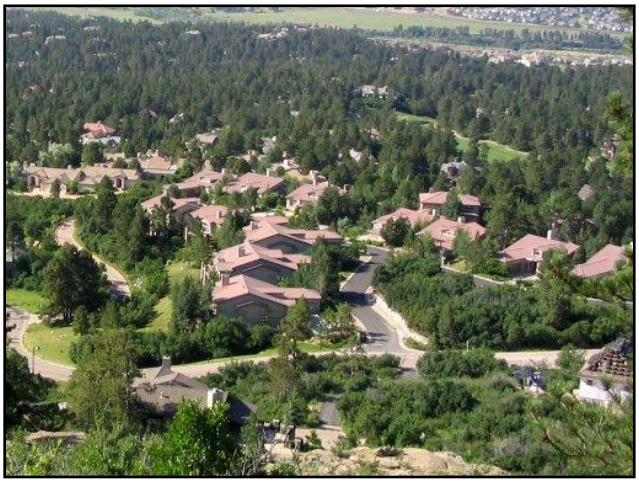
| Hazard Rating: | Low |
|---|---|
| **Does the neighborhood have dual access roads?** | Yes |
| **Are there road grades > 8%?** | No |
| **Are all access roads of adequate width?** | Yes |
| **Average lot size:** | <1 Acre |
| **Fuel models found in the neighborhood:** | 1, 2, 5 |
| **Water supply:** | Hydrants |
| **Hazards:** | None |

**Description:** Pine Bluffs is a community of large to mid-size homes on small lots. These homes are of newer construction and most of the siding and roofs are ignition-resistant types. There are some homes with wooden siding, but most of these have rock or masonry wainscoting. There are, however, several homes with flammable decks and projections. Many of the houses have flammable native or ornamental conifers planted too close to the structure (in some cases directly under eaves). Roads are paved and of adequate width. There are some tight driveways, but most of the driveways are short. Addressing is present, but not reflective for most homes. Pine Bluffs has a good network of hydrants. Fuels are primarily open canopy ponderosa with a grass understory, but these are broken by heavy development. Fuels are isolated near roads and development, such that there is no continuous fuel bed. The existing native fuels are located between homes and may contribute to structural extension between them, but it is unlikely that a vegetation fire would extend beyond this community, except through ember generation under extreme conditions. The topography is flat to gently rolling hills.

**Pine Bluffs Recommendations**

- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B*).
- Discourage the use of combustible materials for decks, siding and projections, especially where homes are upslope from heavy fuels.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers and kept clean of flammable materials, especially where such openings are located on slopes above jackpots of heavy fuels.
- Clean leaf and needle litter from roofs and gutters, and away from foundations. Clear flammable vegetation away from power lines near homes.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Add reflective addressing to all driveways and homes.

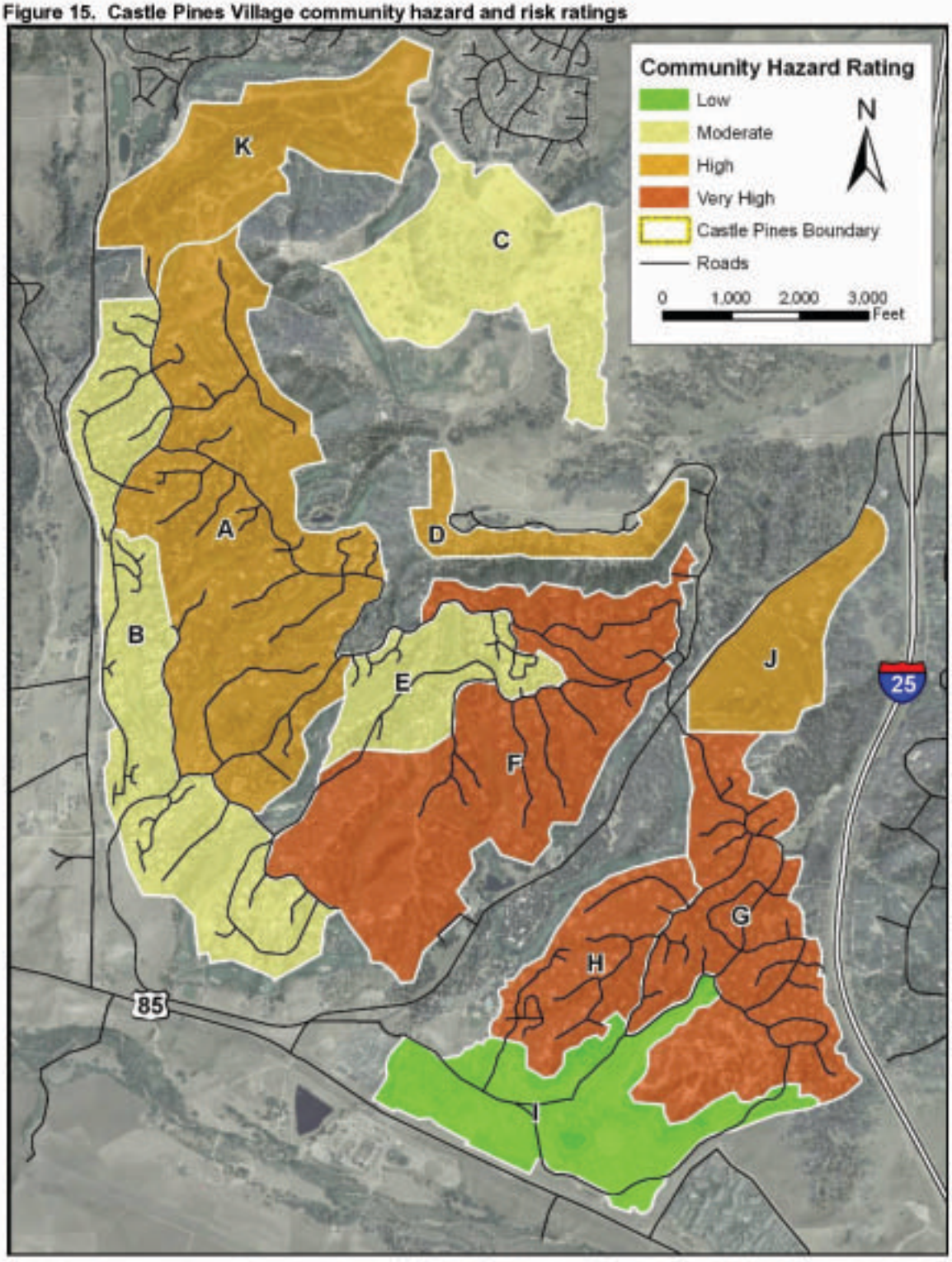
## Castle Pines Village



**Description:** In 2007, Castle Pines Village had a separate hazard and risk analysis conducted. The same field assessments and fire behavior methodology were used to identify 11 communities within the study area. Of these 11 communities, three were categorized as very high, four as high, three as moderate, and one as low (**Figure 15**). There are approximately 6,121 citizens residing within the community of Castle Pines Village.[10] While many of the houses have non-combustible siding and roofs, some houses have wooden siding and shake shingle roofing. Decks overhanging flammable vegetation are common in several of the communities. House markers are present, but not typically reflective. Some houses have defensible space, but it is minimal, with untreated vegetation often within 30' of the structure. Roads are well labeled and are adequate for engine access, but dead ends are not always marked. Utilities are primarily located underground. All of the communities have hydrants for water access.

[10] http://www.city-data.com/housing/houses-Castle-Pines-Colorado.html#top; referenced 08-24-07

**Figure 15. Castle Pines Village community hazard and risk ratings**




Native vegetation present in the Castle Pines area includes ponderosa pine, Gambel oak, serviceberry, currant, mountain mahogany, and chokecherry, and mid-grass prairie habitat. This is the environment Castle Pines Village has inherited and is the environment the Village is dedicated to preserve. Established parks and open space areas have taken advantage of the natural settings within the Village. To maintain the natural character of the land, developers of the

community have designated a significant amount of acreage as open space. These spaces have been preserved for the enjoyment of all property owners.[11] Wildfire, specifically severe wildfire, can have significant adverse effects on wildlife habitat and the environment in general. Given moderate weather conditions, fast rates of spread and torching, but no active crown fire are predicted. Higher wind speeds, hotter temperatures, and lower relative humidity will allow for even faster rates of spread and the potential for torching and crown runs. Ember cast is more likely in this part of the study area because of the higher timber component.

### Castle Pines Village Recommendations

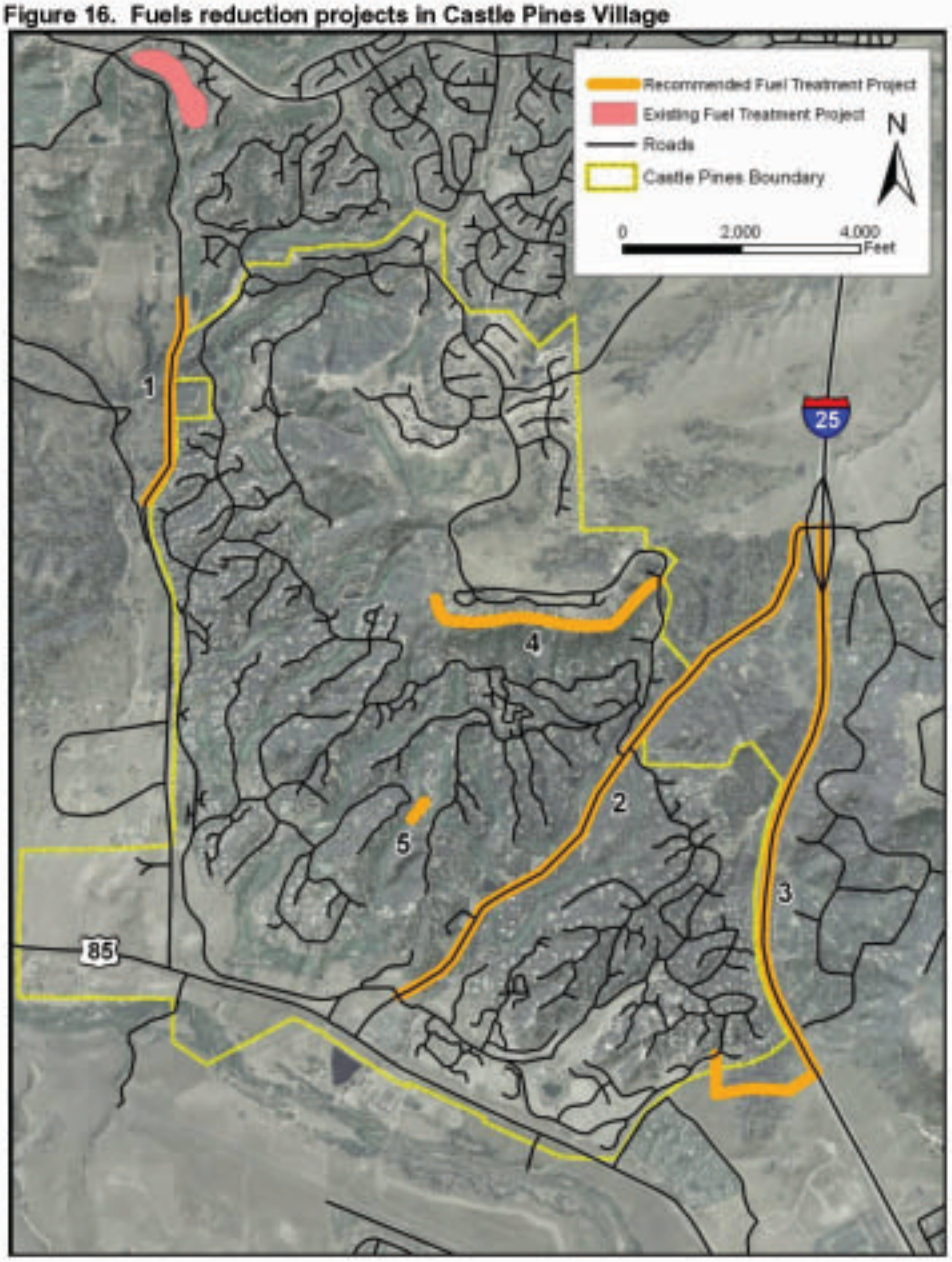
- Five specific fuels reduction projects are recommended for Castle Pines Village (**Table 3** and **Figure 16**). These treatments were recommended to reduce hazardous fuels, minimize the impact of fire on communities near the treatments, improve access and egress, and increase long-term property values as a result of the other goals.
- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B*).

**Table 3. Fuels reduction projects for Castle Pines Village**

| |
|---|
| **1. Happy Canyon Road Treatment** |
| **2. Daniels Park Road Treatment** |
| **3. Interstate I-25 Road Treatment / Fuelbreak** |
| **4. Cliffgate Lane Fuel Reduction** |
| **5. Connection between Fairway 8 and 9 Fuel Reduction** |

[11] http://www.castlepinesvillage.org/wildlifecommittee.htm; referenced 08-30-07

**Figure 16. Fuels reduction projects in Castle Pines Village**




1. **Happy Canyon Road Treatment.** Priority level High. **(Figure 16).** This project focuses on limbing and vegetation management along the Daniels Park Road from I-25 to the gate 3 / 4 entrance locations. This project will incorporate the existing fuel reduction work. This project will help to protect the communities of F & H (rated as very high hazard) and K (rated as high hazard). Vegetation management should be conducted to conform to the shaded fuel break guidelines described in the "Access Route Fuels Modification Recommendations" section. This project will be a cooperative effort between Castle Pines Village and Douglas County.

2. **Daniels Park Road Treatment.** Priority level High. **(Figure 16).** This project focuses on limbing and vegetation management along Daniels Park Road from the Cherokee Ranch Castle entrance north .75 miles. This project will help to protect

the Castle Pines Village communities B (rated as moderate hazard) and A & K (rated as high hazard) from wildfire ignitions originating from within the Cherokee Ranch and off the Daniels Park Road easement. Vegetation management should be conducted to conform to the shaded fuel break guidelines described in the "Access Route Fuels Modification Recommendations" section. This project should be a cooperative effort between Castle Pines Village, Cherokee Ranch Foundation, and Douglas County.

3. **Interstate 25 Road Treatment / Fuel Break. Priority Level Moderate. (Figure 16).** This project focuses on limbing and vegetation management along the southbound right of way of Interstate 25 from the Happy Canyon Road Exit south for 1.7 miles. The concrete guardrail should be extended to the south. From this point a constructed fuel break with a dirt surface of 8 feet in width extends from I-25 to Castle Pines Drive South. This project is designed to protect the communities of G (rated as very high hazard) and J (rated as high hazard) from ignitions originating on I-25. The fuel break itself should incorporate extended defensible space of the homes that back up to I-25. This fuel break could also serve as firefighter access. Vegetation management should be conducted to conform to the shaded fuel break guidelines described in the "Access Route Fuels Modification Recommendations" section.

4. **Cliffgate Lane Fuel Reduction Project. Priority Level Moderate. (Figure 16).** This project is designed to break-up the continuity of the fuels behind the homes on Cliffgate Lane, on top of the cliff itself. The project would run from Country Club Drive at the East end to the Castle Pines Country Club at the west end. This treatment will help to protect the community of D (rated as high hazard). Vegetation management should be conducted to conform to the shaded fuel break guidelines described in the "Access Route Fuels Modification Recommendations" section.

5. **Fairway 8 and 9 Fuel Break. Priority Level Low. (Figure 16).** This project focuses on breaking up the continuity of the fuels between Fairway 8 and Fairway 9. The project will help minimize the potential that a fire originating in the Elk Pointe Lane area will spread north. This treatment will help protect the communities of F (rated as very high hazard) and E (rated as moderate hazard).

- In addition to fuels reduction projects, several evacuation routes are recommended for CPV. These routes are described below and can be seen in **Figure 17**.

**Figure 17. Evacuation route improvements for Castle Pines Village**


- **Research improved automatic gate openers:** Priority Level High. With recent advances in technology other automated types of gate openers exist. For example a device is currently available which allows activation via a "mic click" of a portable/mobile radio. Recommend a gate-opening device that does not require a key or Opticom device. Additional incoming emergency resources may not possess these access items, but will have a 2-way radio.

a. **Happy Canyon Road to Elk Pointe Lane:** Priority Level High. **(Figure 17)**. This project focuses on reducing the fuels along the established emergency access route from Happy Canyon Road thru the Castle Pines Village Maintenance Facility to Elk

Pointe Lane. Fuels mitigation consisting of limbing and vegetation management to create a safe, effective access route is recommended (see the "Access Route Fuels Modification Projects" section of this report). The route must be well marked. The device that activates the gate must be standardized with all other gates.

b. **Castle Pines Drive South to Castlegate Drive North: Priority Level High. (Figure 17)**. This project focuses on establishing an emergency access route from Castle Pines Drive South to Castlegate Drive North. This project might require a cooperative effort between Castle Pines Village and the Town of Castle Rock or Douglas County. The route must be well marked. The device that activates the gate must be standardized with all other gates.

c. **Country Club Drive to Oxford Drive: Priority Level High. (Figure 17)** This project focuses on establishing an emergency access route from Country Club Drive to Oxford Drive utilizing the Castle Pines North Water Treatment facility driveway. This project would require a cooperative effort between Castle Pines Village and Castle Pines North or Douglas County. The route must be well marked. The device that activates the gate must be standardized with all other gates.

d. **Country Club Parkway to Daniels Park Road: Priority Level High. (Figure 17)**. This project focuses on establishing an emergency access route from Country Club Parkway to Daniels Park Road utilizing the "old gate" roadway. The route must be well marked. The device that activates the gate must be standardized with all other gates.

e. **Castle Pines Drive North to Daniels Park Road: Priority Level High. (Figure 17)**. This project focuses on establishing an emergency access route from Castle Pines Drive North to Daniels Park Road utilizing the existing locked gated roadway. This access route will require little preparation. The route must be well marked. The device that activates the gate must be standardized with all other gates.

f. **Country Club Parkway to Daniels Park Road: Priority Level Moderate. (Figure 17)**. This project focuses on establishing an emergency access route from Country Club Parkway to Daniels Park Road utilizing the property adjacent (south side) to the Country Club at Castle Pines golf course maintenance facility. The route must be well marked. The device that activates the gate must be standardized with all other gates.

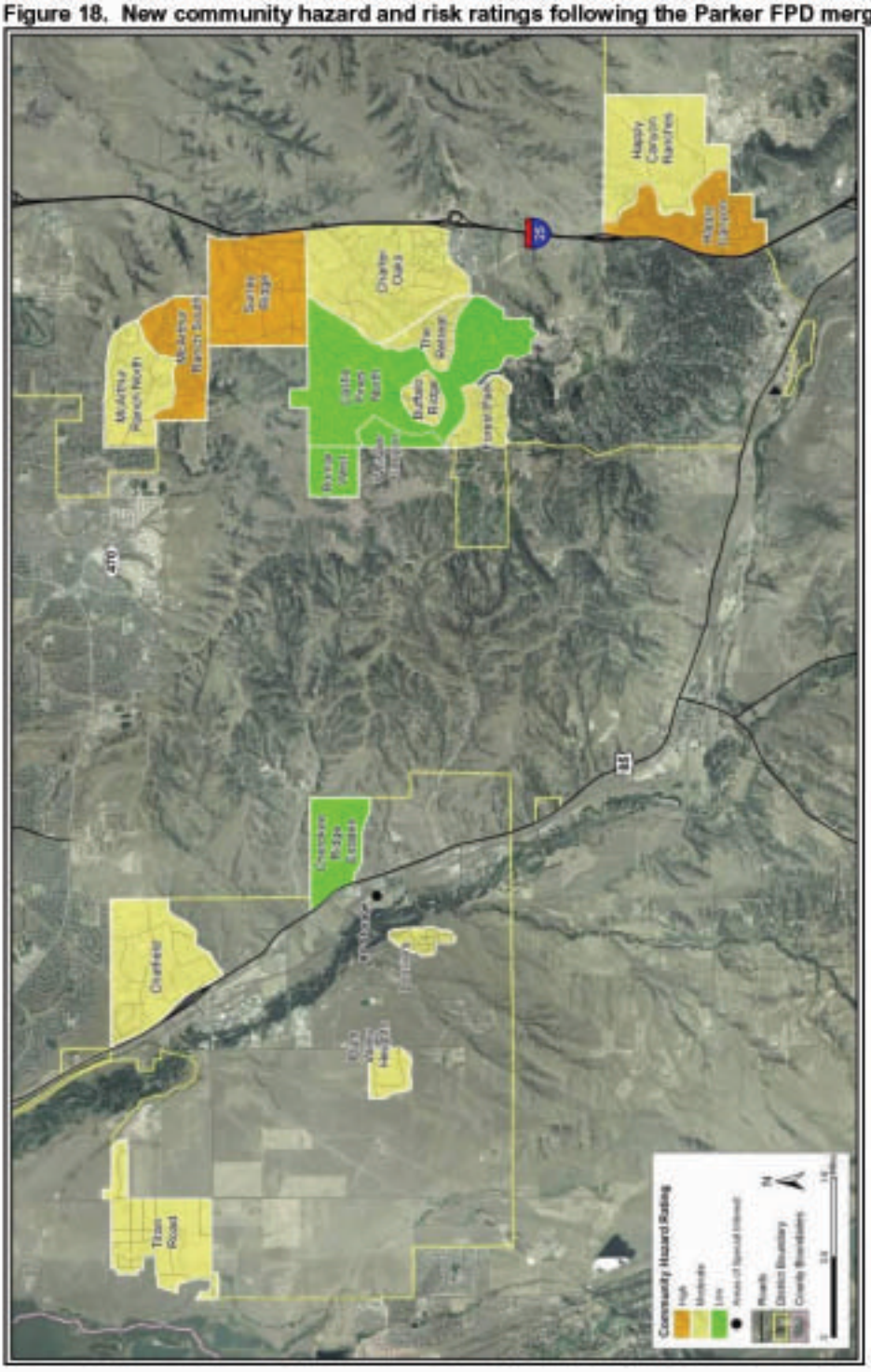
- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B*).
- Extended defensible space is recommended for homes located in dangerous topography (saddles, above natural chimneys or mid-slope on steep slopes) with jackpots of heavier fuel loads near or below the home such as ponderosa stands or heavy shrubs.
- Discourage the use of combustible materials for decks, siding, and roofs, especially where homes are upslope from fuels. Replace any shake roofs on homes and outbuildings with non-combustible types such as metal or composite shingle.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers, and kept clean of flammable materials, especially where such openings are located on slopes above fuels.

- Clean leaf litter from roofs and gutters and away from foundations.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Add reflective addressing to all driveways and homes.

## Community Descriptions Following the PFPD and SMFR Merger

The merger with PFPD and SMFR has increased the response area of both agencies as they are now the South Metro Fire Rescue Authority. As a result, additional communities were added to fully encompass the area that SMFRA now responds to. The same methodology from the PFPD was implemented for the new communities and a hazard and risk rating was determined for these areas (**Figure 18**).

**Figure 18. New community hazard and risk ratings following the Parker FPD merger**



## Happy Canyon

**Hazard Rating: High**

**Description:** The Happy Canyon community is situated along the east side of I-25, adjacent to the Happy Canyon Ranches community. This community has some steep slopes and ravines, and many of the houses lie within these drainages and at the top of the hills. The homes are large, but typically located on lots less than an acre in size. Structures typically have high fire resistant roofs, but there are some cedar shake shingle roofs, as well. There is a mixture of combustible and non combustible materials used for siding and decking. Many of the decks have open areas underneath. An abundance of dead fuel has accumulated around the houses, in gutters, and under the decks. Addressing is difficult to see and non-reflective. Most gas lines are buried, but other utilities are located above ground. RVs are parked next to many of the houses. The residences lack defensible space. There is a secondary egress route for homes on top of the bluff, through a locked gate at the south end of Mesa Drive, but the main access is Exit 187 off of I-25. The roads are paved and have less than a 10% slope, but some of the driveways are steeper. Road widths are between 20-24 feet and are well marked with reflective, metal signs. Some of the dead ends are not marked, but adequate turnarounds do exist. Several locked gates were observed. There are no hydrants or other water sources located within the community.

There is fairly continuous fuel loading across the entire community. Gambel oak is dominant throughout, especially on the steep slopes. Ponderosa pines are dominant on most slopes, but Rocky Mountain junipers are scattered throughout. The understory is composed of a continuous grass layer. A surface fire would carry through the grass fuels, and would be unlikely to transition into the tree crowns under moderate weather conditions. Where oak is present in the understory of the ponderosa pines, it will likely act as a ladder fuel, allowing a surface fire to torch the trees. Although large-scale torching and active crown fire is not likely, flame lengths have the potential to be greater than 12 feet, thus limiting suppression activities. High wind speeds will act to increase flame lengths and the rate of spread, giving the fire more opportunity to transition into the trees. Pre-heating in small drainages and at the base of the cliff wall can increase the rate of spread.

**Happy Canyon Recommendations**

- Mitigate the various fuels by mowing and/or cutting along North Lariat Drive (**Figure 19**). This will provide a secondary fuelbreak from ignitions from I-25. Utilize the fire behavior outputs to determine appropriate mitigation practices.
- Ensure that the gate at the secondary egress along North Mesa Drive is opened during a wildfire event.
- Evaluate the water supply in the area to either improve existing hydrants, establish a stored watery supply, and how to use firefighting resources most effectively.
- Keep grassy fuels shorter than 6" and remove Gambel oak in proximity to stored RVs and boats.
- Work with CDOT to ensure fuels are cleared along I-25 to prevent ignitions from discarded cigarettes.
- Because of the large amount of Gambel oak in the area, it is recommended that the oak be managed as described in the *Plains/Prairies Fuels Modification* section of the report.
- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B*).
- Extended defensible space is recommended for homes located in dangerous topography (saddles, above natural chimneys or mid-slope on steep slopes) with jackpots of heavier fuel loads near or below the home such as ponderosa stands or heavy shrubs.
- Discourage the use of combustible materials for decks, siding, and roofs, especially where homes are upslope from fuels. Replace any shake roofs on homes and outbuildings with non-combustible types such as metal or composite shingle.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers, and kept clean of flammable materials, especially where such openings are located on slopes above fuels.
- Clean leaf litter from roofs and gutters and away from foundations.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Wherever possible, on driveways and private roads longer than 300 feet, add pullouts for emergency apparatus.
- Add reflective addressing to all driveways and homes.

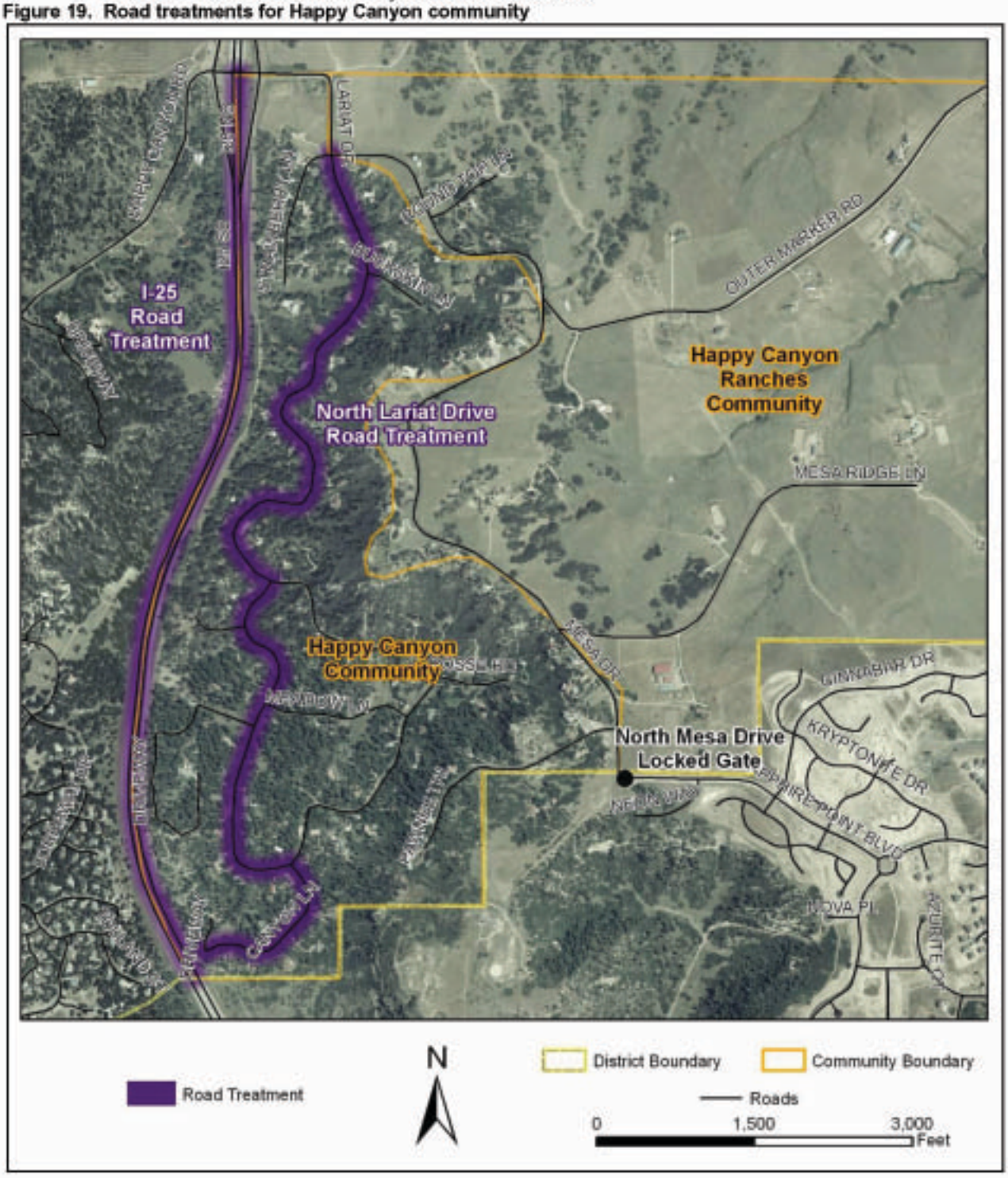
The community of Happy Canyon has an approved CWPP, which was completed in April, 2008. As part of their CWPP, SMFRA conducted individual home assessments for the residents in the community. Recommendations made in this plan are still valid and are being implemented. The community continues to plan and implement the fuels treatments in their CWPP. Happy Canyon serves as an example for other communities wanting to become active in mitigation and defensible space work.

Some of the ongoing recommendations include:

- Repair and maintain existing cisterns
- Work towards an additional egress along Canyon Lane
- Public education to follow Firewise practices and create effective defensible space
- Monthly chipping program to remove cutting slash

- Widen Bridle Trail so it may act as a fuelbreak

**Figure 19. Road treatments for Happy Canyon community**



## McArthur Ranch South

### Hazard Rating: High

**Description:** The McArthur Ranch South community sits to the west of I-25. The structures are large and have fire resistant construction. The roofs are fire resistant and the siding is a combination of combustible and non-combustible materials. Lot sizes are greater than an acre and all of the utilities are underground. Although the houses are built with adequate fire resistant materials, they still need defensible space, which has not been done. Home addressing is not reflective and fastened on combustible wood posts. Steeper slopes, ravines, houses located midslope and on the top of hillsides increases the risk of losses due to fire. There is a single way in and out of the community on a maintained dirt road. The driveways are extremely steep and narrow. Street signs have been updated, and as a result, are well-marked, metal and reflective. There are no hydrants or other water supply for this community.

There are very few trees within the community, but a significant amount of Gambel oak is present on steep slopes. More open areas have flashy, grass vegetation. Given the appropriate weather conditions and depending on the time of year, extreme fire behavior could occur. When the oak has dried out in the fall, fast rates of spread and long flame lengths are possible. This would encourage preheating of uphill fuels and may result in ember cast and faster rates of spread.

#### McArthur Ranch South Recommendations

- Evaluate the water supply in the area to either improve existing hydrants, establish a stored watery supply, and how to use firefighting resources most effectively.
- Because of the large amount of Gambel oak in the area, it is recommended that the oak be managed as described in the *Plains/Prairies Fuels Modification* section of the report.
- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B*).

- Extended defensible space is recommended for homes located in dangerous topography (saddles, above natural chimneys or mid-slope on steep slopes) with jackpots of heavier fuel loads near or below the home such as ponderosa stands or heavy shrubs.
- Discourage the use of combustible materials for decks, siding, and roofs, especially where homes are upslope from fuels. Replace any shake roofs on homes and outbuildings with non-combustible types such as metal or composite shingle.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers, and kept clean of flammable materials, especially where such openings are located on slopes above fuels.
- Clean leaf litter from roofs and gutters and away from foundations.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Wherever possible, on driveways and private roads longer than 300 feet, add pullouts for emergency apparatus. Turnarounds should be constructed at the end of all driveways and dead-end roads using the established Douglas County standards.
- Add reflective addressing to all driveways and homes.

## Surrey Ridge

**Hazard Rating: High**

**Description:** Surrey Ridge borders I-25 along the west side. Homes sit on lots that are smaller than an acre. The construction includes many cedar shake roofs, which are highly flammable. The siding and deck materials are a mixture of combustible and non-combustible materials. There is some defensible space, especially for the residences that have yards that are well maintained. Often addresses are not reflective or not present. All of the utilities are underground. There is only one ingress/egress, but an additional exit off of I-25 is under construction, which may provide an alternative access point. A long dead-end within the community may be confusing in case of an emergency. Roads are paved and provide adequate turnaround space for emergency equipment. Streets are well signed and clearly labeled. A single cistern exists in the northern part of the community along North Heather Drive. There are no hydrants within close proximity.

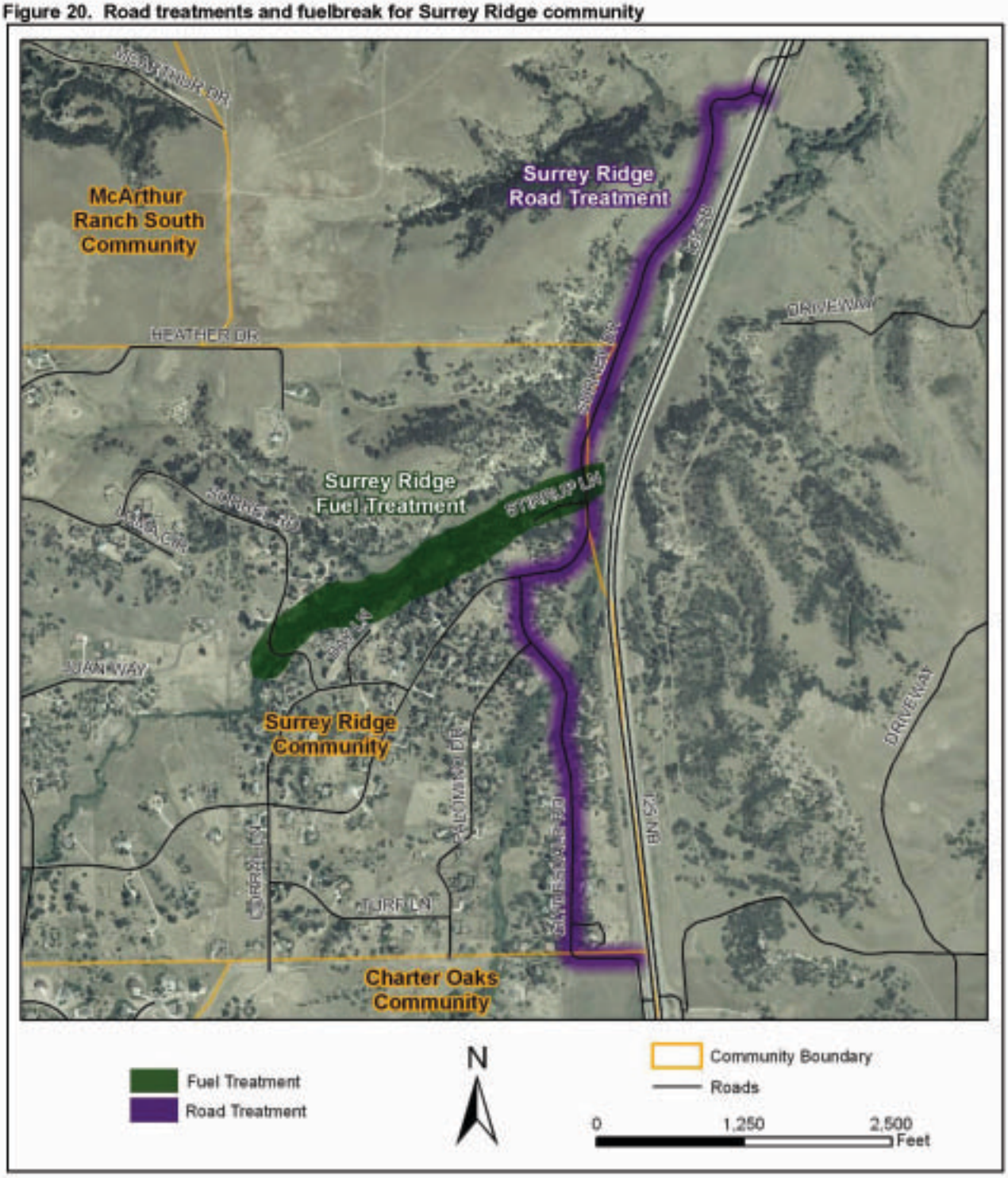
Ponderosa pines are the most common tree species in the Surrey Ridge community. There are a few dense areas, but they are generally widely spaced and there is a continuous grass understory. Gambel oak is common in the small ravines within the community. Fuels are continuous, but there are few ladder fuels. Moderate weather conditions will promote surface fire, carried by the grass. Fire is unlikely to transition into any of the trees or into the shrubs. More extreme weather conditions would provide faster rates of spread and longer flame lengths. It is more likely that fire would burn in the Gambel oak within the ravines and produce longer flame lengths given extreme weather conditions.

### Surrey Ridge Recommendations

- Conduct roadside fuels reduction along North Surrey Road to North Surrey Drive (**Figure 20**). In general, clearing vegetation two-times the distance of the predicted flame length is adequate. This will protect the community from ignitions off of I-25 and maintain the main evacuation route.
- Remove dead and down fuels within the washes and drainages **(Figure 20**). This will reduce the possibility of surface fire transitioning into the tree crowns.
- Because of the large amount of Gambel oak in the area, it is recommended that the oak be managed as described in the *Plains/Prairies Fuels Modification* section of the report.

- Evaluate the water supply in the area to either improve existing hydrants, establish a stored watery supply, and how to use firefighting resources most effectively.
- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B*).
- Extended defensible space is recommended for homes located in dangerous topography (saddles, above natural chimneys or mid-slope on steep slopes) with jackpots of heavier fuel loads near or below the home such as ponderosa stands or heavy shrubs.
- Discourage the use of combustible materials for decks, siding, and roofs, especially where homes are upslope from fuels. Replace any shake roofs on homes and outbuildings with non-combustible types such as metal or composite shingle.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers, and kept clean of flammable materials, especially where such openings are located on slopes above fuels.
- Clean leaf litter from roofs and gutters and away from foundations.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Add reflective addressing to all driveways and homes.

**Figure 20. Road treatments and fuelbreak for Surrey Ridge community**



## Charter Oaks

**Hazard Rating: Moderate**

**Description:** Charter Oaks borders the west side of I-25 and is to the south of the Surrey Ridge community. Many of the houses are built on large lots to accommodate horses. As a result, there are barns in addition to residential buildings. The roofs are highly resistant to fire and have both combustible and non-combustible siding. The addressing is poor; house numbers are located on wood posts and are non-reflective. There are multiple ingress/egress routes along paved roads, with the exception of the long dead-end in the western portion of the community. Some of the roads are less than 20 feet wide but the majority are 24 feet in width and provide adequate turnaround space. Street signs are reflective and easy to see. There are hydrants distributed through the southern part of the community, but much of the northern half is without water supply.

There are some steep ravines within the community that typically have Gambel oak. Large areas are covered by short grasses, but some slopes have patches of Gambel oak. Several different conifer species are present, especially next to houses, where they have been planted The grass fuels are continuous, and surface fuels are light and will burn quickly. Fast rates of spread are expected, and high winds will drive the direction of fire spread. The lack of ladder fuels will decrease the risk of fire spreading into the sparse conifer trees.

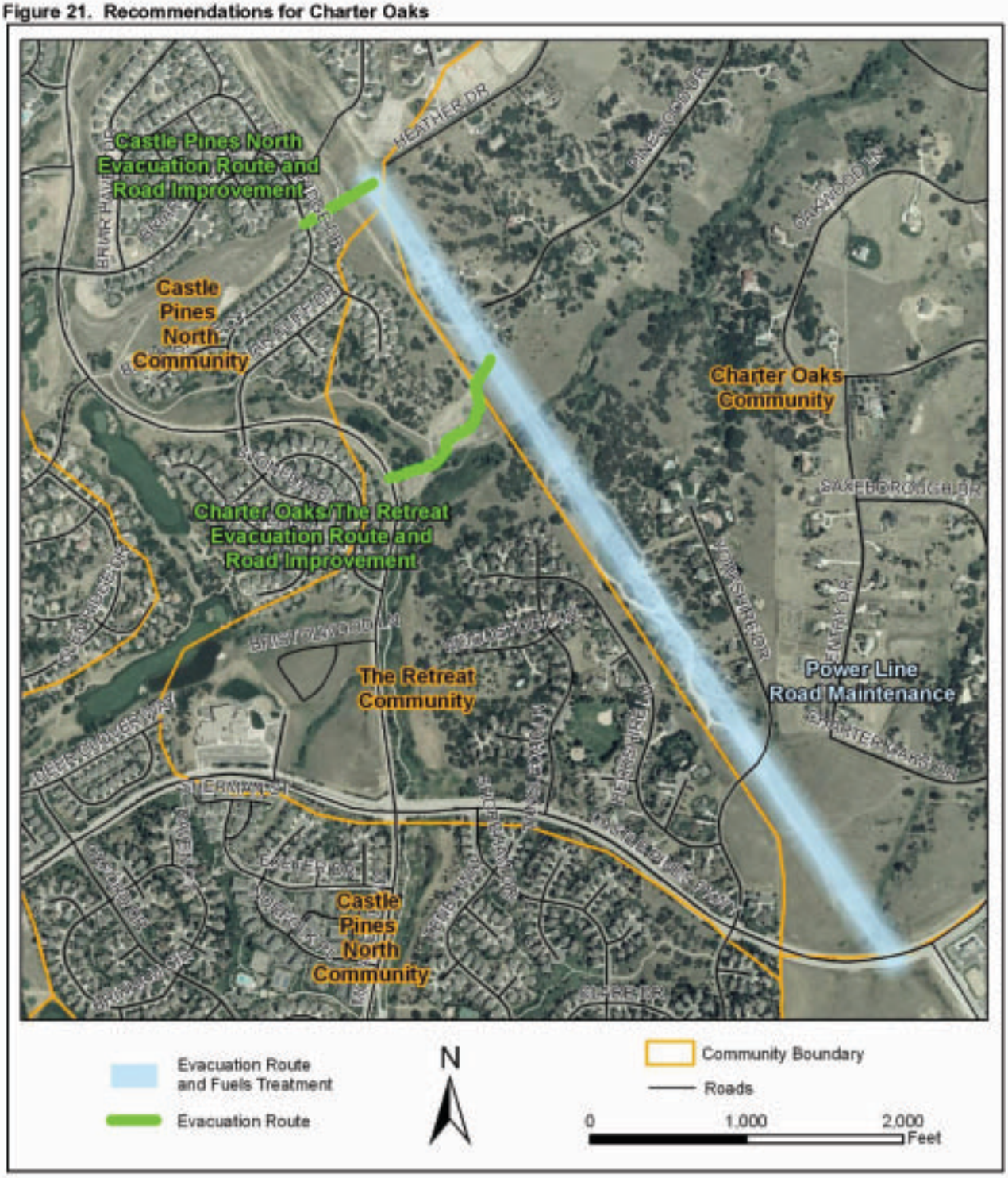
### Charter Oaks Recommendations

- **Power Line Maintenance:** Because of the transmission line installation along the west edge of the Charter Oaks, there is a rough dirt road that runs the length of the power line. This road should be maintained for several reasons (**Figure 21**). First, keeping vegetation cleared will reduce the risk of any fire spreading if a power line were to be blown

down and arc. Second, it can act as a potential secondary access for residents in Charter Oaks, the Retreat and Castle Pines North communities.

- **Charter Oaks/The Retreat Evacuation:** In addition to the transmission line, there is another rough, undeveloped connection starting along the transmission lines in Charter Oaks that leads to the Retreat. Improving and maintain these routes reduce fuels and can act as evacuation routes for residents in either community (**Figure 21**). This route can be gated to reduce recreational use.
- Consider early evacuation and the resources necessary for equine rescue.
- Evaluate the water supply in the area to either improve existing hydrants, establish a stored watery supply, and how to use firefighting resources most effectively.
- Because of the large amount of Gambel oak in the area, it is recommended that the oak be managed as described in the *Plains/Prairies Fuels Modification* section of the report.
- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B* for details).
- Discourage the use of combustible materials for decks, siding, and roofs, especially where homes are upslope from fuels. Replace any shake roofs on homes and outbuildings with non-combustible types such as metal or composite shingle.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers, and kept clean of flammable materials, especially where such openings are located on slopes above fuels.
- Clean leaf litter from roofs and gutters and away from foundations.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Add reflective addressing to all driveways and homes.

**Figure 21. Recommendations for Charter Oaks**



## Chatfield

**Hazard Rating: Moderate**

**Description:** Chatfield is a well-dispersed community, with large lots, and multiple outbuildings. It is located along the east side of Highway 85. Many of the homes have pens and barns for horses. The construction is good, with high fire resistant roofs but combustible siding. The houses have large lots, and well maintained yards provide adequate defensible space given the short grass fuels. Addressing is present, but not reflective. There are multiple routes for ingress/egress along well paved roads. The roads are between 20-24 feet in width and have adequate turnarounds. Streets are well marked with reflective signage. There are four hydrants located along the western boundary of the community, as well as a cistern along Wildfield Lane. However, these water sources are not dispersed throughout the community and flows from the hydrants are low. As a result, water supply is considered to be limited.

Grasses are the primary fuel that would carry fire surface within this community. Small pines are dispersed, and patches of Gambel oak are scattered throughout. Given the right conditions, grasses can burn extremely fast, creating flame lengths greater than four feet in length. Surface fire is most likely given moderate weather conditions. However, the vegetation outside of the community to the south east of the community has the potential to produce more active fire behavior, especially with higher wind speeds. Long flame lengths and fast rates of spread could carry fire into the Chatfield community.

### Chatfield Recommendations

- Create a landscape scale fuels treatment along the southern border of the community to limit fire spread from the open space area to the south (**Figure 22**).
- Consider early evacuation and the resources necessary for equine rescue.
- Evaluate the water supply in the area to either improve existing hydrants, establish a stored watery supply, and how to use firefighting resources most effectively.

- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B* for details).
- Discourage the use of combustible materials for decks, siding, and roofs, especially where homes are upslope from fuels. Replace any shake roofs on homes and outbuildings with non-combustible types such as metal or composite shingle.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers, and kept clean of flammable materials, especially where such openings are located on slopes above fuels.
- Clean leaf litter from roofs and gutters and away from foundations.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Add reflective addressing to all driveways and homes.

**Figure 22. Fuelbreak along the south edge of the Chatfield community**

## Buffalo Ridge

**Hazard Rating: Moderate**

**Description:** The community of Buffalo Ridge is unique because of the abundance of fuels and potential for fire behavior in relation to the surrounding area. Most of the area surrounding the community is highly developed, with large, wide, paved roads, and little vegetation. Within the community, there is a higher component of Gambel oak and various planted evergreen species. The Ridge at Castle Pines North Golf Course is a prominent feature within the community. The houses are well built, and have non-combustible roofs, siding, and deck materials. A few cedar shake shingle roofs are still present. Landscaping has been done around most of the homes, which provides adequate defensible space, but further clearing is needed for some of the homes, especially those that have vegetation directly next to the house. Home addresses are present, but are not reflective. The streets are well marked with reflective signage; roads are paved, and provide adequate turnaround space for emergency vehicles. There is a secondary egress available for emergency equipment along Buffalo Ridge Road, but it is closed off for non-emergent traffic. There are hydrants located throughout the community.

There is very little threat of fire coming into the community from the surrounding area, but there is a larger concern of fire starting from within the community. The center of Buffalo Ridge has less infrastructure and a high component of Gambel oak and grass. During the fall and early spring before the oak has a chance to green, it is prone to active fire behavior. Moderate wind speeds and temperatures will not produce active fire behavior, but high winds during the right time of the year could allow for flame lengths longer than 12 feet in some places. Ember cast into the community is especially dangerous if the embers come into contact with shingle roofs.

### Buffalo Ridge Recommendations

- Ensure the ability to access all of Buffalo Ridge Road for evacuation in case of a wild-land fire (**Figure 23**).
- Because of the large amount of Gambel oak in the area, it is recommended that the oak be managed as described in the *Plains/Prairies Fuels Modification* section of the report.
- A parcel-level analysis is recommended.

- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B* for details).
- Discourage the use of combustible materials for decks, siding, and roofs, especially where homes are upslope from fuels. Replace any shake roofs on homes and outbuildings with non-combustible types such as metal or composite shingle.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers, and kept clean of flammable materials, especially where such openings are located on slopes above fuels.
- Clean leaf litter from roofs and gutters and away from foundations.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Add reflective addressing to all driveways and homes.

**Figure 23. Location where access needs to be granted if evacuation is required**

## Forest Park




**Hazard Rating: Moderate**

**Description:** The infrastructure of the Forest Park community is fire resistant. Although the houses are fairly close together, they have high fire resistant roofs and non-combustible siding and decks. The utilities are all located underground, reducing risk of ignition from downed power lines. Defensible space has been created for some of the houses, but not all. In many areas, Gambel oak is growing directly next to the house. All of the houses have addresses, but they are not all reflective. There is only one way in and out of the community, but the roads are paved and well marked. Road widths are good and provide adequate turnaround space for vehicles. Water is available via hydrants installed throughout the community.

Much of the area within and surrounding forest park is urban, meaning there are few fuels to support fire. The land directly surrounding the homes is landscaped yards. However, there are small open spaces between the homes that have stringers of Gambel oak. The open area between Forest Trails Drive and Forest Park Drive has a large oak component. Ponderosa pines are dominant in the overstory with a large oak component in the understory. In moderate weather conditions, a surface fire would be expected through the grassy areas and into the oak. The flame lengths would mostly be low (less than four feet), but could extend beyond 12 feet. The oak provides fuels to extend fire into the canopies of the ponderosa pines in the area. With

extreme weather conditions, which include high wind speeds, some areas could possibly see small areas of active crown fire. This would produce longer flame lengths, often over 12 feet, and ember cast. Although they do not completely mitigate the chance of ember cast, the presence of Daniel's Park Road to the west, the golf course in and around the community, and Castle Pines Parkway to the north act as fuelbreaks from fire spreading into the community from areas outside of the community.

**Forest Park Recommendations**

- Because of the large amount of Gambel oak in the area, it is recommended that the oak be managed as described in the *Plains/Prairies Fuels Modification* section of the report. Consider treating the oak to reduce the risk of fire spread into the overstory trees.
- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B* for details).
- Discourage the use of combustible materials for decks, siding, and roofs, especially where homes are upslope from fuels. Replace any shake roofs on homes and outbuildings with non-combustible types such as metal or composite shingle.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers, and kept clean of flammable materials, especially where such openings are located on slopes above fuels.
- Clean leaf litter from roofs and gutters and away from foundations.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Add reflective addressing to all driveways and homes.

Within the larger community of Forest Park, the community of Pine Ridge has an approved CWPP, which was completed in April of 2007. Pine Ridge has achieved the status of a Fire-Wise Community, which is something the residents should take great pride in. Many of the recommendations have already been completed and activities are focusing on maintenance. Pine Ridge is continuing to maintain the work that has already been completed. Recommendations from this report may apply to other communities with similar vegetation.

## Happy Canyon Ranches

**Hazard Rating: Moderate**

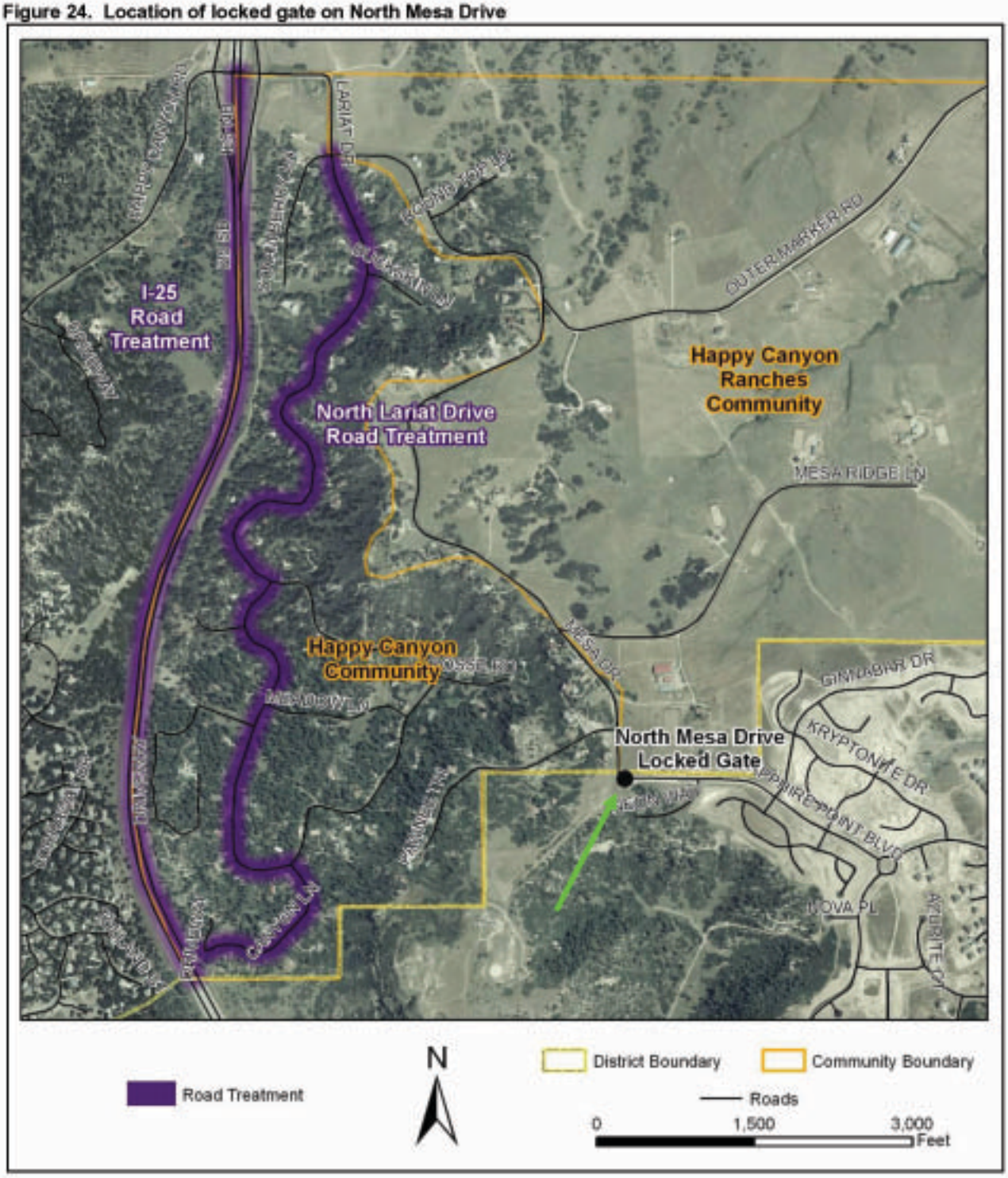
**Description:** The topography in the Happy Canyon Ranches is diverse. The homes within the community sit along a cliff band that runs along the west side of the community. The result is an almost vertical wall behind many of the homes and a large, open grassland area to the east. The structures have fire resistant roofing and a mixture of combustible and non-combustible siding and decking material. The utilities are above ground and the houses have propane tanks, many of which have large amounts of oak surrounding them. Addressing is present, but not reflective. The nature of homeowner's landscaping provides defensible space along the east edge, but mitigation activities on the cliff band have been limited due to the almost vertical rock face. The cliff band acts as a natural fuelbreak for some of the homes, but it is not wide enough in all areas to protect homes from fire. Most of the roads are paved, like North Mesa Drive, but Outer Marker Road and Mesa Ridge Lane that lead to the residences to the east, are dirt. Roads in the community provide adequate turnarounds for fire apparatus and are greater than 20 feet in width. Signage is present and reflective. There is a secondary egress route through a locked gate at the south end of Mesa Drive. There are no hydrants within the community, nor is there any other water supply.

Prairie grasses are the most common vegetation found throughout most of the community. However, there are stringers of oak dispersed across the landscape. The vegetation along the cliff band is primarily oak with a few scattered ponderosa pines. Moderate weather conditions are not likely to easily move fire into the tree crowns. Toward the top of the cliff band, there is the potential for some torching due to preheating from the fire below. Fire may spread quickly in grasses to the east could transition into the oak. Active crown fire below the community is probable given extreme conditions with high wind speeds. This dries out the fuels further up the hill and allows them to burn more readily. The result is long flame lengths and embers that could impinge upon the homes along the rock band.

### Happy Canyon Ranches Recommendations

- Ensure that the gate on North Mesa Drive is opened during a wildfire event (**Figure 24**).
- Because of the large quantities of horses and livestock, create an early evacuation system and consider the resources necessary for equine rescue.
- Evaluate the water supply in the area to either improve existing hydrants, establish a stored watery supply, and how to use firefighting resources most effectively.
- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B* for details).
- Discourage the use of combustible materials for decks, siding, and roofs, especially where homes are upslope from fuels. Replace any shake roofs on homes and outbuildings with non-combustible types such as metal or composite shingle.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers, and kept clean of flammable materials, especially where such openings are located on slopes above fuels.
- Clean leaf litter from roofs and gutters and away from foundations.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Add reflective addressing to all driveways and homes.

**Figure 24. Location of locked gate on North Mesa Drive**



## Louviers

**Hazard Rating: Moderate**

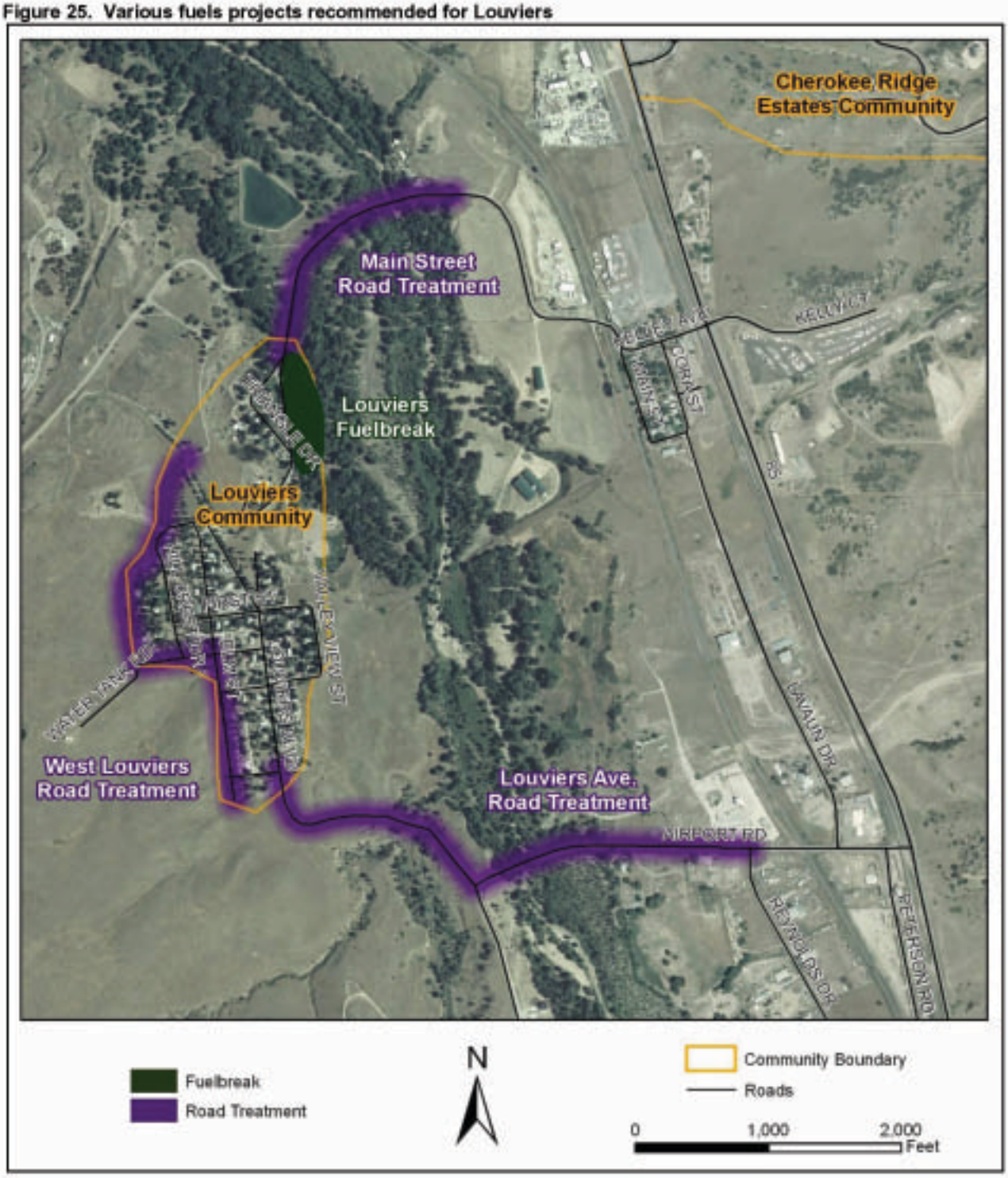
**Description:** Louviers is a small community located to the west of Highway 85. The town has older homes that are constructed using combustible siding and decking materials. Structures located within the center of the community are not at a high risk for wildfire; the homes on the outskirts have more exposure to wildlands. The roofs are asphalt, which have high fire resistance. Some of the utilities in the communities are buried, but at least one line runs above ground. The lots sizes are less than an acre, so the houses are fairly close together. The residences with well manicured lawns have adequate defensible space, but some homes have vegetation directly against the house. Houses have addressing, but they are not reflective. Car and RV storage along the side of many of the roads, especially the west section of Main Street, has the potential to block roads or be impacted from fire. Roads into Louviers are paved and flat, but are narrow (less than 20 feet). Both Kelley Avenue and Airport Road provide ingress to and egress from Louviers. There is a road along the western perimeter of the community, which allows for additional protection from a grass fire. Adequate turnarounds are present. Street signs are easily visible and reflective. The community has dispersed hydrants throughout, although the flows are very low and may not be adequate for extensive firefighting operations.

There are grassy fuels surrounding most of the community. The grasses are the primary carrier of fire, and the fuelbed is continuous. There are ponderosa pines as you enter the community from the north, and Douglas County Open Space has conducted some fuels reduction work in this area. The greatest concern is along an alley, west of Triangle Drive and Main Street. This alley has a large fuel load of cottonwoods and oaks. Wood scraps and fire wood also contribute to the fuel load here. Given moderate weather conditions, active fire behavior is not likely. Flame lengths will be low enough to allow ground crews to directly attack the fire. Higher wind speeds associated with more extreme weather are likely to produce longer flame lengths in both grasses and shrubs. Some crowning and active fire behavior is probable in the conifers, especially in the area outside of the community to the east. Generally, west winds should prevent fire from coming into the community from this direction.

**Louviers Recommendations**

- Thin along the main access/egress routes, which include Main Street and Louviers Avenue/Airport Road (**Figure 25**).
- Mow along the west perimeter of the community to reduce the risk of embers and fire spreading into the community (**Figure 25**).
- Focus on reducing fuels in the area along the alley along the north east side of the community (**Figure 25**).
- Evaluate the water supply in the area to either improve existing hydrants, establish a stored watery supply, and how to use firefighting resources most effectively.
- Keep roadsides clear of debris.
- Remove shrubs and keep grass less than 6" in areas where RVs are stored.
- Limb conifers in open areas to reduce the chance of crown fire.
- A parcel-level analysis is recommended.
- Maintaining adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B* for details).
- Discourage the use of combustible materials for decks, siding, and roofs, especially where homes are upslope from fuels. Replace any shake roofs on homes and outbuildings with non-combustible types such as metal or composite shingle.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers, and kept clean of flammable materials, especially where such openings are located on slopes above fuels.
- Clean leaf litter from roofs and gutters and away from foundations.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Add reflective addressing to all driveways and homes.

Figure 25. Various fuels projects recommended for Louviers



## McArthur Ranch North

**Hazard Rating: Moderate**

**Description:** Most of residences in this community are located on large lots and have horses. There are multiple barns, farm equipment, horse paddocks, and outbuildings. The houses are older construction, but have high fire resistant roofs and a mixture of combustible and non-combustible siding. The well maintained grass yards provide adequate defensible space for the houses. Addressing is frequently not visible and when present, is not reflective. All of the utilities are located below ground. The road into the community is paved, but eventually turns to dirt. There is only one way in and out of the community, but there are adequate turnarounds and the roads are well signed. There is no water supply within the community.

The community backs to an open area to the south that is more open and has dispersed clumps of Gambel oak. Within the community, grass is the main fuel that would carry fire. Because there are very few trees, there is little to no potential for crown fire. Fast spreading surface fire is possible given the continuous nature of the grassy fuels. Slightly longer flame lengths and more intense fire behavior may be seen in the draws near the south eastern part of the community along the boundary with McArthur Ranch South.

### McArthur Ranch North Recommendations

- Evaluate the water supply in the area to either improve existing hydrants, establish a stored watery supply, and how to use firefighting resources most effectively.
- Consider early evacuation and the resources necessary for equine rescue.
- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B* for details).

- Discourage the use of combustible materials for decks, siding, and roofs, especially where homes are upslope from fuels. Replace any shake roofs on homes and outbuildings with non-combustible types such as metal or composite shingle.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers, and kept clean of flammable materials, especially where such openings are located on slopes above fuels.
- Clean leaf litter from roofs and gutters and away from foundations.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Wherever possible, on driveways and private roads longer than 300 feet, add pullouts for emergency apparatus. Turnarounds should be constructed at the end of all driveways and dead-end roads.
- Add reflective addressing to all driveways and homes.

## Plum Valley Heights

**Hazard Rating: Moderate**

**Description:** The community of Plum Valley Heights is located to the west of Highway 85, just north west of the town of Louviers. The homes in the community have older construction, and have an even mixture of non-combustible and shake shingle roofs. The siding and decking materials are a combination of combustible and non-combustible materials. Lot sizes are typically greater than an acre, and there are quite a few out-buildings and areas for horses and RVs. Well maintained yards offer adequate defensible space for many of the structures. All of the utilities are located underground. Addressing is present, but not reflective. The roads within the community are paved and provide adequate turnaround space for emergency vehicles. There are also multiple ways in and out of the community along well marked streets. There are no hydrants in close proximity, nor is there any other water source available within the community.

The main fuel in the area is grass. There are few trees and most are planted for landscaping around the houses. Fire behavior will not include torching, but because the grass fuels are so light, extreme rates of spread are possible. Higher wind speeds will increase the spread of the fire and the flame lengths, potentially sending embers on to roofs and throughout the neighborhood. For this reason, it is important that any vegetation is cleared from the roof, since it can be receptive to fire.

### Plum Valley Heights Recommendations

- Mowing along the perimeter of the community will reduce the rate of spread and diminish fire behavior if fire were to start from outside of the area.
- Consider early evacuation and the resources necessary for equine rescue.
- A parcel-level analysis is recommended.

- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B* for details).
- Discourage the use of combustible materials for decks, siding, and roofs, especially where homes are upslope from fuels. Replace any shake roofs on homes and outbuildings with non-combustible types such as metal or composite shingle.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers, and kept clean of flammable materials, especially where such openings are located on slopes above fuels.
- Clean leaf litter from roofs and gutters and away from foundations.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Add reflective addressing to all driveways and homes.

## The Retreat

**Hazard Rating: Moderate**

**Description:** The Retreat is a neighborhood that sits along Castle Pines Parkway. The irrigated yards are well manicured, which present good defensible space for most of the structures. Those on the west border should increase their defensible space because of the risk of fire impinging from this side. House construction is variable. While many houses have high fire resistant roofs, there are multiple houses with shake shingle roofs. These roofs do not offer the protection from embers that other roofing materials do, and often there is oak directly against these homes. Siding and deck materials are also variable in their level of fire resistance. There are no above ground utilities, which reduce the risk of fire from a downed power line. Home addressing is present but not reflective. The streets all have signs and are reflective and easy to read. Road widths are greater than 24 feet and not steep. Multiple routes exist for ingress and egress. Water is available from hydrants located throughout the community.

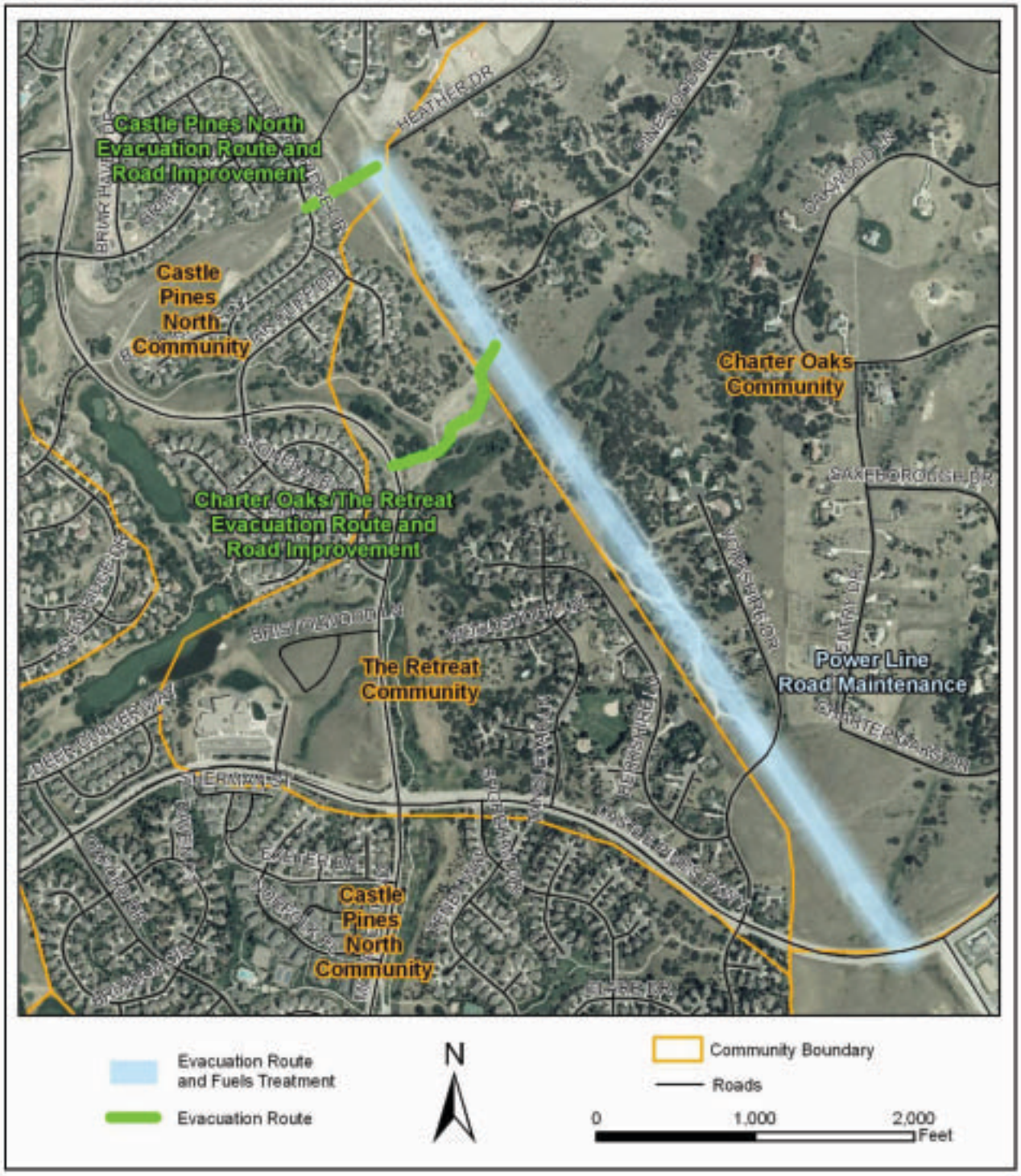
The west side of the community is not developed; there is a large area of open grassland and drainages with Gambel oak. The fuel loading is light, but with a west wind, fire could be directed into the community. The light, flashy nature of grasses produce fast moving surface fires, usually controlled by the direction of the wind. Fire starting to the west of Monarch Boulevard would likely spread toward The Retreat, but because of the large, paved road and the golf course path, it would likely stop at the road. Fire starting to the east of Monarch Boulevard could spread more easily into the neighborhood. Adequate defensible space will protect the houses along the western edge and limit fire spread into the rest of the area.

### The Retreat Recommendations

- **Charter Oaks/The Retreat Evacuation Route:** Along the transmission line there is a rough, undeveloped connection between Charter Oaks and the Retreat. Improve and maintain this route to reduce fuels so it can act as evacuation routes for residents in either community (**Figure 26**). This route can be gated to reduce recreational use.
- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B* for details).

- Discourage the use of combustible materials for decks, siding, and roofs, especially where homes are upslope from fuels. Replace any shake roofs on homes and outbuildings with non-combustible types such as metal or composite shingle.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers, and kept clean of flammable materials, especially where such openings are located on slopes above fuels.
- Clean leaf litter from roofs and gutters and away from foundations.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Add reflective addressing to all driveways and homes.

Figure 26. Charter Oaks/The Retreat evacuation route road improvement



## Titan Road

**Hazard Rating: Moderate**

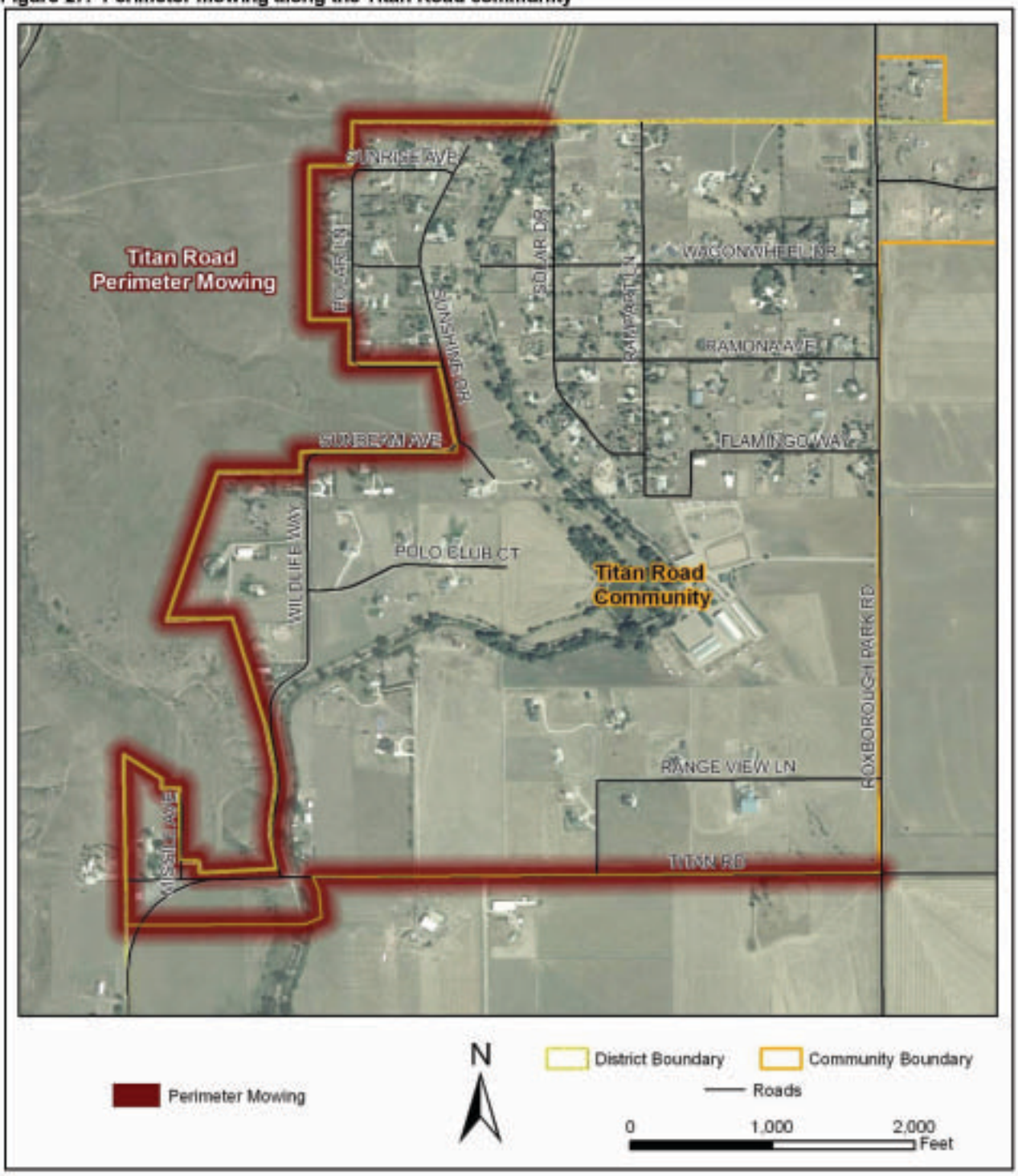
**Description:** As with many of the communities to the west of Highway 85, Titan Road is surrounded by large, grass fields. Many of the houses back to grasslands. The lawns are typically irrigated grass, which provided good defensible space. Lots are large, and many have barns and other outbuildings, which often house horses. Roofs are composite, which provide high resistance to fire. The siding and deck materials are a mixture of combustible and non-combustible materials. Home addressing is limited and often not present. Some defensible space has been completed in the form of landscaped yards. West Titan Road is the main road that leads in and out of the community, but secondary access is available to the north along North Roxborough Park Road. This road eventually leads out to Highway 121 through Chatfield State Park. Although paved, the roads with the community are less than 20 feet wide in place and do not have adequate turnarounds for fire apparatus. There are approximately 8 hydrants, widely dispersed, throughout. The flows from the hydrants are very low and may not be adequate for firefighting operations. There are no cisterns or other water storage.

The majority of the fuels in and surrounding the community are grasses and small shrubs. Because of the large quantities of grass fuels, crown fire is limited. There is an irrigation ditch that transects the area from north to south. An increased number of trees are found along this ditch. A fast moving surface fire is most likely, but there is the possibility of fire transitioning into the trees. High wind speeds will cause the fire to spread more rapidly and produce longer flame lengths. However, light grassy fuels are more easily slowed by roads, sidewalks, and irrigated lawns. Mowing is one of the easiest ways to limit and control fire spread within this fuel type.

**Titan Road Recommendations**

- Conduct frequent mowing along the perimeter of the Titan Road community (**Figure 27**). Tie into the ditch along the north boundary and work along the west side to Titan Road. Continue the mowing along the southern boundary on West Titan Road.
- Consider the resources necessary for equine rescue.
- Evaluate the water supply in the area to either improve existing hydrants, establish a stored watery supply, and how to use firefighting resources most effectively.
- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B* for details).
- Discourage the use of combustible materials for decks, siding, and roofs, especially where homes are upslope from fuels. Replace any shake roofs on homes and outbuildings with non-combustible types such as metal or composite shingle.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers, and kept clean of flammable materials, especially where such openings are located on slopes above fuels.
- Clean leaf litter from roofs and gutters and away from foundations.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Wherever possible, on driveways and private roads longer than 300 feet, add pullouts for emergency apparatus. Turnarounds should be constructed at the end of all driveways and dead-end roads.
- Add reflective addressing to all driveways and homes.

**Figure 27. Perimeter mowing along the Titan Road community**



## Castle Pines North

**Hazard Rating: Low**

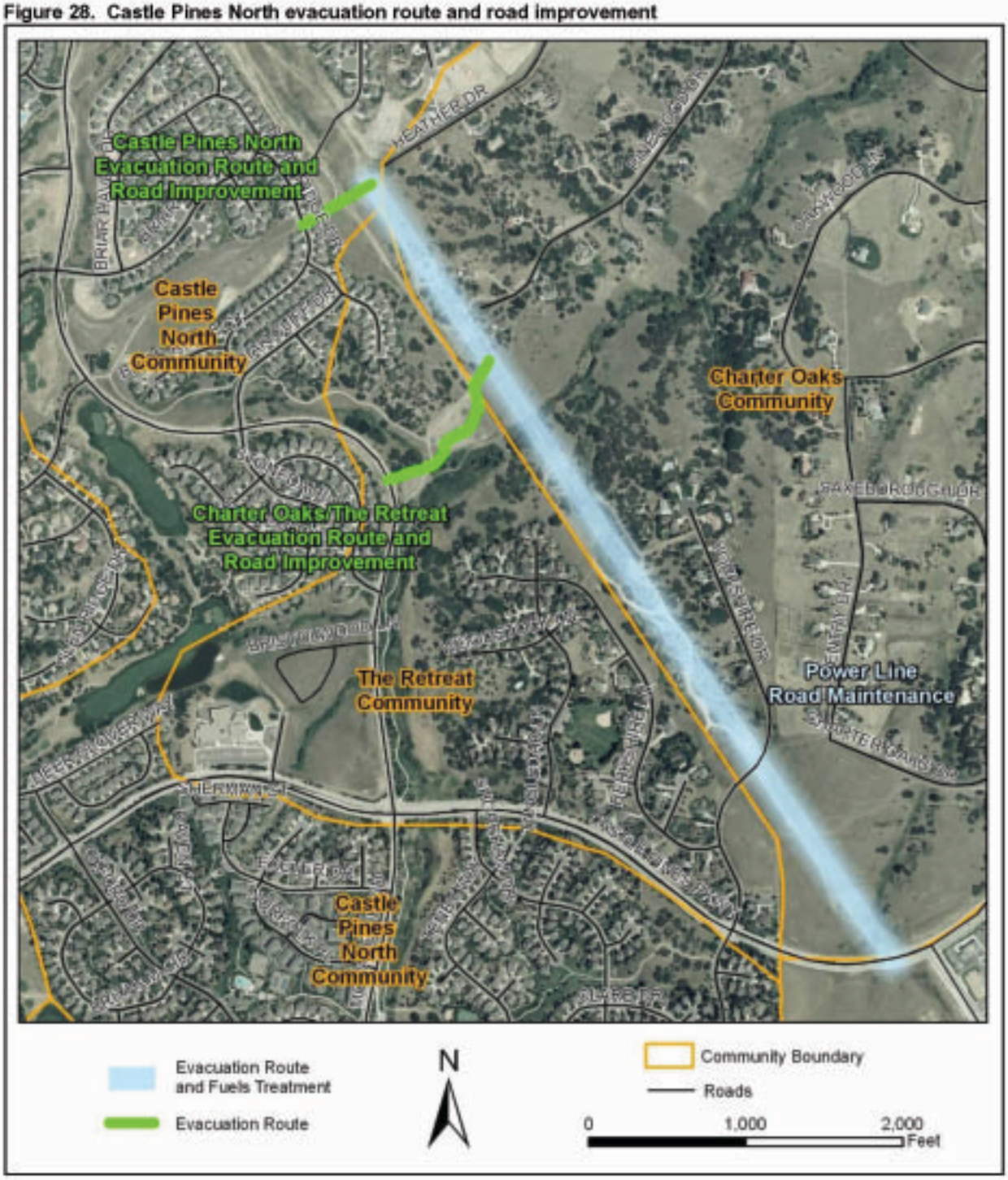
**Description:** Castle Pines North has a low rating because of the numerous roads, well-built homes, lack of continuous vegetation, and close proximity of commercial infrastructure. There is very high housing density within the community. The houses have a mixture of combustible and non-combustible siding and decking materials. The roofs are highly resistant to fire. The close proximity of the houses limits the amount of area where defensible space can be implemented, but maintaining landscaping around one's house is generally adequate. All utilities are located underground, but there is a large transmission line that runs along the north west section of the community and is accessible by a dirt road. There are multiple ways in and out of the community along well marked roads. There are hydrants located throughout the entire community and there are multiple fire stations within close proximity to the subdivisions.

The Ridge at Castle Pines North Golf Course is a prominent feature of the community. Many of the course's greens are located within the community. Because the grass is irrigated, and kept short, it will not burn, and it also acts as a fuelbreak for fire spreading into the community. There are some open areas within the area, mostly to the north, along Hidden Point Boulevard. Taller grasses and some Gambel oak are present within the community. Grass can allow for fast spreading surface fire, but without the tree canopy, torching and crown fire are not possible. The oak does not generally carry fire well, but during certain times of the year, like late fall and early spring, the combination of low relative humidity, high temperatures, and high wind can produce active fire behavior in the oak. Special attention should be given to the houses that border the open, undeveloped areas.

## Castle Pines North Recommendations

- **Castle Pines North Evacuation Route:** There is a rough, undeveloped connection between the transmission lines within Castle Pines North that leads further into the community. By improving and maintaining this route, it can act as evacuation routes for residents in the communities of Castle Pines North, Charter Oaks, or the Retreat (**Figure 28**). This route can be gated to reduce recreational use.
- Because of the large amount of Gambel oak in the area, it is recommended that the oak be managed as described in the *Plains/Prairies Fuels Modification* section of the report. Additional information on oak treatment for this area can be found under the Castle Pines North Metropolitan District in the Areas of Special Interest section of the report.
- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B* for details).
- Discourage the use of combustible materials for decks, siding, and roofs, especially where homes are upslope from fuels. Replace any shake roofs on homes and outbuildings with non-combustible types such as metal or composite shingle.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers, and kept clean of flammable materials, especially where such openings are located on slopes above fuels.
- Clean leaf litter from roofs and gutters and away from foundations.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Add reflective addressing to all driveways and homes.

Figure 28. Castle Pines North evacuation route and road improvement



## Cherokee Ridge Estates

**Hazard Rating: Low**

**Description:** There is a lot of new construction that is occurring in Cherokee Ridge Estates. The houses have large footprints and, as a result, defensible space has been created by the disturbance from construction. New home construction is extremely fire resistant, including highly fire resistant roofs and non-combustible siding. The houses have addresses, but they could be more visible by being reflective. All of the utilities are located below ground. There are multiple ways in and out of the community. The secondary egress travels through the Sherriff Department's training grounds. There is low housing density, so there are not a large number of people that need to be evacuated. The proximity to the highway provides an additional exposure from discarded cigarettes. The roads are well marked with heavy wood signage that is unlikely to burn. There are two 30,000-gallon cisterns located along Aspen Leaf Drive, one to the west and one at the top of the hill.

There are very few trees in the community. The vast majority of the fuels are grasses with small patches of Gambel oak in the small drainages. Topography is fairly flat, but there are some areas with small ravines that have higher quantities of fuels. There is a high potential for a fast spreading grass fire in this community. With the short grass fuels, shorter flame lengths and very little spread into the shrub layer is expected. Longer grass and higher wind speeds may produce long flame lengths and increased rates of spread. As a result, fire is more likely to spread into the oak in the drainages.

### Cherokee Ridge Estates Recommendations

- Mow mowing along Highway 85 to prevent ignitions from the highway spreading into the community.
- A parcel-level analysis is recommended.
- While the homes have adequate defensible space at this time, it is recommended that it is maintained for all homes (*see Home Mitigation* section in the report for details).
- Discourage the use of combustible materials for decks, siding, and roofs, especially where homes are upslope from fuels. Replace any shake roofs on homes and outbuildings with non-combustible types such as metal or composite shingle.

- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers, and kept clean of flammable materials, especially where such openings are located on slopes above fuels.
- Clean leaf litter from roofs and gutters and away from foundations.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Add reflective addressing to all driveways and homes.

## Romar West




**Hazard Rating: Low**

**Description:** Romar West is comprised of several different neighborhoods, each with distinct building features. The communities that border the west edge of the property are larger, gated neighborhoods. For example, the homes along Amber Ridge Drive and Daniel's Gate Drive are comprised of non-combustible siding and roofing materials. Some of the other homes more centrally located have a mixture of combustible and non-combustible siding and decking materials. The roofs have high fire resistance. Lots are less than an acre in size. At least some defensible space has been completed for all of the houses in the area. Landscaped yards and retaining walls are all solid beginnings toward defensible space. Home addressing is not reflective, making emergency response more difficult if there were smoke or during nighttime operations. All of the utilities are underground. There are multiple ways in and out of Romar West along Grigs Road and Daniel's Gate Drive. The main roads had widths are greater than 24 feet and provide sufficient room for fire apparatus to access areas and turn around. However, within the gated neighborhoods, the roads are often narrower than 20', making apparatus access difficult. Hydrants are located within the neighborhoods and provide adequate water supply.

Romar West is bordered by Daniel's Park Open Space on three sides, the north, west, and south. The area to the north is almost entirely patchy grass. The high density of prairie dogs has reduced the amount of grass and shrub vegetation in the area. This is true for other areas in the open space, as well. However, there are large patches of Gambel oak in the open space and within the community. There is the potential for fire spreading from the open space to gain intensity once it gets into the oak. The dominant west and south winds can drive a grass fire into the community. Higher wind speeds are likely to create longer flame lengths and faster

spread through the grass. During the fall and early spring, the oak is most prone to producing active fire behavior, especially on a hot day with low relative humidity and high wind speeds. Ember cast is likely. Grigs Road provides protection for structures from fire coming from the north.

**Romar West Recommendations**

- Although the houses are highly resistant to fire, it is recommended that linked defensible space is implemented for all the homes along the perimeter of the community (**Figure 29**). Linked defensible space will create a fuelbreak along the entire boundary between Romar West and Daniel's Park Open Space.
- Because of the large amount of Gambel oak in the area, it is recommended that the oak be managed as described in the *Plains/Prairies Fuels Modification* section of the report.
- A parcel-level analysis is recommended.
- Adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B* for details).
- Discourage the use of combustible materials for decks, siding, and roofs, especially where homes are upslope from fuels. Replace any shake roofs on homes and outbuildings with non-combustible types such as metal or composite shingle.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers, and kept clean of flammable materials, especially where such openings are located on slopes above fuels.
- Clean leaf litter from roofs and gutters and away from foundations.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments.
- Add reflective addressing to all driveways and homes.

**Figure 29. Perimeter mowing in the Romar West community**

## Whisper Canyon

**Hazard Rating: Low**

**Description:** The west side of the Whisper Canyon community is completely bordered by Daniel's Park Open Space. This is a gated community that is accessible by Whisper Canyon Road and Twisted Oak Drive. The large houses are extremely fire resistant, having non-combustible siding and decking, and highly fire resistant roofing. Defensible space has been created in the area by the clearing that occurred for house construction. Additionally, the houses that border the open space have irrigated yards and non-flammable landscaping directly adjacent to the structure. All utilities are buried. Address are present, but not reflective. Roads are well marked and turnarounds have been built for fire apparatus access. Hydrants are located throughout.

The fuels within the Whisper Canyon community consist of grass, Gambel oak and ponderosa pines. There is not much fuel loading within the community boundaries, but the open space area has a larger ponderosa pine component with oak understory directly abutting the community. Fire behavior within the community is minimal, but there is potential for ember cast from the open space fuels. Clearing roofs, gutters, and decks is extremely important to prevent embers from catching a house on fire. Crowning is unlikely unless the temperature is high, relative hu-

midity is low and wind speeds are high. A surface fire is more likely, given the continuous grass layer. High temperatures, low relative humidity and strong winds could potentially carry fire into the oak and ponderosa pines. Pockets of crowning and torching are possible, but extreme fire behavior is not expected. Some ember cast is also possible.

**Whisper Canyon Recommendations**

- **Whisper Canyon to Castle Pines North Connection:** An unimproved dirt road exists from Horizon Trail in the Whisper Canyon community to Esperanza Drive within Castle Pines North (**Figure 30**). By improving this informal route, an additional egress is made for those within the Whisper Canyon and Castle Pines North communities. To discourage recreational use, this could be gated.
- A parcel-level analysis is recommended.
- Maintain adequate defensible space is recommended for all homes (*see Home Mitigation* section in *Appendix B* for details).
- Discourage the use of combustible materials for decks, siding, and roofs, especially where homes are upslope from fuels. Replace any shake roofs on homes and outbuildings with non-combustible types such as metal or composite shingle.
- Open areas below decks and projections should be enclosed or screened to prevent the ingress of embers, and kept clean of flammable materials, especially where such openings are located on slopes above fuels.
- Clean leaf litter from roofs and gutters and away from foundations.
- Remove wood piles and any flammable yard clutter to at least thirty feet from structures. Wood piles should be located uphill or parallel to homes, never downhill.
- Discourage the planting of flammable ornamentals such as conifers within 30 feet of homes. Encourage the use of fire- and drought-tolerant plants for ornamental plantings, especially within 30 feet of homes (*see Home Mitigation* section in *Appendix B*).
- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments. .
- Add reflective addressing to all driveways and homes.

Figure 30. Evacuation route and road improvement between Whisper Canyon and Castle Pines North

# AREAS OF SPECIAL INTEREST

In addition to residential communities, certain other properties have been identified by stakeholders as being of special concern or interest. In some cases, these areas present special problems for firefighters. A brief description of each of these properties is presented in this section, followed by recommendations designed to address concerns that are specific to the individual property. These recommendations are in addition to, not in place of, other community recommendations. Where a given community or area overlaps with a special interest property, both sets of recommendations should be followed.

## Transmission Line Corridors

Although these lines are inspected and maintained on a regular basis by the power company, a more thorough walkthrough should be performed along the corridors, to make sure there are no obvious issues related to wildfire. Additionally, please note the following:

- Guidelines for working around power lines should be reviewed with firefighters
- Lines should be highlighted on response maps and run books
- Any remaining buildup of fuels along this corridor should be removed

**Figure 31. Power transmission lines**

## Recreation Trails

These areas of high use with light flashy fuels are always a concern for ignition. Fuels build up in the riparian corridor such as cattails, decadent shrubs, and dead cottonwoods should be removed.

- Seasonal mowing 10 feet on both sides should continue along trail corridors
- Annual Riparian area cleanup (fuels and trash debris removal) in coordination with agency and homeowners should be done

**Figure 32. Recreation trails**

## Railroads

In the area near Louviers, the railroad is a significant source of wildfire ignitions. Railroad lines owned by Union Pacific and Burlington North Santa Fe run throughout the western part of the study area, especially along Highway 85. Although it is not the responsibility of the citizens to mow the grass and cut the vegetation on either side of the tracks, citizen groups should be aware of the danger the tracks present and work to maintain the fuels around the community.

## Rueter-Hess Reservoir

The reservoir is scheduled begin filling in 2010. As recreation develops, there will be a higher risk of ignitions in the area.

- Review development plans as they relate to wildfire hazards.
- Trim and maintain vegetation around parking area and other areas of public use.

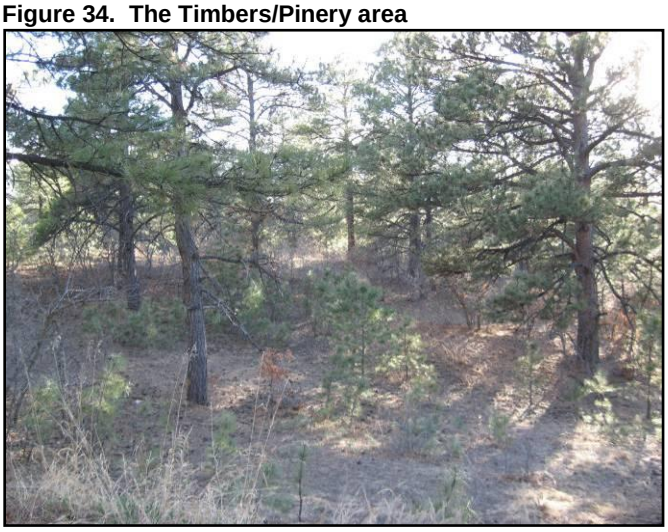
**Figure 33. Rueter-Hess Reservoir**

## The Timbers/Pinery Area

This is an undeveloped area with a network of trails and a history of ignitions. There is a heavy concentration of fuels in the form of overgrown ponderosa pines, shrubs and grass. An ignition here could threaten the adjacent communities directly or from ember cast.

- Remove some overstory trees to increase crown spacing
- Remove understory trees to reduce overall density and ladder fuels
- Limb remaining overstory trees 6-8 feet to reduce ladder fuels
- Remove some of the understory shrubs to reduce fuel loading
- Mow grasses to reduce ignition potential
- Install gates to discourage motor vehicle use

**Figure 34. The Timbers/Pinery area**



## Castle Pines North Metropolitan District Open Space

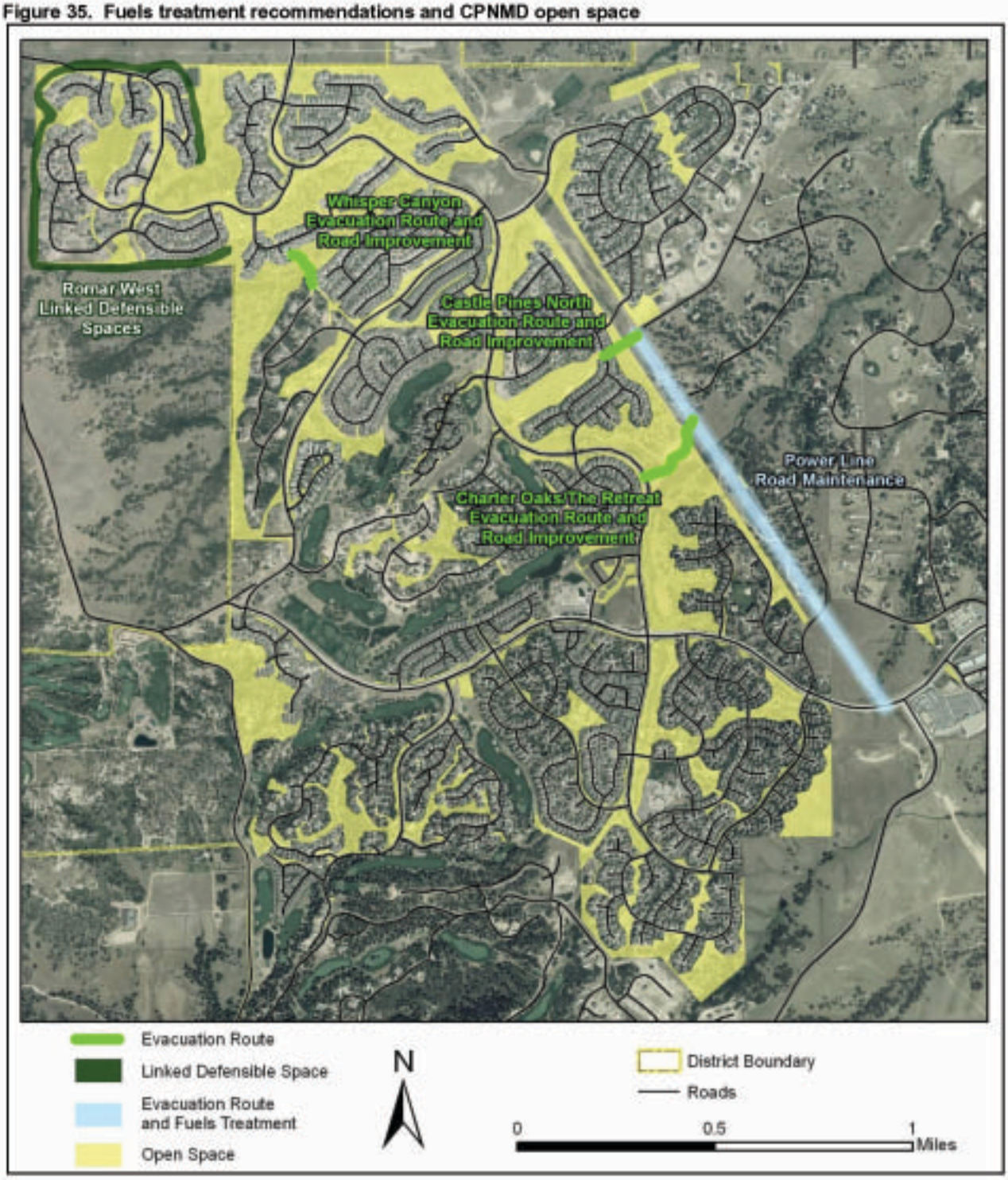
The Castle Pines North Metro District (CPNMD) is a special district that was established in 1984. The Metro District provides water, wastewater and storm water services, and oversees the District-owned parks, trails and open spaces within the community. The Metro District currently serves the Castle Pines North population of nearly 10,000 and has more than 3,200 residential and business customers.

There are five communities that have been identified that exist within the bounds of CPNMD: Buffalo Ridge, Castle Pines North, Forest Park, The Retreat, and Whisper Canyon. Two of these communities are rated as low and three as moderate; however, since these ratings tend to focus more on infrastructure, they do not completely capture the fire potential within the small, isolated open space areas. The houses are built primarily of a combination of combustible and non-combustible materials. They generally have well maintained yards, and the only true wildland exposure is the fuels within the open space areas, highlighted in yellow in **Figure 36**. These pockets of potentially combustible fuels are composed of grass and Gambel oak. While there is little chance of a surface fire directly impinging upon the homes in the communities, there is concern regarding ember cast if the oak were to catch fire. It is possible that embers landing on ornamental vegetation and combustible roofs could cause structure loss and extension to the adjacent homes. Consequently, just because a community has a moderate or even

low rating, it does not diminish the need for vegetation management within the open space areas. The open space areas within the CPNMD provide an excellent opportunity to correctly mitigate the oak and serve as a demonstration site for other communities that need to manage Gambel oak. Depending on management objectives, the treatment varies. In addition to the section on oak treatment in this document (***Appendix B***), the CSFS publication 6.311, "Gambel Oak Management" is a comprehensive guide for various oak treatments.[12] CPNMD land managers should consider working with the CSFS for potential funding and execution of Gambel oak treatment on the open space.

[12] http://www.ext.colostate.edu/pubs/natres/06311.html; referenced 7-31-09

**Figure 35. Fuels treatment recommendations and CPNMD open space**




## RV Storage Areas

There are several RV Storage areas within the study area, especially along Highway 85. The numerous stored vehicles in these areas are surrounded by grassy fuels. Because RVs are typically stored with propane tanks and other unknown hazardous materials, it is important that the vegetation is kept to a minimum. If a fire were to come into a storage area or start within the area, it would be very difficult to contain, especially because of the lack of available water. In

addition, this would present a very hazardous situation to emergency responders and citizens in the vicinity.

- Mow grass and other vegetation in and around the area regularly

**Figure 36. RV storage area**

## Dump near Titan Road Estates

A large dump exists on the eastern most section of Titan Road Estates. Within this dump, hundreds of tires have been disposed of in a ravine. A grass fire in the area could easily spread into this jackpot of fuels. Burning rubber is difficult to control and presents a hazard for firefighters and anyone else that is in the vicinity. It is important that the fire department is aware of this situation and that these tires are removed promptly.

## Communication Tower Array

Within the Happy Canyon community, there is a road that leads to a collection of communication towers. It is gated at the bottom, so the public cannot access this site. The dirt road appears to be well maintained and the area cleared of hazardous fuels, but the community should work with the private landowner to be cognizant of its condition. Because these towers provide critical infrastructure to the surrounding communities, it is recommended that it be maintained and inspected regularly.

**Figure 37. Communication towers**

# CONCLUSIONS AND NEXT STEPS

Local agreements and existing plans were examined, in order to create a coordinated fire management effort between all parties involved. Public land management, private landowners and resident concerns and comments were used to generate this document. The SMFRA CWPP is a guiding document that will facilitate the implementation of future mitigation efforts. The CWPP is a living document, meaning it changes and evolves through time. Consequently, it should be revisited at least annually to assess the relevance and progress on the given recommendations. There is no official way to amend or adapt a CWPP, but any changes must be collaborative and include stakeholder representation.

The results of the analysis were used to determine a variety of fuel reduction projects throughout the study area. These recommendations focus on reducing the threat of wildfire to values within the study area. Additional recommendations are presented throughout the document and appendices, and include public education, home and street addressing, as well as water source availability. The following is a brief list of next steps for SMFRA and the stakeholders:

- Recommendations in the document need to be analyzed, refined, prioritized by South Metro and the stakeholders then presented to the communities for further discussion.
- Determine water supply analysis process for communities with limited water availability.

- Develop an outreach strategy for taking document to the communities for review and identification of specific fuel treatment priorities, other activities, and development of implementation plan.

# GLOSSARY

The following definitions apply to terms used in the South Metro Fire Rescue Authority Community Wildfire Protection Plan.

**1-hour time lag fuels**: Grasses, litter and duff; <1/4 inch in diameter

**10-hour time lag fuels**: Twigs and small stems; 1/4 inch to 1 inch in diameter

**100-hour time lag fuels**: Branches; 1 to 3 inches in diameter

**1000-hour time lag fuels**: Large stems and branches; >3 inches in diameter

**Active Crown Fire:** This is a crown fire in which the entire fuel complex – all fuel strata – become involved, but the crowning phase remains dependent on heat released from the surface fuel strata for continued spread (also called a Running Crown Fire or Continuous Crown Fire).

**ArcGIS 9.x:** This is Geographic Information System (GIS) software that is designed to handle mapping data in a way that can be analyzed, queried, and displayed. ArcGIS is in its ninth major revision and is published by the Environmental Systems Research Institute (ESRI).

**Citizen Safety Zone**: An area that can be used for protection by residents in the event that the main evacuation route is compromised. The area should be cleared of fuels and otherwise well maintained. It should be large enough for all residents of the area to survive an advancing wildfire without special equipment or training.

**Crown Fire (Crowning):** The movement of fire through the crowns of trees or shrubs; may or may not be independent of the surface fire.

**Defensible Space**: An area around a structure where fuels and vegetation are modified cleared or reduced to slow the spread of wildfire toward or from the structure. The design and distance of the defensible space is based on fuels, topography, and the design/materials used in the construction of the structure.

**Energy Release Component:** An index of how hot a fire could burn. ERC is directly related to the 24-hour, potential worst case, total available energy within the flaming front at the head of a fire.

**Extended Defensible Space** (also known as Zone 3): This is a defensible space area where treatment is continued beyond the minimum boundary. This zone focuses on forest management with fuels reduction being a secondary consideration.

**Fine Fuels**: Fuels that are less than 1/4-inch in diameter, such as grass, leaves, draped pine needles, fern, tree moss, and some kinds of slash which, when dry, ignite readily and are consumed rapidly.

**Fire Behavior Potential**: The expected severity of a wildland fire expressed as the rate of spread, the level of crown fire activity, and flame length. This is derived from fire behavior modeling programs using the following inputs: fuels, canopy cover, historical weather averages, elevation, slope, and aspect.

**Fire Danger**: In this document we do not use this as a technical term, due to various and nebulous meanings that have been historically applied.

**Fire Hazard**: Given an ignition, the likelihood and severity of Fire Outcomes (Fire Effects) that result in damage to people, property, and/or the environment. The hazard rating is derived from the Community Assessment and the Fire Behavior Potential.

**Fire Mitigation**: Any action designed to decrease the likelihood of an ignition, reduce Fire Behavior Potential, or to protect property from the impact of undesirable Fire Outcomes.

**Fire Outcomes, AKA Fire Effects**: This is a description of the expected effects of a wildfire on people, property and/or the environment, based on the Fire Behavior Potential and physical presence of Values at Risk. Outcomes can be desirable as well as undesirable.

**Fire Risk**: The probability that an ignition will occur in an area with potential for damaging effects to people, property, and/or the environment. Risk is based primarily on historical ignitions data.

**Flagged Addressing**: A term describing the placement of multiple addresses on a single sign, servicing multiple structures located on a common access.

**FlamMap:** A software package created by the Joint Fire Sciences Program, Rocky Mountain Research Station. The software uses mapped environmental data such as Elevation, Aspect, Slope, and Fuel Model, along with fuel moisture and wind information, to generate predicted fire behavior characteristics such as Flame Length, Crown Fire Activity, and Spread Rate.

**Flame Length**: The distance between the flame tip and the midpoint of the flame depth at the base of the flame (generally the ground surface)—an indicator of fire intensity.

**Fuelbreak**: A natural or constructed discontinuity in a fuel profile that is used to isolate, stop, or reduce the spread of fire. Fuelbreaks may also make retardant lines more effective and serve as control lines for fire suppression actions. Fuelbreaks in the WUI are designed to limit the spread and intensity of crown fire activity.

**ICP (Incident Command Post):** The base camp and command center from which fire suppression operations are directed.

**ISO (Insurance Standards Office):** A leading source of risk (as defined by the insurance industry) information to insurance companies. ISO provides fire risk information in the form of ratings used by insurance companies to price fire insurance products to property owners.

**Jackpot Fuels:** A large concentration of fuels in a given area such as a slash pile.

**Passive Crown Fire:** A crown fire in which individual or small groups of trees torch out (candle), but solid flaming in the canopy fuels cannot be maintained except for short periods.

**Shaded Fuelbreak:** 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.

**Shelter-in-Place Areas**: A method of protecting the public from an advancing wildfire that involves instructing people to remain inside their homes or public buildings until the danger passes. This concept is new to wildfire in the United States, but not to hazardous materials incident response, where time, hazards, and sheer logistics often make evacuation impossible. This concept is the dominant modality for public protection from wildfires in Australia, where fast-moving, short-duration fires in light fuels make evacuation impractical. The success of this tactic depends on a detailed preplan that takes into account the construction type and materials of the building used, topography, depth and type of the fuel profile, as well as current and expected weather and fire behavior.

**Slash:** Debris left after logging, pruning, thinning, or brush cutting. This includes logs, chips, bark, branches, stumps, and broken understory trees or brush.

**Spotting**: Refers to the behavior of a fire producing sparks or embers that are carried by the wind and start new fires beyond the zone of direct ignition by the main fire.

**Structural Triage:** The process of identifying, sorting, and committing resources to a specific structure.

**Surface Fire:** A fire that burns in the surface litter, debris, and small vegetation on the ground.

**Time Lag**: Time needed under specified conditions for a fuel particle to lose about 60% of the difference between its initial moisture content and its equilibrium moisture content.

**Values at Risk:** People, property, ecological elements, and other human and intrinsic values within the project area. Values at Risk are identified by inhabitants as important to the way of life in the study area, and are particularly susceptible to damage from undesirable fire outcomes.

**WHR (Community Wildfire Hazard Rating, AKA Community Assessment)**: A 140-point scale analysis designed to identify factors that increase the potential for and/or severity of undesirable fire outcomes in WUI communities.

**WUI (Wildland Urban Interface)**: The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. This is sometimes referred to as Urban Wildland Interface, or UWI.

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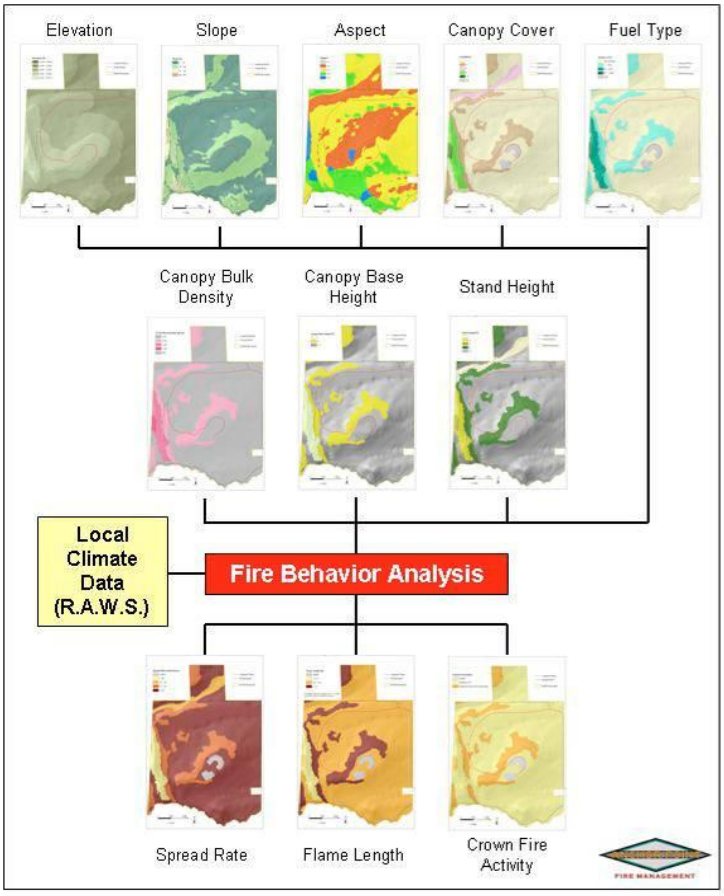
# APPENDIX A
# Fire Behavior Potential Analysis Methodology

## Purpose

The purpose of this document is to describe the methodology used to evaluate the threat represented by physical hazards such as fuels, weather and topography to values at risk in the study area, by modeling their effects on fire behavior potential.

**Figure 1. Flow Chart**




***Note: these graphics are descriptive only; they are not specific to this project.***

The fire behavior potential analysis reports graphically the probable range of spread rate, flame length, and crown fire potential for the analysis area, based upon a set of inputs significant to fire behavior. The model inputs include aspect, slope, elevation, canopy cover, fuel type, canopy bulk density, canopy base height, stand height, and climate data. The model outputs are

determined using FlamMap, which combines surface fire predictions with the potential for crown fire development.[1]

Anchor Point's fire behavior modeling process for surface fire draws heavily from the BEHAVE fire behavior prediction and fuel modeling system. BEHAVE is a nationally recognized set of calculations used to estimate a surface fire's intensity and rate of spread given certain conditions of topography, fuels, and weather.[2]

The BEHAVE modeling system has been used for a variety of applications, including prediction of an ongoing fire, prescribed fire planning, fuel hazard assessment, initial attack dispatch, and fire prevention planning and training. Predictions of wildland surface fire behavior are made for a single point in time and space, given simple user-defined fuels, weather, and topography. Requested values depend on the modeling choices made by the user.

Assumptions of BEHAVE:

- Fire is predicted at the flaming front (fire behavior is not modeled for the time after the flaming front of the fire has passed)
- Fire is free burning (uncontrolled by suppression efforts)
- Behavior is heavily weighted towards the fine fuels (grasses and small-diameter wood)
- Fuels are continuous and uniform
- Fires are considered to be surface fires (crown fire activity is modeled separately)

BEHAVE makes calculations at a single point. In order to make calculations for an entire landscape (important for pre-planning the effects of a wildfire at the community, district, or county scale), fire behavior is modeled using FlamMap which models surface fire predictions and the potential for crown fire development. Crown fire development modeling in FlamMap is based on the work of Van Wagner, are not based on BEHAVE and is run separately from surface fire calculations.[3]

Assumptions of FlamMap:

- Each calculation in a given area is independent of calculations in any other area. Fire is not modeled dynamically across the landscape but statically as a series of individual calculations.
- Weather inputs such as wind and fuel moistures do not change over time
- Fire behavior modeling calculations are performed in a series of uniform squares ("or pixels") across the landscape. These pixels determine the level of detail and nothing smaller than a pixel (30 m in most cases) will be included in the modeling.

---

[1] Mark Finney, Stuart Brittain and Rob Seli., The Joint Fire Sciences Program of the Rocky Mountain Research Station (USDA Forest Service, Missoula, Montana), the Bureau of Land Management and Systems for Environmental Management (Missoula, Montana).

[2] Patricia L. Andrews, producer and designer, Collin D. Bevins, programmer and designer, The Joint Fire Sciences Program of the Rocky Mountain Research Station (USDA Forest Service, Missoula, Montana) and Systems for Environmental Management (Missoula, Montana).

[3] Van Wagner, C.E. 1977. Conditions for the start and spread of a crown fire. *Canadian Journal of Forest Research*. 7: 23-24.

## FlamMap

Anchor Point used FlamMap 3.0 to evaluate the potential fire conditions in the fire behavior study area. The SMFRA district encompasses 114,240 acres (179 square miles). The study area for the fire behavior analysis covers approximately 232,960 acres (364 square miles). Modeling beyond the district boundary provides the user with an analysis of potential fire behavior impacts from adjacent lands. From both a planning and tactical perspective, it is important to evaluate exposures beyond the area of interest.

The study area is broken down into grid cells of 30 m per side inside each of which fire behavior is predicted based on input fuel, weather and topographic information. For the SMFRA FlamMap run, existing data for surface fuels from the LandFire program was used.[4]

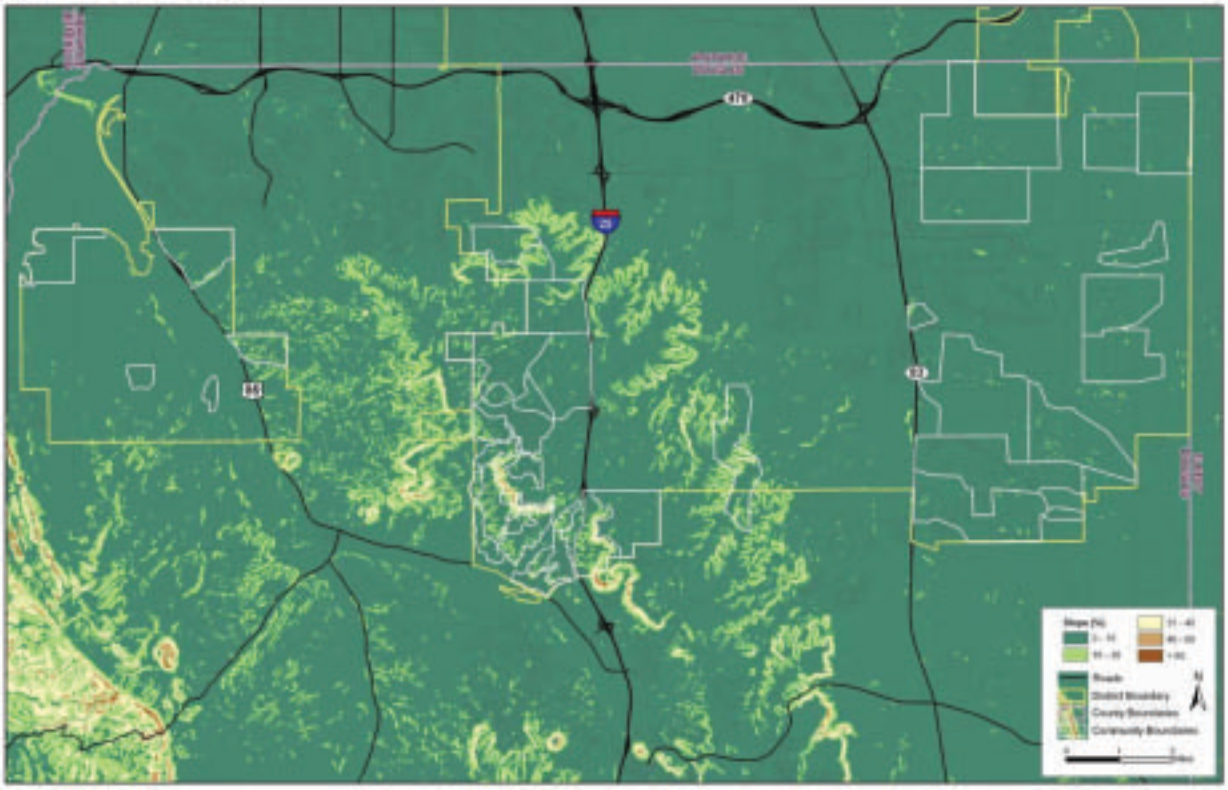
The final set of input data for the FlamMap model consist of reference weather and fuel moisture information summarized from a Remote Automated Weather Station (RAWS) site. See the section below for details on RAWS information.

## Fire Behavior Inputs

The major factors influencing fire behavior are fuels (type and coverage), weather, and topography (aspect, slope and elevation). The following pages contain a brief explanation of each.

[4] http://www.landfire.gov; referenced 7-23-09

**Figure 2. Percent Slope**



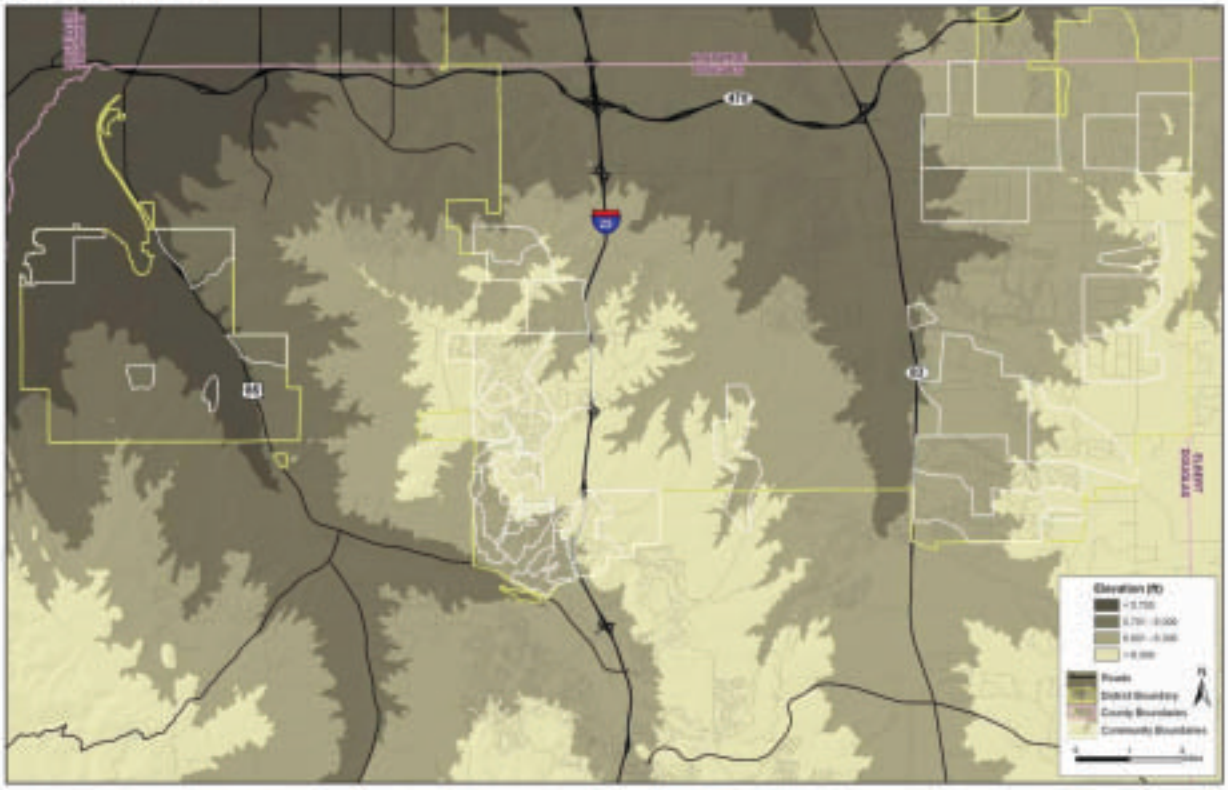
Slopes are shown here as percent (rise/run x100). Steeper slopes intensify fire behavior and thus will contribute to a higher wildfire hazard rating.

**Figure 3. Aspect**

Aspects are shown as degrees from north ranging from 0 to 360 according to their orientation. Aspects are influential in the type and quantity of vegetative fuels. Fuels on south facing slopes tend to be drier and more lightly loaded than fuels on north facing slopes, when all other influences are equal. Aspect also has an influence on plant species dominance.

| Classification | North | East | South | West |
|---|---|---|---|---|
| Range (degrees) | 315-45 | 45-135 | 135-225 | 225-315 |

**Figure 4. Elevation**



Elevations within the study area range from approximately 5,500' to 6,500'. As elevation increases, environmental conditions, fuel species, and characteristics change.

## Reference Weather Used in the Fire Behavior Potential Evaluation

As stated above, climate and fuel moisture inputs for FlamMap were created by using data collected from a RAWS.

At the stakeholder meeting, it was brought to our attention that a RAWS weather station in Franktown might be better suited for the fire behavior analysis.

Anchor Point staff explored using the Franktown data. However, there were some gaps in the data set. Also, it was not in the required format and would need to be converted. Then a decision would be made as to whether the data set is valid. This RAWS could then be put into the national database. (Anchor Point helped facilitate communication with the national staff that is now working on putting the Franktown RAWS on-line.)

We chose to use Ft. Carson RAWS because it is an official NFDRS Fire RAWS that is maintained under the national regulations and guidelines. Also, we used it for the adjacent projects. RAWS data are a good representation of general local weather parameters and are used to calculate fire behavior scenarios. Sometimes RAWS data are unavailable near the area of interest and it is necessary to choose one that may not be as in as close of proximity to the location desired. No RAWS station can ever be as accurate as weather taken on-site at a fire. There are variations in wind, temperature and relative humidity at locations even a few feet apart and fluctuate constantly. These microclimates can cause different fire behavior to occur. The outputs in our report are to be used for pre-planning and are useful to compare areas of the project with a static set of weather inputs. These should never replace real-time weather measurements during a fire.

**Ft. Carson Site Information**

| | |
|---|---|
| Latitude (dd mm' ss") | 38° 39' 31" N |
| Longitude (dd mm' ss") | -104° 51' 14" W |
| Elevation (ft.) | 6745 |

Weather observations for a fourteen year period (1994-2008) from the Ft. Carson Remote Automated Weather Station (RAWS) were used to calculate these conditions. The moderate condition class ($16^{th}$ to $89^{th}$ percentile) was calculated for each variable (1-hour, 10-hour, and 100-hour fuel moisture, woody fuel moisture, herbaceous fuel moisture, and wind speed) using Fire Family Plus. This weather condition class most closely represents an average fire season day.

The extreme conditions class was calculated using $97^{th}$ percentile weather data. In other words, the weather conditions on the most severe fire weather days (sorted by Spread Component) in each season for the fourteen year period were used for this analysis. It is reasonable to assume that similar conditions exist on at least three to five days of the fire season during an average year. In fact, during extreme years such conditions may exist for significantly longer periods. Even these calculations may be conservative compared to observed fire behavior.

The following values, derived from Fire Family Plus, were used as climate/fuel moisture inputs in FlamMap:

**Table 1. Weather conditions used to run FlamMap**

| Moderate Weather Conditions | |
|---|---|
| **Variable** | **Value** |
| 20 ft Wind Speed Upslope | 17 mph |
| Herbaceous Fuel Moisture | 29% |
| Woody Fuel Moisture | 83% |
| 1-hr Fuel Moisture | 5% |
| 10-hr Fuel moisture | 6% |
| 100-hr Fuel moisture | 10% |

| Extreme Weather Conditions | |
|---|---|
| **Variable** | **Value** |
| 20 ft Wind Speed SW | 32 mph |
| Herbaceous Fuel Moisture | 38% |
| Woody Fuel Moisture | 72% |
| 1-hr Fuel Moisture | 4% |
| 10-hr Fuel Moisture | 4% |
| 100-hr Fuel Moisture | 6% |

**Note: Strong winds at 20-feet will feel significantly less noticeable on the skin at ground level. For example, a "gentle breeze" on the skin may constitute an 11 MPH wind at 20-feet, adding one of the components necessary for extreme weather conditions.**

## Dead Fuel Moisture

Dead fuel moisture responds solely to ambient environmental conditions and is critical in determining fire potential. Dead fuel moistures are classed by time lag. A fuel's time lag is proportional to its diameter and is loosely defined as the time it takes a fuel particle to reach two-thirds of its way to equilibrium with its local environment. Dead fuels in the National Fire Danger Rating System (NFDRS) fall into four classes: 1, 10, 100, and 1,000-hour.[5]

## Live Fuel Moisture

Live fuel moisture is the amount of water in a fuel, expressed as a percent of the oven-dry weight of that fuel. Fuel moisture between 300% and 30% is considered live. Anything below 30% is considered dead fuel. Fuel moistures can exceed 100% because the living cells can expand beyond their normal size to hold more water when available.

[5]U.S. National Fire Danger Rating System Overview: INT-GTR-367 - FIRES: Fire Information Retrieval and Evaluation System - a Program for Fire Danger Rating Analysis

## Fuel Models and Fire Behavior

In the context of fire behavior modeling, “fuel models” are a set of numbers that describe fuels in terms that the fire behavior modeling equations can use directly. There are seven characteristics used to categorize fuel models:

- Fuel Loading
- Size and Shape
- Compactness
- Horizontal Continuity
- Vertical Arrangement
- Moisture Content
- Chemical Content

Each of the major fuel types present in the study area are described below, in terms of the characteristics that coincide with that fuel model. Unless otherwise noted, fuel model descriptions are taken from Scott and Burgan’s *Standard Fire Behavior Fuel Models: A Comprehensive Set for Use with Rothermel’s Surface Fire Spread Model,* a national standard guide to fuel modeling.[6]

**Vegetation for the project area may or may not be specifically listed in the description**. **The photos, taken from the guide, are only an aid to help visualize the characteristics of the model, and may not be the same as the actual vegetation in the study area.**

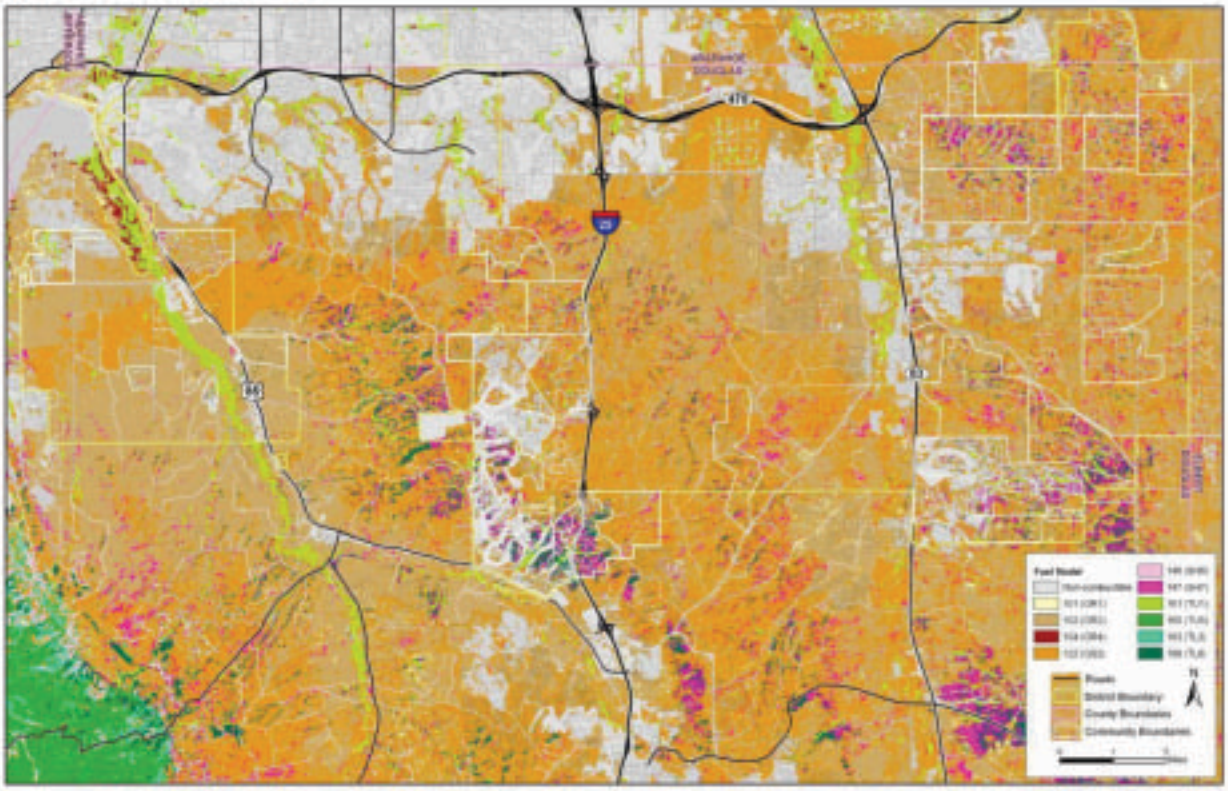
A table showing a range of surface fire behavior under moderate burning conditions based on the **BEHAVE** system is also included.

In *Standard Fire Behavior Fuel Models*, Scott and Burgan describe 40 fuel models in the following five groups: Grass (GR), Grass/Shrub (GS), Shrub (SH), Timber Understory (TU) and Timber Litter (TL). The study area is represented primarily by ten of these fuel models (FM): FM101 (GR1), FM102 (GR2), FM104 (GR4), FM122 (GS2), FM146 (SH6), FM147 (SH7), FM161 (TU1), FM165 (TU5), FM183 (TL3) and FM188 (TL8). Other fuel models exist, but not in quantities sufficient to significantly influence fire behavior in the Wildland Urban Interface. **Figure 5** displays the fuel types graphically for the study area.

Lakes and the non-combustible category on the map legend indicate areas of insignificant combustibility.

[6] Scott, J.H. and R. Burgan. 2005. *Standard Fire Behavior Fuel Models: A Comprehensive Set for Use with Rothermel’s Surface Fire Spread Model*, United States Department of Agriculture Forest Service, RMRS-GTR-153.

**Figure 5. SMFR Fuel Models**



# FUEL MODEL 101 (GR1)

**Figure 6. Short, Sparse Dry-Climate Grass (Dynamic)**

## Description

The primary carrier of fire in GR1 is sparse grass, though small amounts of fine dead fuel may be present. The grass in GR1 is generally short, either naturally or by grazing, and may be sparse or discontinuous. The moisture of extinction of GR1 is indicative of a dry climate fuel bed, but GR1 may also be applied in high-extinction moisture fuel beds because in both cases predicted spread rate and flame length are low compared to other GR models.

## Fire Behavior

Spread rate moderate; flame length low.

| | |
|---|---|
| Fine fuel load (t/ac) | 0.40 |
| Characteristic SAV (ft-1) | 2054 |
| Packing ratio (dimensionless) | 0.00143 |
| Extinction moisture content (percent) | 15 |

## FUEL MODEL 101 (GR1)

**Rate of spread in chains/hour**
**(1 chain=66 ft) (80 chains/HR = 1 MPH)**

| Fine Dead Fuel moisture % | Mid-flame Wind Speed | | | | | |
|---|---|---|---|---|---|---|
| | 2.0 | 4.0 | 6.0 | 8.0 | 10.0 | 12.0 |
| 2.0 | 9.8 | 25 | 37.6 | 37.6 | 37.6 | 37.6 |
| 4.0 | 7.4 | 19 | 21.4 | 21.4 | 21.4 | 21.4 |
| 6.0 | 6.3 | 16.1 | 16.1 | 16.1 | 16.1 | 16.1 |
| 8.0 | 5.7 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 |
| 10.0 | 5 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 |

**10-hr fuel = 6%, 100-hr fuel = 10%, herbaceous fuel moisture = 30%, slope = 10%**

**Flame Length in Feet**

| Fine Dead Fuel moisture % | Mid-flame Wind Speed | | | | | |
|---|---|---|---|---|---|---|
| | 2.0 | 4.0 | 6.0 | 8.0 | 10.0 | 12.0 |
| 2.0 | 1.7 | 2.6 | 3.1 | 3.1 | 3.1 | 3.1 |
| 4.0 | 1.4 | 2.1 | 2.2 | 2.2 | 2.2 | 2.2 |
| 6.0 | 1.2 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 |
| 8.0 | 1.1 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 |
| 10.0 | 1 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |

# FUEL MODEL 102 (GR2)

**Figure 7. Moderately Coarse Continuous Grass**

## Description

The primary carrier of fire in GR2 is grass, though small amounts of fine dead fuel may be present. Load is greater than GR1, and fuel bed may be more continuous. Shrubs, if present, do not affect fire behavior.

## Fire Behavior

Spread rate high; flame length moderate.

| | |
|---|---|
| Fine fuel load (t/ac) | 1.10 |
| Characteristic SAV (ft-1) | 1820 |
| Packing ratio (dimensionless) | 0.00158 |
| Extinction moisture content (percent) | 15 |

# FUEL MODEL 102 (GR2)

**Rate of spread in chains/hour**
**(1 chain=66 ft) (80 chains/HR = 1 MPH)**

| Fine Dead Fuel moisture % | Mid-flame Wind Speed | | | | | |
|---|---|---|---|---|---|---|
| | 2.0 | 4.0 | 6.0 | 8.0 | 10.0 | 12.0 |
| 2.0 | 23.5 | 57.2 | 99.8 | 149.4 | 205.2 | 266.2 |
| 4.0 | 17.9 | 43.4 | 75.8 | 113.5 | 155.9 | 192.1 |
| 6.0 | 15.2 | 37.1 | 64.7 | 96.9 | 133 | 145 |
| 8.0 | 13.8 | 33.5 | 58.5 | 87.6 | 120.2 | 124.9 |
| 10.0 | 12 | 29.3 | 51.1 | 76.6 | 98.7 | 98.7 |
| 12.0 | 9 | 21.8 | 38 | 52.5 | 52.5 | 52.5 |

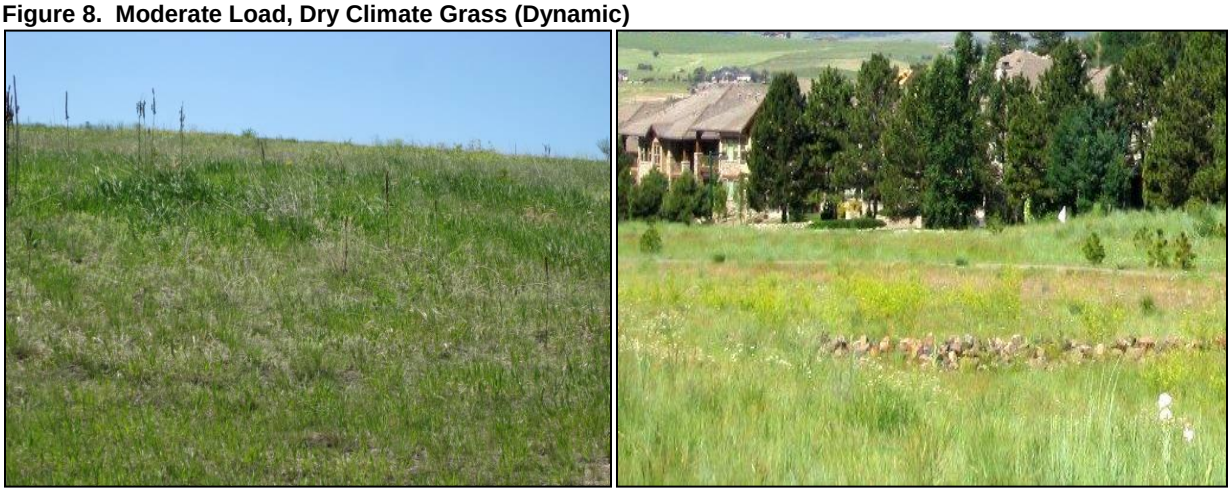
**10-hr fuel 6%, 100 = 10%, herbaceous fuel moisture = 30%, slope 10%**

**Flame Length in Feet**

| Fine Dead Fuel moisture % | Mid-flame Wind Speed | | | | | |
|---|---|---|---|---|---|---|
| | 2.0 | 4.0 | 6.0 | 8.0 | 10.0 | 12.0 |
| 2.0 | 4.2 | 6.3 | 8.1 | 9.7 | 11.3 | 12.7 |
| 4.0 | 3.3 | 5 | 6.5 | 7.8 | 9.1 | 10 |
| 6.0 | 3 | 4.5 | 5.8 | 7 | 8.1 | 8.4 |
| 8.0 | 2.8 | 4.2 | 5.5 | 6.6 | 7.6 | 7.8 |
| 10.0 | 2.6 | 3.9 | 5 | 6 | 6.7 | 6.7 |
| 12.0 | 2 | 3 | 3.9 | 4.5 | 4.5 | 4.5 |

# FUEL MODEL 104 (GR4)

**Figure 8. Moderate Load, Dry Climate Grass (Dynamic)**



## Description:

The primary carrier of fire in GR4 is continuous, dry-climate grass. Load and depth are greater than GR2; fuel bed depth is about 2 feet.

## Fire Behavior

Spread rate very high; flame length high.

| | |
|---|---|
| Fine fuel load (t/ac) | 2.15 |
| Characteristic SAV (ft-1) | 1826 |
| Packing ratio (dimensionless) | 0.00154 |
| Extinction moisture content (percent) | 15 |

# FUEL MODEL 104 (GR4)

**Rate of spread in chains/hour**
**(1 chain=66 ft) (80 chains/HR = 1 MPH)**

| Fine Dead Fuel moisture % | Mid-flame Wind Speed | | | | | |
|---|---|---|---|---|---|---|
| | 2.0 | 4.0 | 6.0 | 8.0 | 10.0 | 12.0 |
| 2.0 | 14.5 | 31.8 | 52.6 | 76.3 | 102.4 | 130.4 |
| 4.0 | 13.5 | 29.4 | 48.8 | 70.7 | 94.8 | 120.8 |
| 6.0 | 12.6 | 27.5 | 45.7 | 66.2 | 88.8 | 113.1 |
| 8.0 | 11.9 | 26 | 43.2 | 62.6 | 83.9 | 106.9 |
| 10.0 | 11.4 | 24.9 | 41.2 | 59.8 | 80.1 | 102.1 |
| 12.0 | 10.9 | 23.9 | 39.7 | 57.5 | 77.1 | 98.3 |

**10-hr fuel = 6%, 100-hr fuel = 10%, herbaceous fuel moisture = 30%, woody fuel moisture = 83%, slope = 10%**

**Flame Length in Feet**

| Fine Dead Fuel moisture % | Mid-flame Wind Speed | | | | | |
|---|---|---|---|---|---|---|
| | 2.0 | 4.0 | 6.0 | 8.0 | 10.0 | 12.0 |
| 2.0 | 11.6 | 16.7 | 21 | 25 | 28.6 | 31.9 |
| 4.0 | 10.9 | 15.6 | 19.7 | 23.4 | 26.8 | 29.9 |
| 6.0 | 10.3 | 14.8 | 18.7 | 22.2 | 25.4 | 28.3 |
| 8.0 | 9.9 | 14.1 | 17.8 | 21.2 | 24.2 | 27.1 |
| 10.0 | 9.5 | 13.6 | 17.2 | 20.4 | 23.3 | 26.1 |
| 12.0 | 9.2 | 13.2 | 16.7 | 19.8 | 22.7 | 25.3 |

# FUEL MODEL 122 (GS2)

**Figure 9. Moderate Load, Dry Climate Grass-Shrub (Dynamic)**

## Description

The primary carrier of fire in GS2 is grass and shrubs combined. All GS fuel models are dynamic, meaning that their live herbaceous fuel load shifts from live to dead as a function of live herbaceous moisture content. The effect of live herbaceous moisture content on spread rate and intensity is strong and depends on the relative amount of grass and shrub load in the fuel model. Shrubs are 1 to 3 feet high, grass load is moderate.

## Fire Behavior

Spread rate is high; flame length moderate.

| | |
|---|---|
| Fine fuel load (t/ac) | 2.1 |
| Characteristic SAV (ft-1) | 1827 |
| Packing ratio (dimensionless) | 0.00249 |
| Extinction moisture content (percent) | 15 |

# FUEL MODEL 122 (GS2)

**Rate of spread in chains/hour**
**(1 chain=66 ft) (80 chains/HR = 1 MPH)**

| Fine Dead Fuel moisture % | Mid-flame Wind Speed | | | | | |
|---|---|---|---|---|---|---|
| | 2.0 | 4.0 | 6.0 | 8.0 | 10.0 | 12.0 |
| 2.0 | 10.4 | 24.9 | 43.3 | 64.8 | 88.9 | 115.3 |
| 4.0 | 9 | 21.7 | 37.7 | 56.4 | 77.4 | 100.4 |
| 6.0 | 8.3 | 20 | 34.7 | 52 | 71.4 | 92.6 |
| 8.0 | 7.9 | 19 | 33 | 49.4 | 67.8 | 87.9 |
| 10.0 | 7.4 | 17.7 | 30.7 | 46 | 63.1 | 81.9 |
| 12.0 | 4 | 9.6 | 16.7 | 25 | 34.3 | 42.3 |

**10-hr fuel = 6%, herbaceous fuel moisture = 30%, woody fuel moisture = 83%, slope = 10%**

**Flame Length in Feet**

| Fine Dead Fuel moisture % | Mid-flame Wind Speed | | | | | |
|---|---|---|---|---|---|---|
| | 2.0 | 4.0 | 6.0 | 8.0 | 10.0 | 12.0 |
| 2.0 | 3.9 | 5.8 | 7.5 | 9 | 10.4 | 11.8 |
| 4.0 | 3.4 | 5.2 | 6.6 | 8 | 9.3 | 10.4 |
| 6.0 | 3.2 | 4.8 | 6.2 | 7.5 | 8.7 | 9.8 |
| 8.0 | 3.1 | 4.6 | 6 | 7.2 | 8.3 | 9.4 |
| 10.0 | 2.9 | 4.4 | 5.6 | 6.8 | 7.8 | 8.8 |
| 12.0 | 1.7 | 2.5 | 3.2 | 3.9 | 4.5 | 5 |

# FUEL MODEL 146 (SH6)

**Figure 10. Low Load, Humid Climate Shrub**

## Description

The primary carrier of fire in SH6 is woody shrubs and shrub litter. Dense shrubs; little or no herbaceous fuel; fuel bed depth about 2 feet.

## Fire Behavior

Spread rate is high; flame length high.

| | |
|---|---|
| Fine fuel load (t/ac) | 4.3 |
| Characteristic SAV (ft-1) | 1144 |
| Packing ratio (dimensionless) | 0.00412 |
| Extinction moisture content (percent) | 30 |

## FUEL MODEL 146 (SH6)

**Rate of spread in chains/hour**
**(1 chain=66 ft) (80 chains/HR = 1 MPH)**

| Fine Dead Fuel moisture % | Mid-flame Wind Speed | | | | | |
|---|---|---|---|---|---|---|
| | 2.0 | 4.0 | 6.0 | 8.0 | 10.0 | 12.0 |
| 2.0 | 12.2 | 24.5 | 37.6 | 51.3 | 65.5 | 80.1 |
| 4.0 | 11 | 22 | 33.8 | 46.2 | 58.9 | 72.1 |
| 6.0 | 10.1 | 20.2 | 31 | 42.3 | 54 | 66 |
| 8.0 | 9.4 | 18.8 | 28.9 | 39.4 | 50.3 | 61.5 |
| 10.0 | 8.9 | 17.8 | 27.3 | 37.3 | 47.6 | 58.2 |
| 12.0 | 8.5 | 17 | 26.2 | 35.7 | 45.6 | 55.8 |

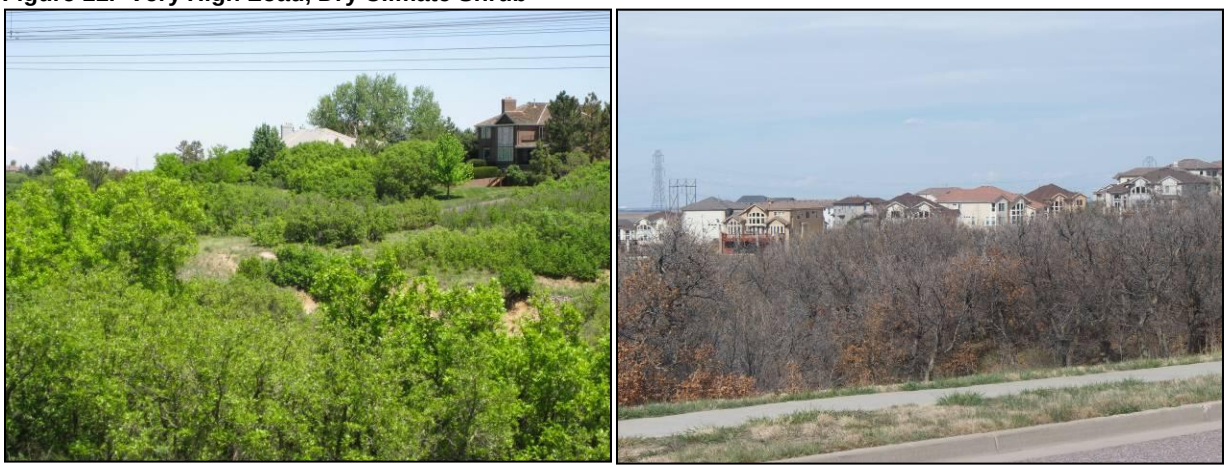
**10-hr fuel = 6%, woody fuel moisture = 83%, slope = 10%**

**Flame Length in Feet**

| Fine Dead Fuel moisture % | Mid-flame Wind Speed | | | | | |
|---|---|---|---|---|---|---|
| | 2.0 | 4.0 | 6.0 | 8.0 | 10.0 | 12.0 |
| 2.0 | 7.4 | 10.1 | 12.3 | 14.2 | 15.9 | 17.5 |
| 4.0 | 6.7 | 9.2 | 11.3 | 13 | 14.5 | 15.9 |
| 6.0 | 6.2 | 8.6 | 10.4 | 12.1 | 13.5 | 14.8 |
| 8.0 | 5.9 | 8.1 | 9.9 | 11.4 | 12.7 | 14 |
| 10.0 | 5.6 | 7.7 | 9.4 | 10.9 | 12.2 | 13.4 |
| 12.0 | 5.4 | 7.5 | 9.1 | 10.5 | 11.8 | 12.9 |

# FUEL MODEL 147 (SH7)

**Figure 11. Very High Load, Dry Climate Shrub**



## Description

The primary carrier of fire in SH7 is woody shrubs and shrub litter. Very heavy shrub load; depth 4 to 6 feet. Spread rate lower than SH5, but flame length similar.

## Fire Behavior

Spread rate is high; flame length very high.

| | |
|---|---|
| Fine fuel load (t/ac) | 6.9 |
| Characteristic SAV (ft-1) | 1233 |
| Packing ratio (dimensionless) | 0.00344 |
| Extinction moisture content (percent) | 15 |

# FUEL MODEL 147 (SH7)

**Rate of spread in chains/hour**
**(1 chain=66 ft) (80 chains/HR = 1 MPH)**

| | | Mid-flame Wind Speed | | | | | |
|---|---|---|---|---|---|---|---|
| Fine Dead Fuel moisture % | | 2.0 | 4.0 | 6.0 | 8.0 | 10.0 | 12.0 |
| | 2.0 | 17.9 | 37 | 58 | 80.2 | 103.5 | 127.7 |
| | 4.0 | 16.4 | 33.8 | 52.9 | 73.3 | 94.5 | 116.6 |
| | 6.0 | 15.5 | 31.9 | 50 | 69.2 | 89.3 | 110.2 |
| | 8.0 | 14.9 | 30.7 | 48.1 | 66.6 | 85.9 | 105.9 |
| | 10.0 | 14.2 | 29.4 | 46 | 63.7 | 82.2 | 101.4 |
| | 12.0 | 13.2 | 27.2 | 42.6 | 58.9 | 76.1 | 93.8 |

**10-hr fuel = 6%, 100-hr fuel = 10% woody fuel moisture = 83%, slope = 10%**

**Flame Length in Feet**

| | | Mid-flame Wind Speed | | | | | |
|---|---|---|---|---|---|---|---|
| Fine Dead Fuel moisture % | | 2.0 | 4.0 | 6.0 | 8.0 | 10.0 | 12.0 |
| | 2.0 | 9.8 | 13.7 | 16.8 | 19.6 | 22 | 24.2 |
| | 4.0 | 9.1 | 12.6 | 15.5 | 18.1 | 20.3 | 22.4 |
| | 6.0 | 8.6 | 12 | 14.8 | 17.2 | 19.3 | 21.3 |
| | 8.0 | 8.4 | 11.7 | 14.3 | 16.6 | 18.7 | 20.6 |
| | 10.0 | 8.1 | 11.2 | 13.8 | 16 | 18 | 19.9 |
| | 12.0 | 7.5 | 10.5 | 12.9 | 15 | 16.8 | 18.5 |

# FUEL MODEL 161 (TU1)

**Figure 12. Low Load, Dry Climate Timber-Grass-Shrub (Dynamic)**

## Description

The primary carrier of fire in the TU fuel models is forest litter in combination with herbaceous or shrub fuels. TU1 and TU3 contain live herbaceous load and are dynamic, meaning that their live herbaceous fuel load is allocated between live and dead as a function of live herbaceous moisture content. The effect of live herbaceous moisture content on spread rate and intensity is strong and depends on the relative amount of grass and shrub load in the fuel model. The primary carrier of fire in TU1 is a low load of grass and/or shrub with litter.

## Fire Behavior

Spread rate is low; flame length low.

| | |
|---|---|
| Fine fuel load (t/ac) | 1.3 |
| Characteristic SAV (ft-1) | 1606 |
| Packing ratio (dimensionless) | 0.00885 |
| Extinction moisture content (percent) | 20 |

# FUEL MODEL 161 (TU1)

**Rate of spread in chains/hour**
**(1 chain=66 ft) (80 chains/HR = 1 MPH)**

| Fine Dead Fuel moisture % | Mid-flame Wind Speed | | | | | |
|---|---|---|---|---|---|---|
| | 2.0 | 4.0 | 6.0 | 8.0 | 10.0 | 12.0 |
| 2.0 | 1.4 | 3 | 4.9 | 7.1 | 9.4 | 12 |
| 4.0 | 1.3 | 2.8 | 4.6 | 6.6 | 8.8 | 11.2 |
| 6.0 | 1.2 | 2.6 | 4.3 | 6.3 | 8.4 | 10.7 |
| 8.0 | 1.2 | 2.5 | 4.2 | 6.1 | 8.1 | 10.3 |
| 10.0 | 1.1 | 2.5 | 4.1 | 5.9 | 7.9 | 10 |
| 12.0 | 1.1 | 2.4 | 3.9 | 5.6 | 7.5 | 9.5 |

**10-hr fuel = 6%, 100-hr fuel = 10%, herbaceous fuel moisture = 30%, woody fuel moisture = 83%, slope = 10%**

**Flame Length in Feet**

| Fine Dead Fuel moisture % | Mid-flame Wind Speed | | | | | |
|---|---|---|---|---|---|---|
| | 2.0 | 4.0 | 6.0 | 8.0 | 10.0 | 12.0 |
| 2.0 | 1.4 | 2 | 2.5 | 2.9 | 3.3 | 3.7 |
| 4.0 | 1.3 | 1.8 | 2.3 | 2.7 | 3.1 | 3.5 |
| 6.0 | 1.2 | 1.8 | 2.2 | 2.6 | 3 | 3.4 |
| 8.0 | 1.2 | 1.7 | 2.2 | 2.6 | 2.9 | 3.3 |
| 10.0 | 1.2 | 1.7 | 2.1 | 2.5 | 2.9 | 3.2 |
| 12.0 | 1.1 | 1.6 | 2 | 2.4 | 2.8 | 3.1 |

# FUEL MODEL 165 (TU5)

**Figure 13. Very High Load, Dry Climate Timber-Shrub**

## Description

The primary carrier of fire in TU5 is heavy forest litter with a shrub or small tree understory.

## Fire Behavior

Spread rate is moderate; flame length moderate.

| | |
|---|---|
| Fine fuel load (t/ac) | 6.9 |
| Characteristic SAV (ft-1) | 1233 |
| Packing ratio (dimensionless) | 0.00344 |
| Extinction moisture content (percent) | 15 |

## FUEL MODEL 165 (TU5)

**Rate of spread in chains/hour**
**(1 chain=66 ft) (80 chains/HR = 1 MPH)**

| Fine Dead Fuel moisture % | Mid-flame Wind Speed | | | | | |
|---|---|---|---|---|---|---|
| | 2.0 | 4.0 | 6.0 | 8.0 | 10.0 | 12.0 |
| 2.0 | 5.1 | 9.8 | 14.9 | 20.3 | 25.9 | 31.8 |
| 4.0 | 4.5 | 8.7 | 13.2 | 18 | 23 | 28.2 |
| 6.0 | 4.1 | 7.9 | 12 | 16.3 | 20.9 | 25.6 |
| 8.0 | 3.8 | 7.3 | 11.1 | 15.1 | 19.3 | 23.7 |
| 10.0 | 3.6 | 6.9 | 10.4 | 14.2 | 18.2 | 22.3 |
| 12.0 | 3.4 | 6.5 | 9.9 | 13.5 | 17.2 | 21.1 |

**10-hr fuel = 6%, 100-hr fuel = 10% woody fuel moisture = 83%, slope = 10%**

**Flame Length in Feet**

| Fine Dead Fuel moisture % | Mid-flame Wind Speed | | | | | |
|---|---|---|---|---|---|---|
| | 2.0 | 4.0 | 6.0 | 8.0 | 10.0 | 12.0 |
| 2.0 | 6 | 8.1 | 9.9 | 11.4 | 12.8 | 14 |
| 4.0 | 5.5 | 7.4 | 9 | 10.4 | 11.6 | 12.7 |
| 6.0 | 5.1 | 6.9 | 8.3 | 9.6 | 10.8 | 11.8 |
| 8.0 | 4.8 | 6.5 | 7.9 | 9.1 | 10.2 | 11.2 |
| 10.0 | 4.6 | 6.2 | 7.5 | 8.7 | 9.7 | 10.7 |
| 12.0 | 4.5 | 6 | 7.3 | 8.4 | 9.4 | 10.3 |

# FUEL MODEL 183 (TL3)

**Figure 14. Moderate Load, Conifer Litter**

## Description

The primary carrier of fire in the TL fuel models is dead and down woody fuel. Live fuel, if present, has little effect on fire behavior. The primary carrier of fire in TL3 is moderate load conifer litter with a light load of coarse fuels.

## Fire Behavior

Spread rate is very low; flame length low.

| | |
|---|---|
| Fine fuel load (t/ac) | 1.3 |
| Characteristic SAV (ft-1) | 1606 |
| Packing ratio (dimensionless) | 0.00885 |
| Extinction moisture content (percent) | 20 |

# FUEL MODEL 183 (TL3)

**Rate of spread in chains/hour**
**(1 chain=66 ft) (80 chains/HR = 1 MPH)**

| Fine Dead Fuel moisture % | Mid-flame Wind Speed | | | | | |
|---|---|---|---|---|---|---|
| | 2.0 | 4.0 | 6.0 | 8.0 | 10.0 | 12.0 |
| 2.0 | 0.9 | 1.9 | 3.1 | 4.3 | 5.4 | 5.4 |
| 4.0 | 0.8 | 1.6 | 2.5 | 3.6 | 3.9 | 3.9 |
| 6.0 | 0.7 | 1.4 | 2.2 | 3.1 | 3.1 | 3.1 |
| 8.0 | 0.6 | 1.2 | 2 | 2.7 | 2.7 | 2.7 |
| 10.0 | 0.6 | 1.1 | 1.8 | 2.4 | 2.4 | 2.4 |
| 12.0 | 0.5 | 1.1 | 1.7 | 2.2 | 2.2 | 2.2 |

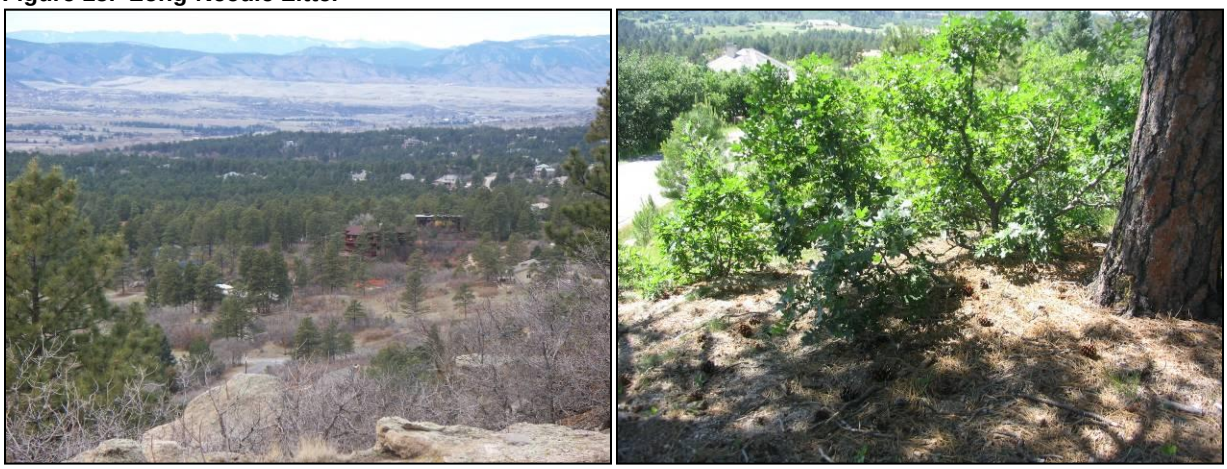
**10-hr fuel = 6%, 100-hr fuel = 10%, slope = 10%**

**Flame Length in Feet**

| Fine Dead Fuel moisture % | Mid-flame Wind Speed | | | | | |
|---|---|---|---|---|---|---|
| | 2.0 | 4.0 | 6.0 | 8.0 | 10.0 | 12.0 |
| 2.0 | 0.9 | 1.2 | 1.5 | 1.7 | 1.9 | 1.9 |
| 4.0 | 0.8 | 1 | 1.3 | 1.5 | 1.6 | 1.6 |
| 6.0 | 0.7 | 0.9 | 1.2 | 1.4 | 1.4 | 1.4 |
| 8.0 | 0.6 | 0.9 | 1.1 | 1.3 | 1.3 | 1.3 |
| 10.0 | 0.6 | 0.8 | 1 | 1.2 | 1.2 | 1.2 |
| 12.0 | 0.6 | 0.8 | 1 | 1.1 | 1.1 | 1.1 |

# FUEL MODEL 188 (TL8)

**Figure 15. Long-Needle Litter**



## Description

The primary carrier of fire in TL8 is moderate load long-needle pine litter, and may include small amounts of herbaceous load.

## Fire Behavior

Spread rate is moderate; flame length is low.

| | |
|---|---|
| Fine fuel load (t/ac) | 5.8 |
| Characteristic SAV (ft-1) | 1770 |
| Packing ratio (dimensionless) | 0.03969 |
| Extinction moisture content (percent) | 35 |

# FUEL MODEL 188 (TL8)

**Rate of spread in chains/hour**
**(1 chain=66 ft) (80 chains/HR = 1 MPH)**

| Fine Dead Fuel moisture % | Mid-flame Wind Speed | | | | | |
|---|---|---|---|---|---|---|
| | 2.0 | 4.0 | 6.0 | 8.0 | 10.0 | 12.0 |
| 2.0 | 3.4 | 6.9 | 11.4 | 16.6 | 22.4 | 28.7 |
| 4.0 | 2.7 | 5.7 | 9.3 | 13.6 | 18.3 | 23.5 |
| 6.0 | 2.3 | 4.8 | 7.8 | 11.4 | 15.4 | 19.7 |
| 8.0 | 2 | 4.1 | 6.7 | 9.8 | 13.2 | 16.9 |
| 10.0 | 1.7 | 3.6 | 5.9 | 8.7 | 11.7 | 15 |
| 12.0 | 1.6 | 3.3 | 5.4 | 7.8 | 10.5 | 13.5 |

**10-hr fuel = 6%, 100-hr fuel = 10%, herbaceous fuel moisture = 30%, woody fuel moisture = 83%, slope = 10%**

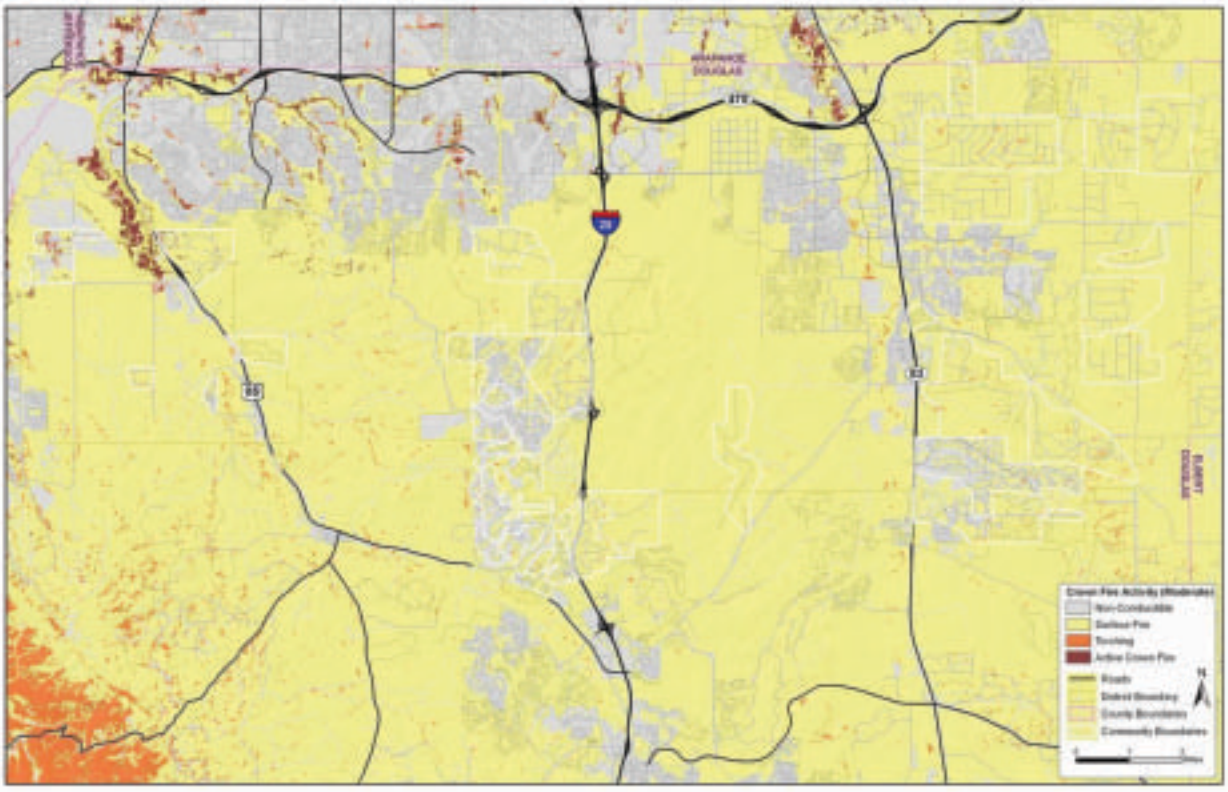
**Flame Length in Feet**

| Fine Dead Fuel moisture % | Mid-flame Wind Speed | | | | | |
|---|---|---|---|---|---|---|
| | 2.0 | 4.0 | 6.0 | 8.0 | 10.0 | 12.0 |
| 2.0 | 2.8 | 4 | 5 | 5.9 | 6.8 | 7.6 |
| 4.0 | 2.4 | 3.4 | 4.3 | 5.1 | 5.8 | 6.5 |
| 6.0 | 2.1 | 3 | 3.8 | 4.5 | 5.1 | 5.8 |
| 8.0 | 1.9 | 2.7 | 3.4 | 4 | 4.6 | 5.2 |
| 10.0 | 1.8 | 2.5 | 3.1 | 3.7 | 4.2 | 4.7 |
| 12.0 | 1.7 | 2.3 | 2.9 | 3.5 | 4 | 4.4 |

## Fire Behavior Analysis Outputs

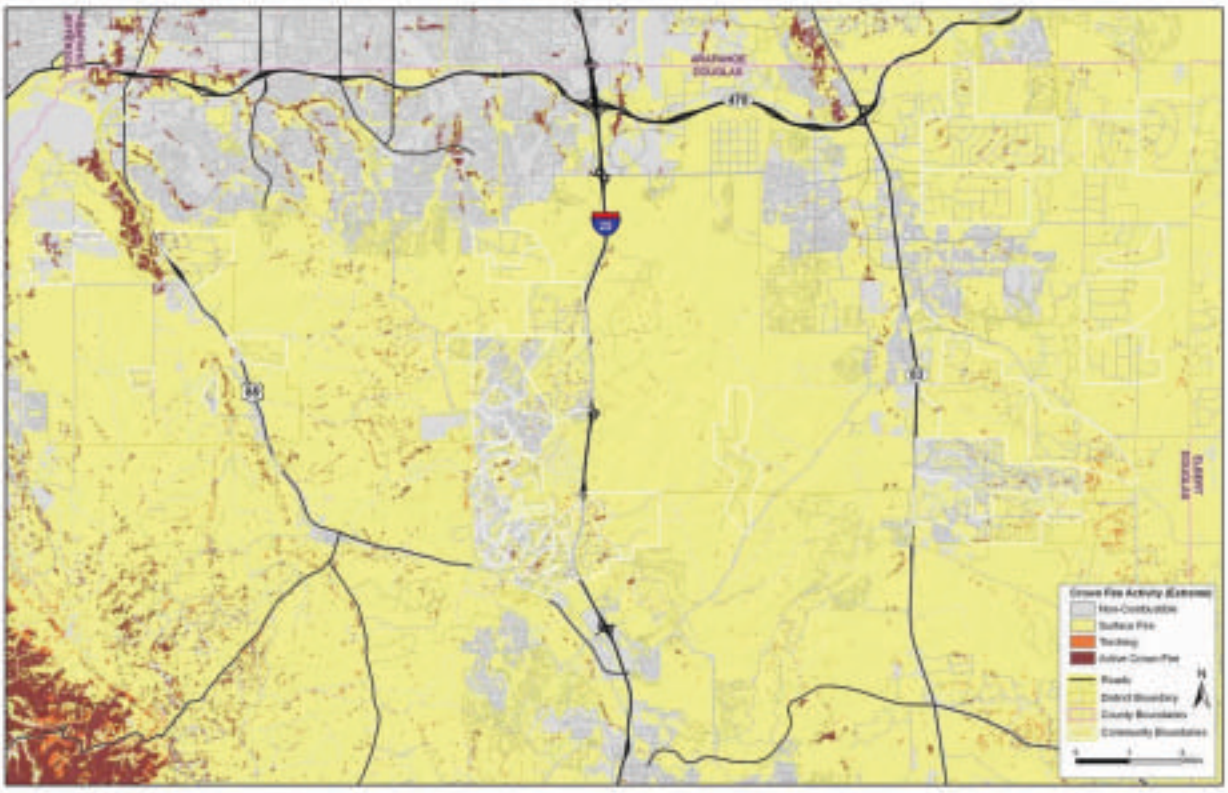
Crown fire activity, rate of spread, and flame length are derived from the fire behavior predictions. The following maps graphically display the outputs of FlamMap for both moderate and extreme weather conditions.

**Figure 10. Predictions of Crown Fire Activity (Moderate Conditions)**



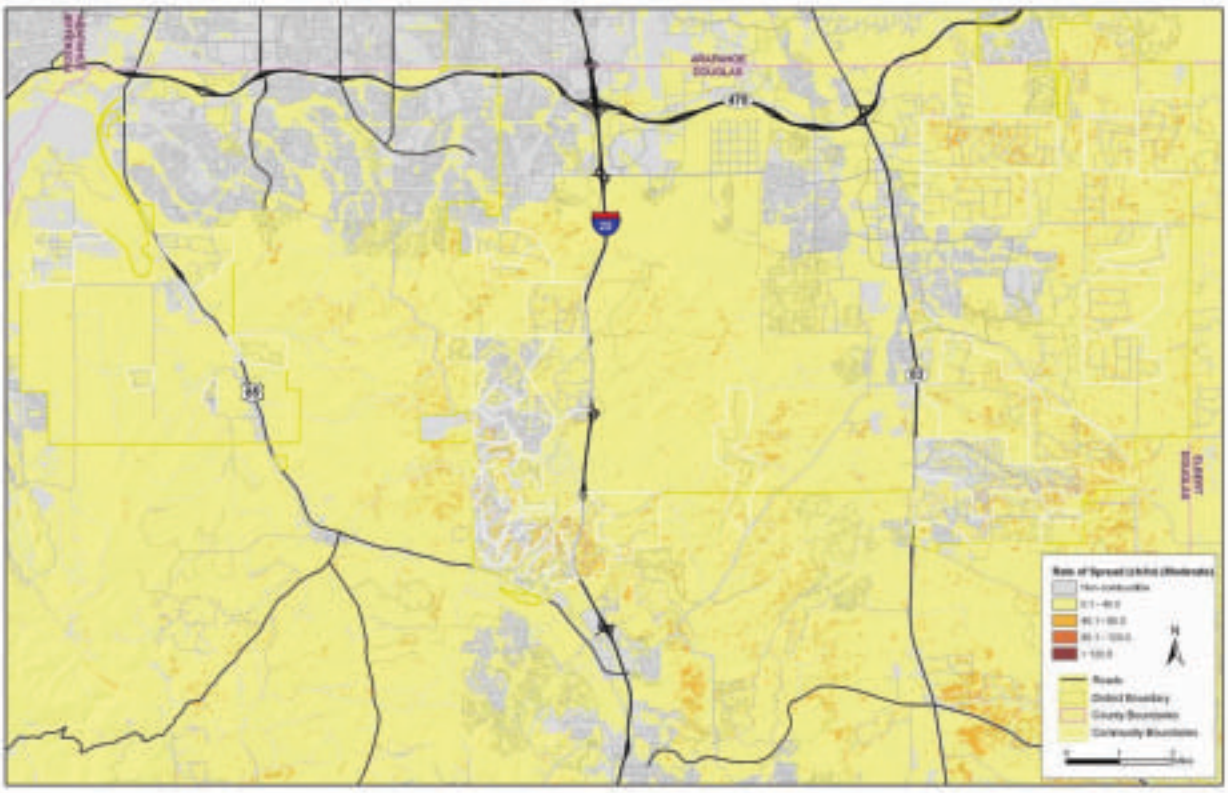
Crown fire activity values are generated by FlamMap and classified into four categories based on standard ranges: Non-combustible, Surface Fire, Passive and Active Crown Fire. In the surface fire category, little or no tree torching will be expected. During passive crown fire activity, isolated torching of trees or groups of trees will be observed and canopy runs will be limited to short distances. During active crown fire activity, sustained runs through the canopy will be observed that may be independent of surface fire activity.

**Figure 11. Predictions of Crown Fire Activity (Extreme Conditions)**



**Note: A limitation of FlamMap is that crown fire is not calculated for shrub models. The best method of determining the probability of crown fire in shrubs is to look at the flame length outputs and assume that if the flame length is greater than half the height of the plant it will likely torch and/or crown.

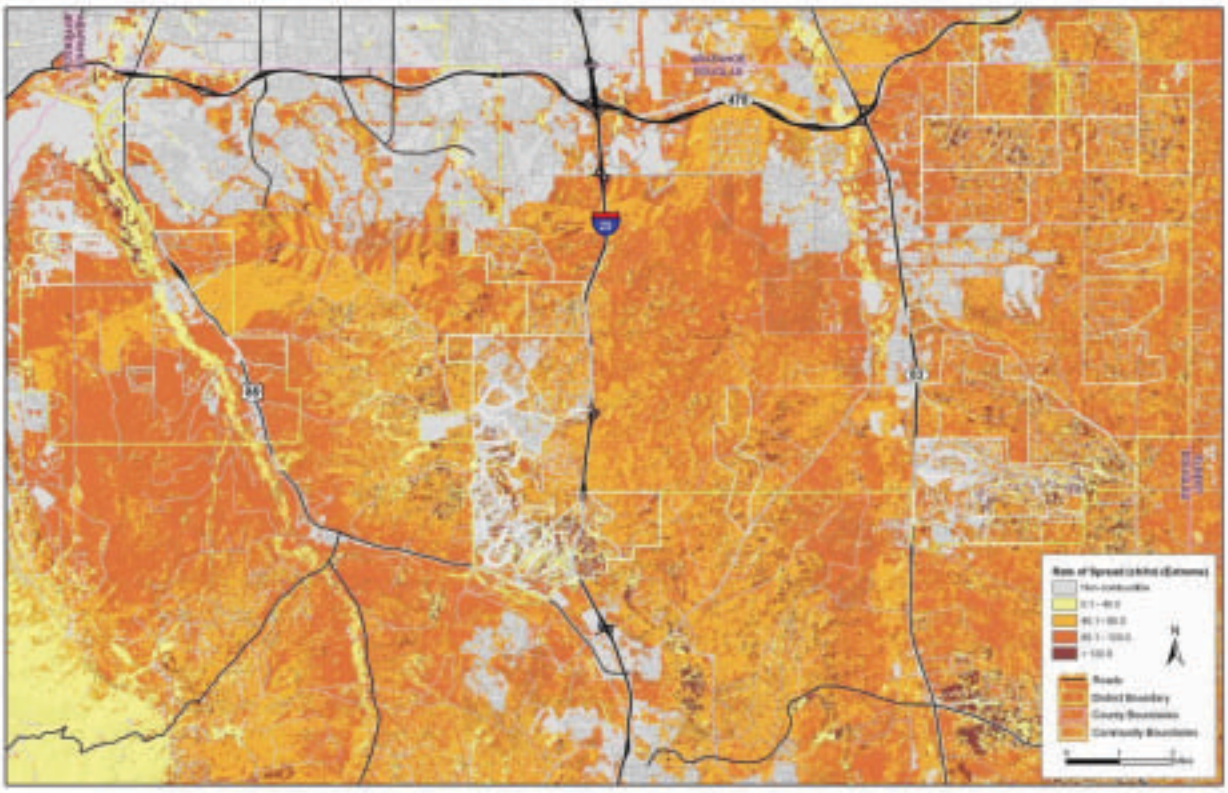
**Figure 12. Rate of Spread Predictions (Moderate Conditions)**



**Rate of spread in chains/hour**
**(1 chain=66 ft) (80 chains/HR = 1 MPH)**

Spread rate values are generated by FlamMap and are classified into four categories based on standard ranges: 0-20 ch/h (chains/hour), 20.1-40 ch/h, 40.1-60 ch/h, and greater than 60 ch/h. A chain is a logging measurement that is equal to 66 feet. One mile equals 80 chains. 1 ch/h equals approximately 1 foot/minute or 80 chains per hour equals 1 mile per hour.

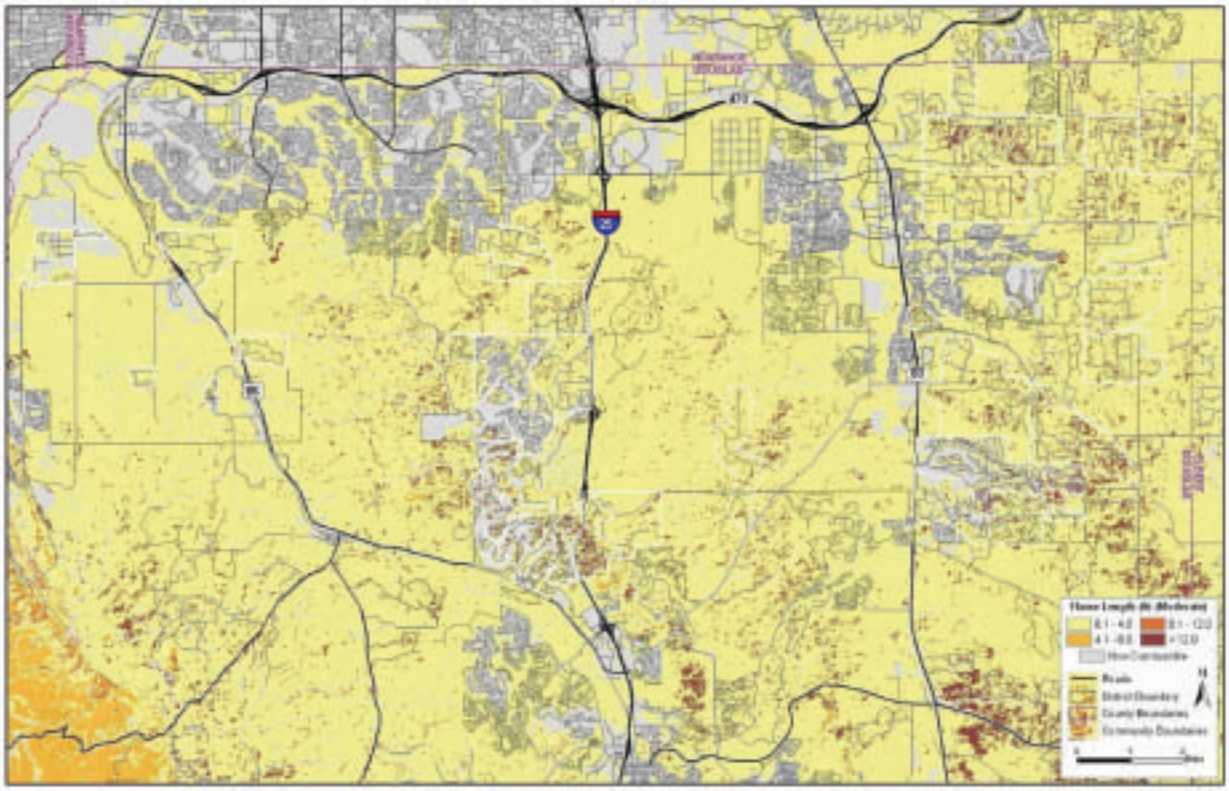
**Figure 13. Rate of Spread Predictions (Extreme Conditions)**



**Rate of spread in chains/hour**
**(1 chain=66 ft) (80 chains/HR = 1 MPH)**

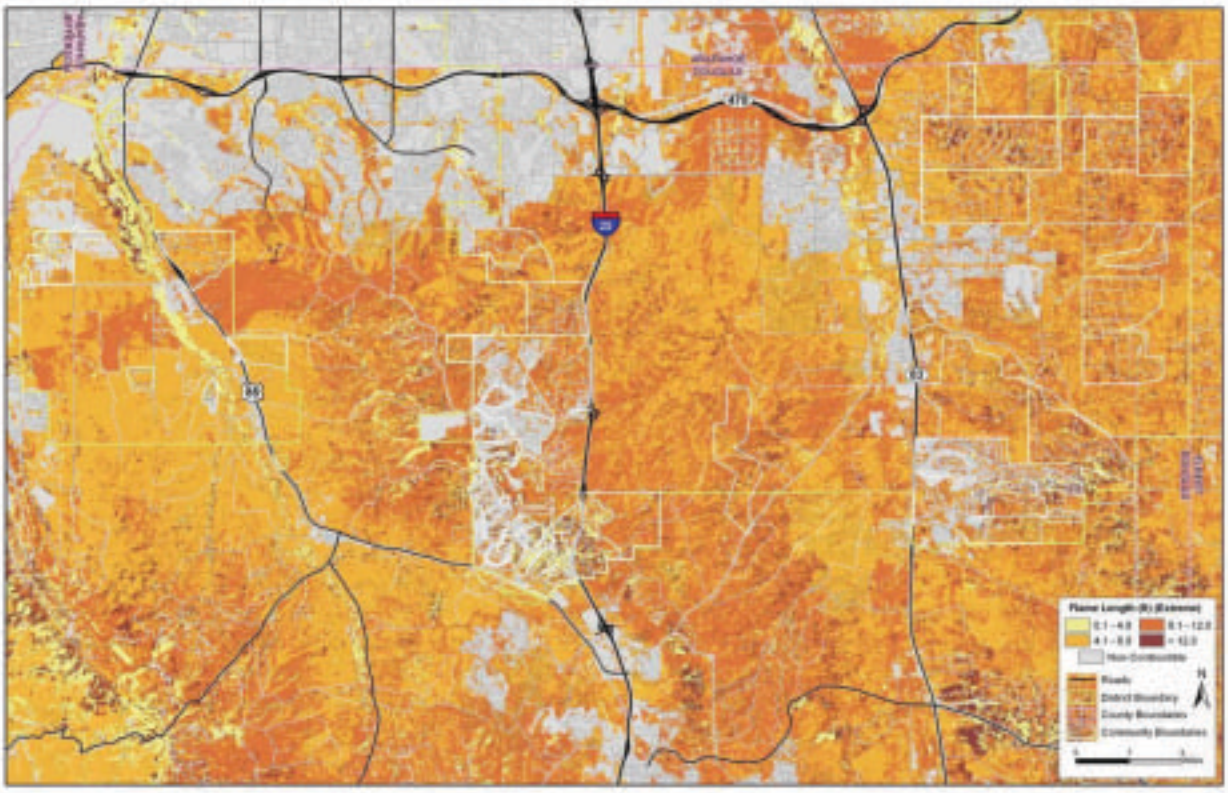
Spotting is not captured in the outputs and can pose a significant concern. Shrubs are very susceptible to winds because they are not sheltered. They have the greatest rate of spread, and under extreme conditions will move even faster as a result of spotting ahead of the main fire front.

**Figure 14. Flame Length Predictions (Moderate Conditions)**



Flame length values are generated by the FlamMap model and classified in four categories based on standard ranges: 0.1-4.0 feet, 4.1-8.0 feet, 8.1-12.0 feet and greater than 12.0 feet. Flame lengths of 4 feet and less are acceptable for direct attack by hand crews. Flame lengths of 8 feet and less are suitable for direct attack by machinery. With flame lengths of greater than 8 feet, indirect attack and aerial attack are the preferred methods of suppression.

**Figure 15. Flame Length Predictions (Extreme Conditions)**



The shrubs (SH 6 & 7) have dangerous flame lengths even under moderate conditions. With a stronger wind, the flame lengths increase drastically in the shrubs as the winds fan them.

## Fire Behavior Interpretation and Limitations

This evaluation is a prediction of likely fire behavior, given a standardized set of conditions and a single point source ignition at every point. It does not consider cumulative impacts of increased fire intensity over time and space. The model does not calculate the probability that a wildfire will occur. It assumes an ignition occurrence for every 30 m x 30 m cell.

Weather conditions are extremely variable and all possible combinations cannot be accounted for. These outputs are best used for pre-planning and not as a stand-alone product for tactical planning. Whenever possible, fire behavior calculations should be done with actual weather observations during the fire. The most current Energy Release Component (ERC) values should also be calculated and distributed during the fire season to be used as a guideline for fire behavior potential.

# APPENDIX B
# Solutions and Mitigation

The local land management, stakeholders, and fire management agencies (ideally with the input of a citizen's advisory council) must determine priority actions. The following areas have been identified for the study area, and recommendations are provided for each. These sections are NOT ranked by priority, but specific recommendations have been given priority rankings in the main CWPP document.

- Addressing and Evacuation
- Public Education
- Local Preparedness and Firefighting Capabilities
- Home Mitigation
    - Defensible Space
    - Plains/Prairie Fuels Modifications
        - Special Consideration for Fuels Treatment in Oak Brush
- Water Supply

## Addressing and Evacuation

### Addressing

Some of the communities within the study area have missing or inadequate street signage and/or addressing. In some parts of the study area, there are intersections with no street signs (**Figure 1**). Street signs with the recently analyzed SMFRA District boundary are consistently well marked, with standard reflective signage. For many homes, the only address marker is a homemade sign. These vary widely in type and location, and some cannot easily be identified as address markers. Many are not reflective and some are mounted in such a way that determining which driveway they belong to is difficult or impossible (**Figure 2**). In some communities, the street signs are combustible and non-reflective (**Figure 3**). The most common address markers are numbers stuck onto mailboxes (**Figure 4**). This is of course a functional system for mail delivery but for the purposes of emergency response, it may be difficult to locate the physical address. For many homes, there is no address indicated at the house itself.

While residents may consider non-reflective wooden address signage to be decorative, such signage is an impediment to quick and effective response. Proper reflective signage is a critical operational need. Below are pictures from within the study area of the issues that were observed. Knowing at a glance the difference between a road and a driveway (and which houses are on the driveway) cuts down on errors and time wasted interpreting maps. This is especially true for out-of-district operators who do not have the opportunity to train on access issues specific to the response area. The value of the time saved, especially at night and in difficult conditions, cannot be overstated: it can make the difference between lives saved and lost.

**Figure 1. Unmarked intersection**

**Figure 2. Confusing marker on wire fence**


**Figure 3. Non-reflective wooden addressing**

**Figure 4. Mailbox address markers**

**Recommendations**

- A program of replacing worn or difficult to read street signs should be developed, and should include Douglas County officials, developers, HOAs and SMFRA. Every intersection and street name change should have adequate, reflective signage. Maintain road signage in areas that already have well-marked existing signs.
- In the Johnson Road community, address numbers do not follow the county system. Although this area is known locally as Johnson Road, all of the homes have East Parker Road addresses, thereby adding to the confusion for outside (mutual aid) resources. Address numbers in the Johnson Road community should be reviewed and corrected by Douglas County as soon as possible, and consideration should be given to reassigning these homes from East Parker Road to Johnson Road to eliminate this confusing situation.
- Flagged addressing on community driveways should be replaced with reflective markers that indicate the proper road fork, where applicable, for each address. This system should be repeated at every place where the driveway divides and an individual driveway leaves the community driveway.
- For each home, reflective markers should be placed where the driveway leaves an access road and on the house itself. These may be in addition to, or in place of, existing decorative address markers. Consistency in height and placement should be stressed.
- Lot markers should be replaced with address markers as soon as the home has a certificate of occupancy.
- Where dead-end and private road markers occur, the addresses of homes beyond the marker should be clearly posted. This can be done with a group address marker, for example "14391-14393 Democrat Road."
- Develop a public education campaign to advise property owners of the importance of proper street addressing and how to correctly address their property.

## Evacuation Planning

- *Priority level **High**.* In order to reduce potential conflicts between evacuating citizens and incoming responders, it is desirable to have nearby evacuation centers for citizens and staging areas for fire resources. This is especially important in communities with single access and a high population density. Evacuation centers should include heated buildings with facilities large enough to handle the population. Schools and churches are usually ideal for this purpose. Fire staging areas should contain large safety zones, a good view in the direction of the fire, easy access and turnarounds for large apparatus, a significant fuel break between the fire and the escape route, topography conducive to radio communications, and access to water. Golf courses and large irrigated meadows may make good safety zones for firefighting forces. Local responders are encouraged to preplan the use of potential staging areas with property owners.
- *Priority level **High**.* Identify and pre-plan primary escape routes for all WUI communities. Emergency management personnel should be included in the development of preplans for citizen evacuation. Reevaluate and update these plans as necessary.
- *Priority level **High**.* Educate citizens on the proper escape routes and evacuation centers to use in the event of an evacuation. This also applies to animal rescue. Douglas

County has the County Animal Response Team (CART), which provides aid to domestic animals before, during, and after emergency situations. The program is currently under the direction of Cherrie Abbot, who can be reached at cabbott@dc.sheriff.net or at 303-660-7589. Additional (during emergencies) can be found on the Douglas County Sheriff's Department website: http://www.dcsheriff.net/emergencymanagement/index.html

- *Priority level **High**.* Ensure the existing reverse 911 system includes wildfire notifications.
- *Priority level **Moderate**.* Perform response drills to determine the timing and effectiveness of escape routes and fire resource staging areas.

# PUBLIC EDUCATION

An overview of PFPD's previous and SMFRA's current efforts can be found in the main CWPP document. Below are additional recommendations to continue public education and outreach.

**Additional Recommendations**

- Use these web sites for a list of public education materials, and for general homeowner education:
    - http://www.southmetro.org/safety/
    - http://www.douglas.co.us/building/wildfire/
    - http://www.fs.fed.us/fire/links/links_prevention.html
    - http://www.firewise.org
    - http://csfs.colostate.edu/pages/wf-protection.html
    - http://www.blm.gov/nifc/st/en/prog/fire.1.html
- Provide citizens with the findings of this study including:
    - Levels of risk and hazard
    - Values of fuels reduction programs
    - Consequences of inaction for the entire community
- Create a FireWise Council or similar WUI citizen advisory committee to promote the message of shared responsibility. Too often, advice from government agencies can be construed as self-serving. Consequently, citizens may resist acting on this information. The FireWise Council should consist of local citizens, and its primary goals should be:
    - Bringing the concerns of the residents to the prioritization of mitigation actions
    - Selecting demonstration sites
    - Assisting with grant applications and awards
- Make use of regional and local media to promote wildfire public education messages in the fire district.
- Maintain current wildfire educational presentation explaining the concepts of defensible space and wildfire hazard mitigation. The information in this report should be incorporated into that presentation for the education of homeowners district-wide. This could be done through informational gatherings sponsored by the fire department, homeowners associations or neighborhood groups, such as local festivals, school events, times of extreme fire danger, and other times of heightened awareness concerning wildfire. It is far easier to bring the information to citizens than to bring citizens to the information, making this an especially powerful resource.

# HOME MITIGATION

## Defensible Space

Of the 42 communities in the study area, the community-level assessment identified three that are at very high risk, 13 that are at high risk, 20 at a moderate risk, and six at low risk. Construction type, condition, age, fuel loading of the area, and position are contributing factors in making homes more susceptible to ignition under even moderate burning conditions.

Outside of the established communities many ranches and individual home sites exist. The following recommendations apply to all structures that could be threatened by wildfire.

***Because of the nature of the vegetation and topography combined with the majority of homes situated on medium sized parcels, an aggressive program of evaluating and implementing defensible space for all homes will do more to limit fire-related property damage than any other single recommendation in this report.***

**To improve life safety and preserve property, every home in the study area should have compliant, effective defensible space.** This is especially important for homes with wood roofs and homes located on steep slopes, in chimneys, saddles, or near any other topographic feature that contributes to fire intensity. These recommendations are intended to give homeowners enough information to immediately begin making their home FireWise or improve existing home mitigation efforts. Defensible space needs to be maintained throughout the year. Additional detailed information regarding defensible space can be found at http://csfs.colostate.edu/pages/defensible-space.html, also known as CSFS 6.302. The CSFS information varies slightly from the figures below, but it should be noted that defensible space is unique for each home. Because of differences in vegetation, topography, and construction materials, it is suggested that a trained individual be consulted before embarking on a defensible space project.

- ✓ Trees and shrubs are properly thinned and pruned within the defensible space. Remove ladder fuels to 8 feet above the ground. Slash from the thinning has been disposed of properly.
- ✓ Roof and gutters are clear of debris. Branches overhanging the roof and chimney are removed.
- ✓ Chimney screens are in place and in good condition.
- ✓ An outdoor water supply is available, complete with a hose and nozzle that can reach all parts of the house. Fire extinguishers are checked and in working condition. Hand tools such as shovels and rakes are easily accessible.
- ✓ The driveway is wide enough. The clearance of trees and branches is adequate for fire and emergency equipment. (Check with your local fire department.)
- ✓ Road signs and house numbers are posted and easily visible in all weather conditions and at any time of the day.
- ✓ Attic, roof, eaves, and foundation vents are screened and in good condition. Stilt foundations and decks are enclosed, screened or walled up.
- ✓ Firewood is staked on a side contour, at least 50 feet away from structures.
- ✓ Propane tanks should be located at least 30 feet from all structures. The area around the tank must be free of combustible material such as yard debris, weeds, etc.
- ✓ Power poles have vegetation cleared away in a 5-foot radius.
- ✓ Maintain your defensible space constantly:

- Mow non-irrigated grass to a low height (<6 inches). Mow early in the morning, avoiding times of wind, and avoid rocks because a grass fire could ignite from a spark.
- Remove any branches overhanging the roof or chimney.
- Remove all debris and cuttings from the defensible space.

**Figure 5. Enclose decks**

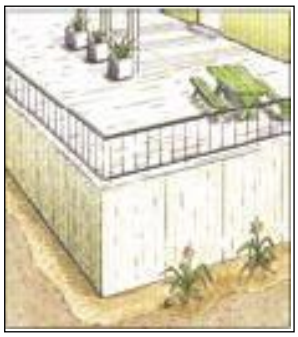


**Figure 6. Clean gutters and roofs**

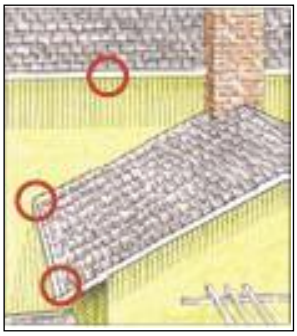


**Figure 7. Maintain chimneys**

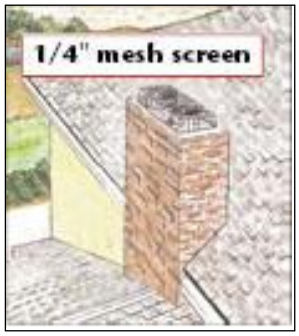



**Figure 8. Defensible space zones for timber and brush lands**

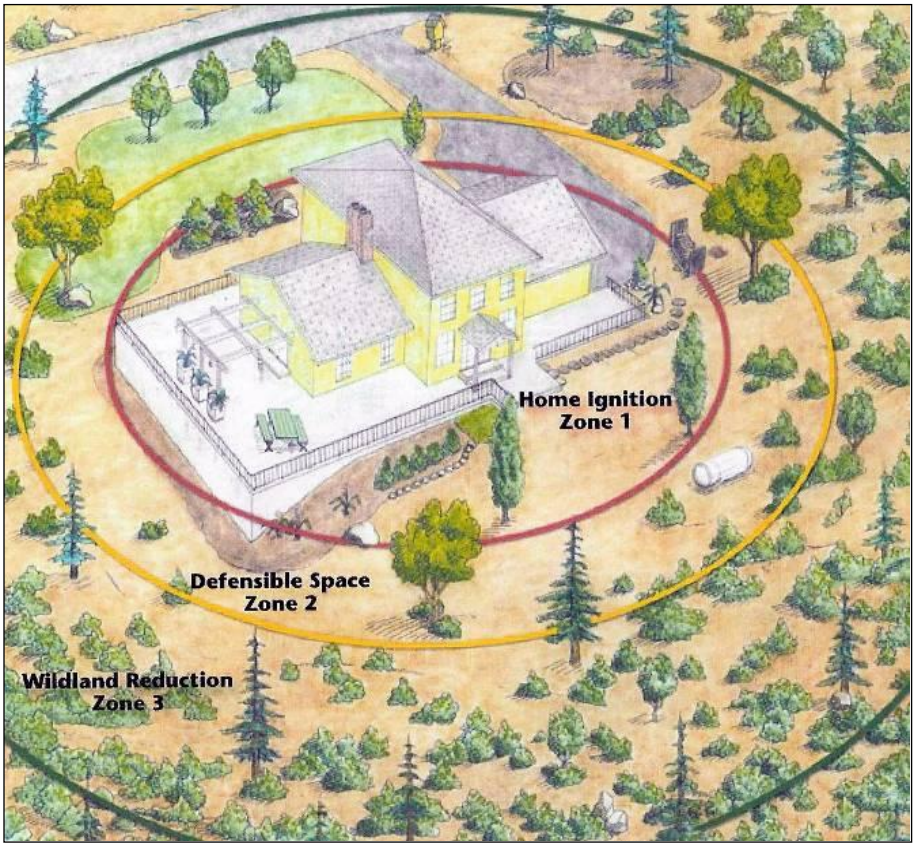
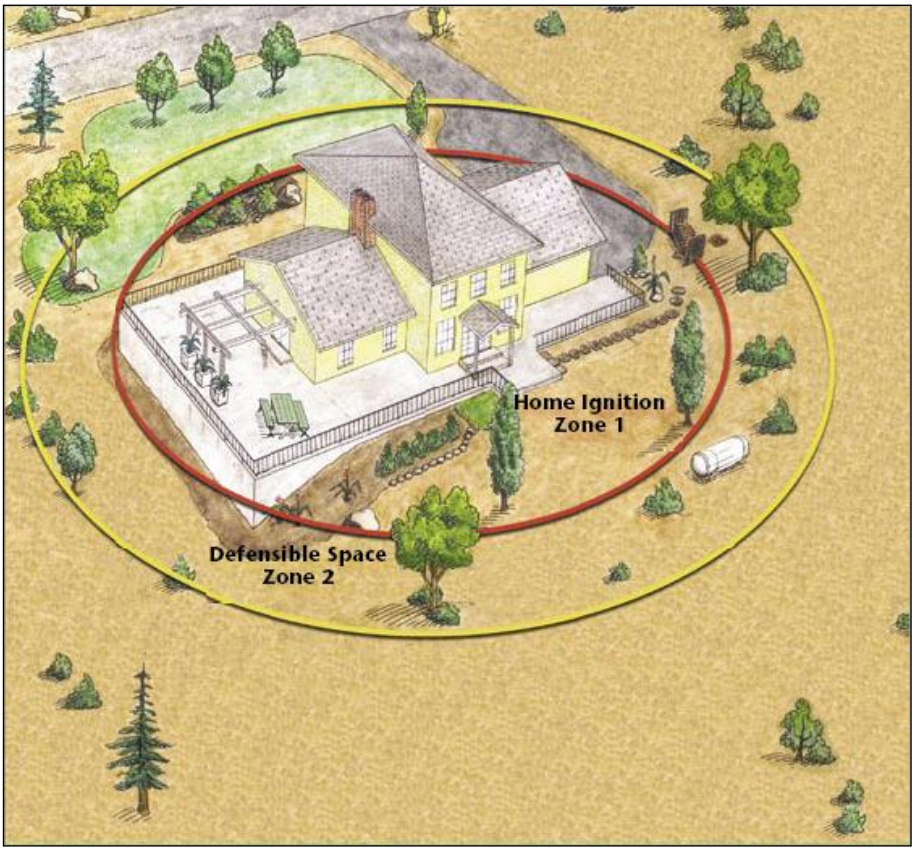


**Figure 9. Defensible space zones for grass lands**




**ZONE 1 (within 15 feet of the home),** shown as Home Ignition Zone 1, suggests eliminating all flammable materials (fire-prone vegetation, wood stacks, wood decking, patio furniture, umbrellas, etc.). Irrigated grass, rock gardens, non-flammable decking, or stone patios are desirable substitutions.

**ZONE 2 Defensible Space (15 to 100 feet from the home – on steep slopes or areas of high winds the Defensible Space will need to be expanded to 150 feet)** suggests thinning trees and large shrubs so there is at least 10 feet between tree tops (crowns). Crown separation is measured from the furthest branch of one tree to the nearest branch on the next tree. On steep slopes or areas subject to high winds, allow at least 1.5 times more space between tree crowns. Remove all ladder fuels from under these remaining trees. Prune all trees to a height of at least 10 feet, or 1/3 of the live crown height. Small clumps of 2 to 3 trees may be occasionally left but leave more space between the crowns of these clumps and surrounding trees. Isolated shrubs may remain, provided they are not under tree crowns. Remove dead stems from trees and shrubs annually. Where shrubs are the primary vegetation in Zone 2, refer to the "Brush and Shrubs" section below.[1]

**ZONE 3 Wildland Reduction, aka Extended Defensible Space (beyond 100 feet),** suggests a much more limited thinning and pruning to the standards in Zone 2. The goal in this zone is to improve the health of the wildlands, which will also help to slow the approaching wildfire.

[1] http://www.ext.colostate.edu/PUBS/natres/06302.html; referenced 7-23-09

**Recommendations**

- *Priority level* ***High***. Conduct a parcel-level wildfire hazard analysis for all the homes in the study area, especially those with a high rating. Completing this process will facilitate the following important fire management practices:
    - Establish a baseline hazard assessment for individual homes in these communities
    - Educate the community through the presentation of the parcel-level Hazard-Risk Analysis at neighborhood public meetings
    - Identify defensible space needs and other effective mitigation techniques
    - Identify and facilitate "cross-boundary" projects
    - Make community achievement of national FIREWISE status a priority
    - Maintain pre-attack/operational Plan for the study area. The pre-attack plan assists fire agencies in developing strategies and tactics that will mitigate damage when incidents do occur.
- *Priority level* ***High***. Ask homeowner's associations and other neighborhood groups to promote the development of defensible space and Firewise plantings. Eliminate any covenants or deed restrictions that require or endorse the use of flammable building materials such as shake roofs.
- *Priority level* ***High***. Add reflective address signs at each driveway entrance to all homes.

## Plains/Prairie Fuels Modifications

One significant fire risk in Colorado is associated with the large number of homes being built in formerly wild prairie lands. With the exception of early spring and during times of snow cover, wild grasses are generally dry enough to ignite quickly and burn easily. This means that the grasses represent what is essentially a year-round fuel source for ignitions. Properties in this landscape are at significant risk from wildfire, so residents need to be aware of what they can do to reduce these risks, which have actually increased dramatically, because of years of aggressive fire suppression policies. Where naturally occurring wildfires historically reduced fuels with regularity, there is now an over-abundance of these fuels.

Anchor Point recommends the *Are You Plains FireWise?* Notebook as a resource for learning more about wildfire risk in the plains regions of the U.S. It is available as a downloadable PDF at: http://csfs.colostate.edu/library/pdfs/RUFireWise/plains_FW.pdf

For a detailed discussion of the various plains fuel types present in the study area, as well as their associated risks, see ***Appendix A***.

### Special Considerations for Fuel Treatments in Oak Brush

Gambel oak is not only present in communities with high hazard and risk ratings; it is also grows in communities with moderate and low ratings. Because of the scale of this study, communities are evaluated by analyzing the overall characteristics of the values at risk. As a result, individual homes are not assessed, which may neglect to capture the increased hazards that may threaten homes in the community. The communities of Romar West, Castle Pines North, and Buffalo Ridge are good examples of this: not all homes are exposed to Gambel oak, but those immediately adjacent may be at a higher risk than the rest of the community. Although a community may have an overall moderate or low rating, it does not mean that there are not

valuable fuels reduction projects in Gambel oak that may protect homes. An additional benefit of proper oak treatment is the ability to use the area as a demonstration site. Implementing an oak treatment project on land managed by Castle Pines North Metropolitan District would create an excellent example for other communities that also have Gambel oak. When planning the fuels reduction projects, special attention should be given to the areas where the oak is unhealthy and poses the largest risk to structures.

Gambel oak is extremely fire tolerant and is seldom actually killed by fire. The USFS Fire Effects Information website reports that following a fire that had consumed all above-ground vegetation, herbaceous plants and litter, Gambel oak quickly reestablished in densities greater than those present before the burn. In a Colorado study Gambel oak increased 100% to 150% in density and 10% to 40% in frequency following a single burn. Fuels reduction by prescribed fire seems to be most effective in Gambel oak when performed during the summer growth period when the plant's carbohydrate reserves are at their lowest. This, of course, is the time when prescribed burning would be least desirable from a control standpoint. Even if it were possible to burn during this period, evidence suggests that it would still require repeated, high-severity fires to reduce Gambel oak.[2]

Specific treatment options and recommendations include:

- Removal of dead, decadent patches, especially those with significant top kill.
- Focus on leaving clumps containing oak greater than 4 inches in diameter. At this point, it takes on more of a tree form, especially if it is pruned 2-3 feet up from the bottom.
- Break up the continuous stands into a mosaic pattern with spacing between clumps.
- Follow CSFS guidelines for treating oak for reducing fire hazards-spacing guidelines:

| **% slope** | **Brush and Shrub Clump Spacing** |
|---|---|
| 0 -10 % | 2 1/2 x shrub height |
| 11 - 20% | 3 x shrub height |
| 21 - 40% | 4 x shrub height |
| > 40% | 6 x shrub height |

- Remove all oak from underneath residual trees and within 20 feet of the drip line of the residual trees.
- Because of vigorous sprouting of oak after treatment, it is imperative that oak regeneration is maintained by mowing or herbicide treatment.
- Utilize the CSFS publication 6.311, “Gambel Oak Management”, available at http://csfs.colostate.edu/pdfs/06311.pdf.

Coordinated efforts between private landowners and professional land managers are critical to prevent fuels reduction efforts that actually result in a decreased fuel load.

[2] http://www.fs.fed.us/database/feis/plants/tree/quegam/all.html; referenced 7-31-09

# LOCAL PREPAREDNESS AND FIRE FIGHTING CAPABILITIES

In addition to the overview of the Authority's capabilities discussed in the main CWPP, this section provides additional, more detailed information regarding response times and additional recommendations to consider.

## Proximity

Distances to the nearest fire stations were calculated in ArcGIS, and take into account the road distance to a given area, rather than merely the "flight distance." **Figure 10,** also in Appendix E, shows the driving distances from the communities to the nearest fire station. Note that while the stations are well equipped and have personnel with excellent training, it is possible that a fire could spread into a community before the apparatus arrive. For this reason, defensible space is the most important, first line of defense.

The distance analysis calculates *drivable distance, not drive time*. However, the distance is an important factor in rating community hazards. Response times will vary greatly over the same distance because of road conditions, steepness, curvature of roads, and evacuation traffic. Most fire service leaders agree that response time is composed of a number of distinct elements: call processing time (the time it takes for dispatchers to ascertain the location and nature of the emergency and initiate the appropriate response), turnout or staffing time (the time it takes for personnel to respond to the dispatch, board apparatus, and begin traveling to the scene), and travel time (the actual time it takes to travel from the station to the scene).

The National Fire Protection Agency (NFPA) has established time objectives for professional fire response:

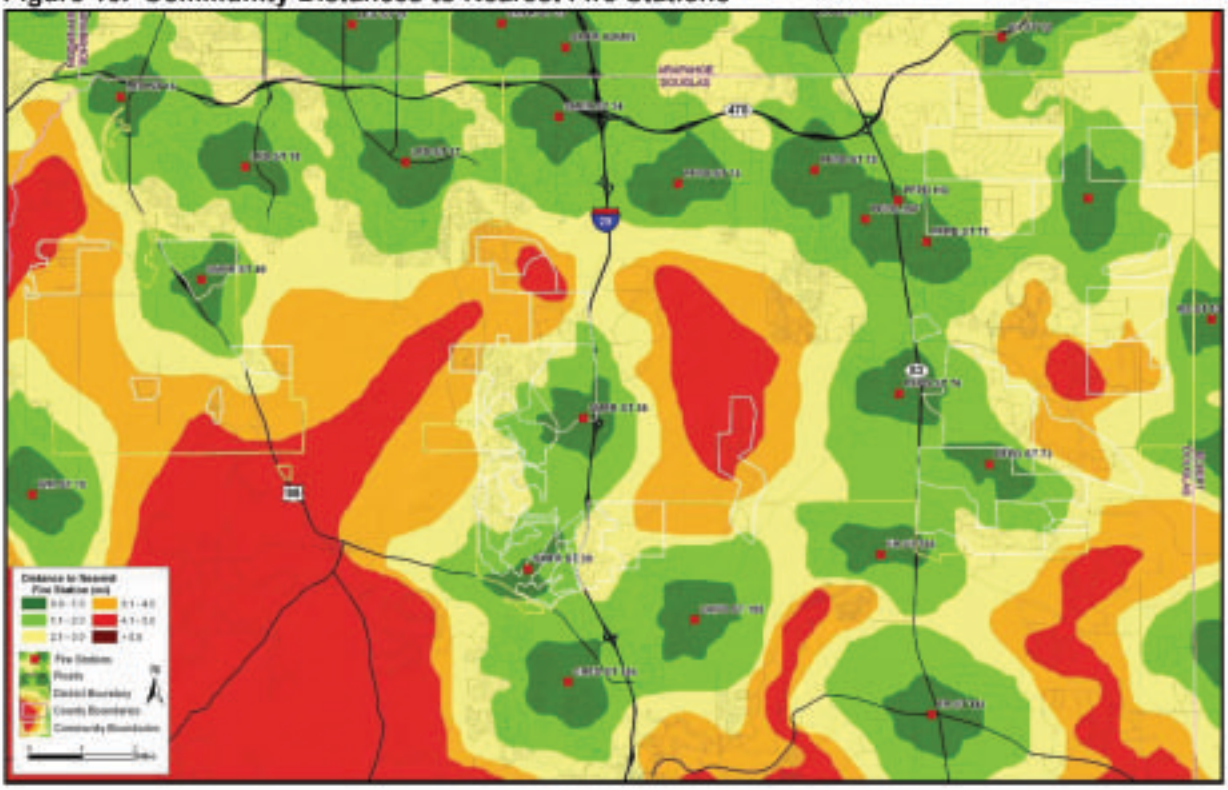
NFPA 1710 requires:

1. Turnout time of one minute.
2. Four minutes or less for the arrival of the first arriving engine company at a fire suppression incident and/or eight minutes or less for the deployment of a full first alarm assignment at a fire suppression incident.[3]

Assuming an average driving speed is 30 MPH, the engine company will be able to drive two miles in the four minutes established by NFPA 1710. Therefore, communities with mean distances greater than two miles from a fire station were given a weighted increase in their hazard rating. The NFPA standard was utilized only to create a uniform method of evaluating the response to the various WUI areas, not to recommend a specific response time standard for SMFRA. Each fire district must create its own response standards based on available resources and local characteristics.

[3] http://72.14.253.104/search?q=cache:u8XMw9ZRQUYJ:www.pcpages.com/fireman02169/1710.pdf+NFpa+1710&hl=en&ct=clnk&cd=1&gl=us , Section **5.2.3.1.1,** page 11.

Figure 10. Community Distances to Nearest Fire Stations



## Current Requirements/Actions

### Training

SMFRA has taken a proactive approach in training all of its firefighter's on wildland fire operations, as well as providing advanced training in incident command and management strategies, in accordance to federal guidelines. The authority should continue to support this type of training to ensure that all members are adequately trained to manage wildland fire incidents.

All SMFRA members receive annual wildland fire fighting refresher training, and all wildland team members receive additional wildland fire fighting refresher training to meet federal guidelines for training.

Additionally, members of the Authority's wildland fire team receive advanced training on wildland fire strategy and tactics, as well as being deployed nationally on wildland fire incidents as part of a state and federal mutual aid system. This practice should continue, as these deployments not only provide critical resources to other jurisdictions in need, but also reinforce training on actual incidents for wildland fire team members, so that they will be better prepared to manage actual incidents within the authority's boundaries.

**Recommendations**

- Continue to staff at least two stations with qualified wildland team members, and consider adding an additional qualified team member to a third station.

- Maintain in-house wildland fire related training for all Authority members, and and continue to support advanced training for wildland team members, to include gaining experience on actual incidents through national deployments.

- Ensure that at least one member on shift at a designated wildland team station has S-212 Wildland Power Saws and is qualified as a sawyer.

- Provide S-215 Fire Operations in the Urban Interface for all officers and consider this training for all members of the Fire Authority.

- S-290 Intermediate Fire Behavior for all officers at designated wildland team fire stations.

- Continue to require national incident command and management courses for all members of the Fire Authority. Additionally, all officers should receive advanced incident command and management courses.

## Equipment

### Personal Protective Equipment

All authority members have been issued gear bags and are required to keep all PPE with them at all times while on duty. All riding positions on all of the authority's apparatus have a dedicated personal protective equipment (PPE) kit which contains web gear (fire shelter, water, and hot shield), helmet, headlamp, and goggles. Additionally, all authority members are issued wildland nomex shirts, pants, leather boots and gloves, in addition to the standard structure suppression PPE.

### Tools

The wildland fire cache, coupled with the apparatus and stations, are properly equipped to support extended wildland operations anywhere in the authority.

### Recommendations

- Equipment:
  - *Priority level **High***. It is recommended that auto-aid agencies carry the same level of PPE on their apparatus, if possible. Be aware of other departments' PPE access or limitations.
  - *Priority level **Moderate***. Maintain the existing wildland fire cache (in addition to any tools on the apparatus) at all stations which are primary response for interface communities. The contents of the cache should be sufficient to outfit two squads for handline construction and direct fire attack.

    **Suggested equipment includes:**

    - Four cutting tools such as pulaskis or super pulaskis
    - Six scraping tools such as shovels or combis
    - Four smothering tools such as flappers
    - Four backpack pumps with spare parts

- Two complete sawyer's kits including chainsaw, gas, oil, sigs, chaps, sawyer's hard hat, ear protection, files, file guides, spare chains, and a spare parts kit
- MREs and water cubies sufficient for 48 hours

# WATER SUPPLY

Water is a critical fire suppression issue in the study area, as it is in many communities in Colorado. While some communities have an adequate network of hydrants, many of the communities analyzed for this report have no water supply at all. The communities with no water or inadequate water supply are Happy Canyon, McArthur Ranch South, Happy Canyon Ranches, McArthur Ranch North, Plum Valley, Homestead Hills, Ponderosa Hills, Democrat Road, Black Forest, Hidden Village, Windy Hills, Titan Road, Louviers, and Parker East. Additionally, although the some of the homes in Lemon Gulch and The Pinery have adequate access to water for fire suppression, others do not. Improvement of the water supply in all these communities constitutes a high priority level. A more detailed analysis of individual community's water supply capabilities will be completed as part of the next steps, following the approval of the CWPP.

**Recommendations**

• *Priority Level* ***High*** Areas with no water or inadequate water supply should be evaluated to improve existing hydrants, establish a stored water supply, or use firefighting resources.

# SOUTH METRO FIRE RESCUE AUTHORITY CWPP

## APPENDIX C
## COLLABORATIVE EFFORT

### THE NEED FOR A CWPP

In response to the Healthy Forests Restoration Act (HFRA), and in an effort to create incentives, Congress directed interface communities to prepare a Community Wildfire Protection Plan (CWPP). Once completed, a CWPP provides statutory incentives for the federal agencies to consider the priorities of local communities as they develop, and implement forest management and hazardous fuel reduction projects.

As a requirement of both HFRA and CSFS guidelines, collaboration is essential for a successful CWPP. Planning should involve representatives from the CSFS, local government and the local fire authority. Additional representatives should be made up of community members, including individuals and HOAs.

Involvement in the SMFRA CWPP was carried out in a variety of ways, including stakeholder and public meetings, fliers sent to individual homes, and online surveys. The efforts and results of these attempts are documented in this appendix. For more detailed information on CSFS guidelines on collaboration, please see http://csfs.colostate.edu/pages/community-wf-protection-planning.htm or Appendix F.

### PROJECT FUNDING AND COORDINATION

SMFRA provided the funding to complete a department-wide hazard and risk assessment and the resultant CWPP.

Future community education and private landowner assistance will be coordinated through SMFRA, Douglas County, and the CSFS. They will continue to identify funding for the implementation of mitigation projects. Additionally, the county's wildfire mitigation program will continue to support communities within the SMFRA.

### INTER-AGENCY COLLABORATION

**Roles and Responsibilities**

To be successful, wildfire mitigation in the interface must be a community-based, collaborative effort. Stakeholders and, primarily, SMFRA, will have the greatest responsibility for getting the mitigation projects implemented by working with private landowners. The CSFS and Douglas County Parks and Open Space, as well as the Douglas County Building Division will be valuable participants in addressing cross-boundary projects throughout the area, which includes projects along roadways and open space boundaries, as in Louviers.

Nearly all of the recommendations from this report affect private land or access roads to private land. There are also mitigation recommendations for individual structures, which are the responsibility of the homeowner. Homeowners will, however, need a point of contact to help

them implement these recommendations. The best defensible space will be created with oversight and expert advice from the fire district and/or government forestry personnel. One-on-one dialog will continue to build the relationship with community members. This level of involvement will allow agencies to keep track of the progress and update this plan to reflect the latest modifications at the community level.

## THE COLLABORATIVE PROCESS

"The initial step in developing a CWPP should be the formation of an operating group with representation from local government, local fire authorities, and the state agency responsible for forest management. (…) Once convened, members of the core team should engage local representatives… to begin sharing perspectives, priorities, and other information relevant to the planning process."[1]

Several stakeholders participated in the SMFRA CWPP. These stakeholders included:

- South Metro Fire Rescue Authority
- Douglas County Parks and Open Space
- Douglass County Building Division
- Douglas County Sheriff's Department
- Castle Pines North
- Castle Pines North Metropolitan District Parks and Open Space
- Castle Pines Village
- Happy Canyon HOA
- Plum Valley HOA
- Local residents
- Colorado State Forest Service
- Anchor Point Group

The true collaborative process was initiated through a stakeholder meeting held in April 2009. Several meetings followed. The purpose of the meetings was to bring all past, current, and future efforts and needs to the table. The primary focus was on the identification and delineation of communities, areas of concern, and Values at Risk. Best practices and anticipated "roadblocks" were identified.

An initial stakeholder meeting with Anchor Point was held on April 22, 2009 to kick-off the project and introduce it to the public. On June 25, 2009 there was a second meeting to present the results and discuss any issues that should be discussed before the first draft report.

In addition, a public meeting was held to get input and feedback from residents. Notification of this meeting was posted on the South Metro Fire website, and was also discussed in the Fire Department newsletter, which was sent out to 90,000 homes within the district. Although there were significant attempts to make citizens aware of the meeting, only four individuals attended

[1] A handbook for Wildland-Urban Interface Communities March 2004, http://www.stateforesters.org/files/cwpphandbook.pdf

that were not part of the stakeholder group. The individuals in attendance spoke favorably of the fuels reduction projects recommended and the overall concept of developing a CWPP.

Additional public outreach was accomplished through a resident survey that was provided through the SMFRA website. This on-line resource was made available, to the public, and was launched on 7/6/2009 and was closed on 8/28/2009. The survey was visited by 67 individuals, only six completed the survey. The results were utilized in the development of this report and are detailed below.

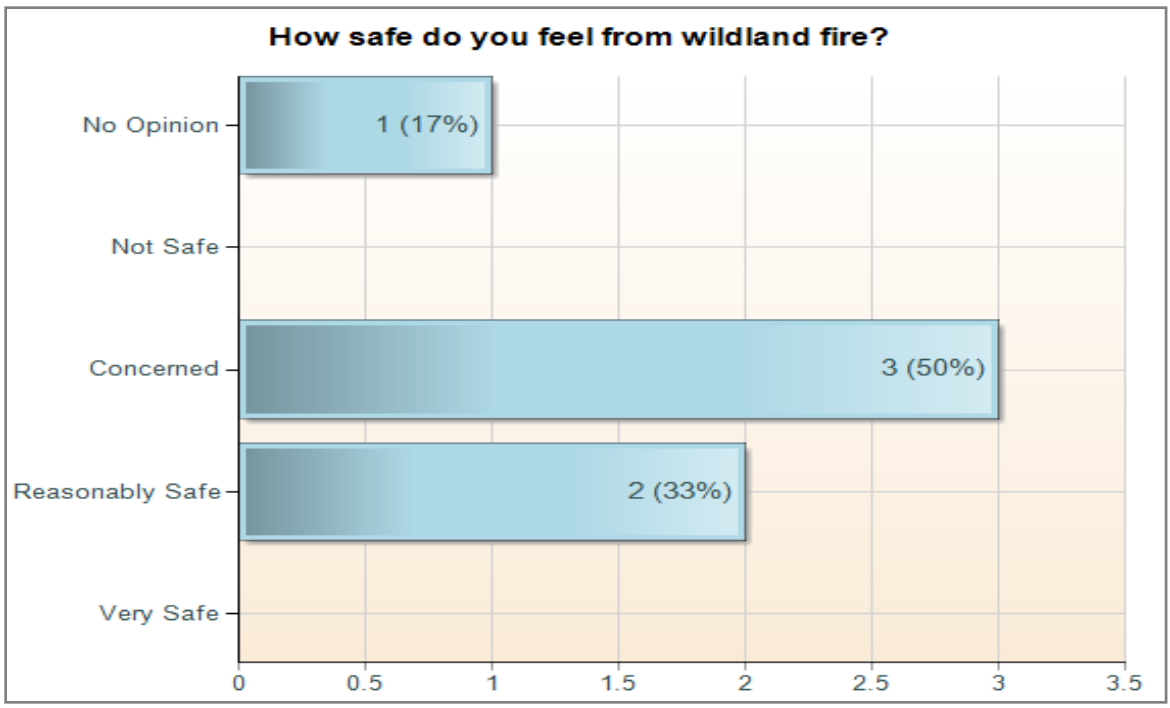
The lack of people at the meetings and responses to the survey demonstrates a need to continue outreach in the District. As a result, additional community involvement has been addressed. Of the 42 communities, those that were not already active in the CWPP process were contacted and made aware of this umbrella CWPP. Currently, it is being determined whether these communities are interested in having an individual community CWPP; if so, a contact person will be designated to assist in the process. Currently meetings are tentatively scheduled for the beginning of 2010 to initiate work with the community stakeholders and umbrella stakeholders.

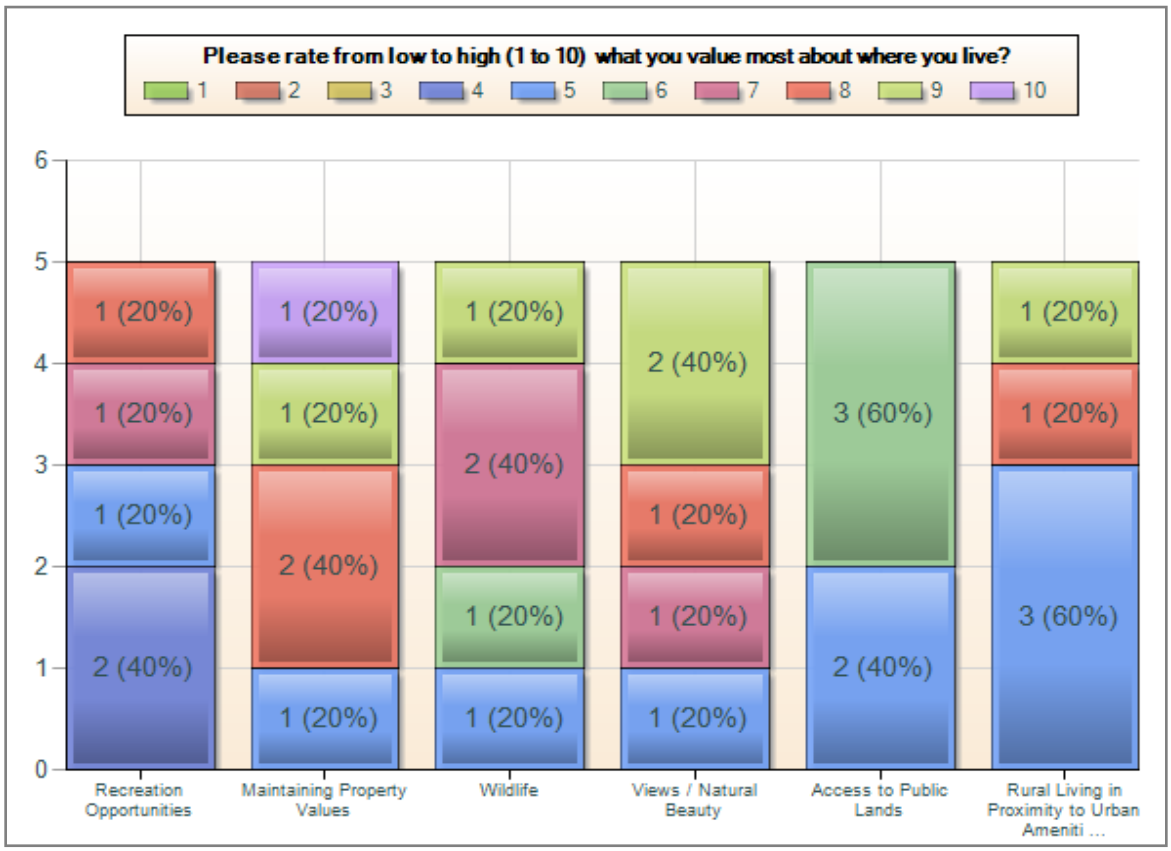
For the larger, umbrella SMFRA CWPP, the stakeholders met and were able to formally agree upon community treatment priorities. The fuel treatment priorities are found in **Appendix D**.

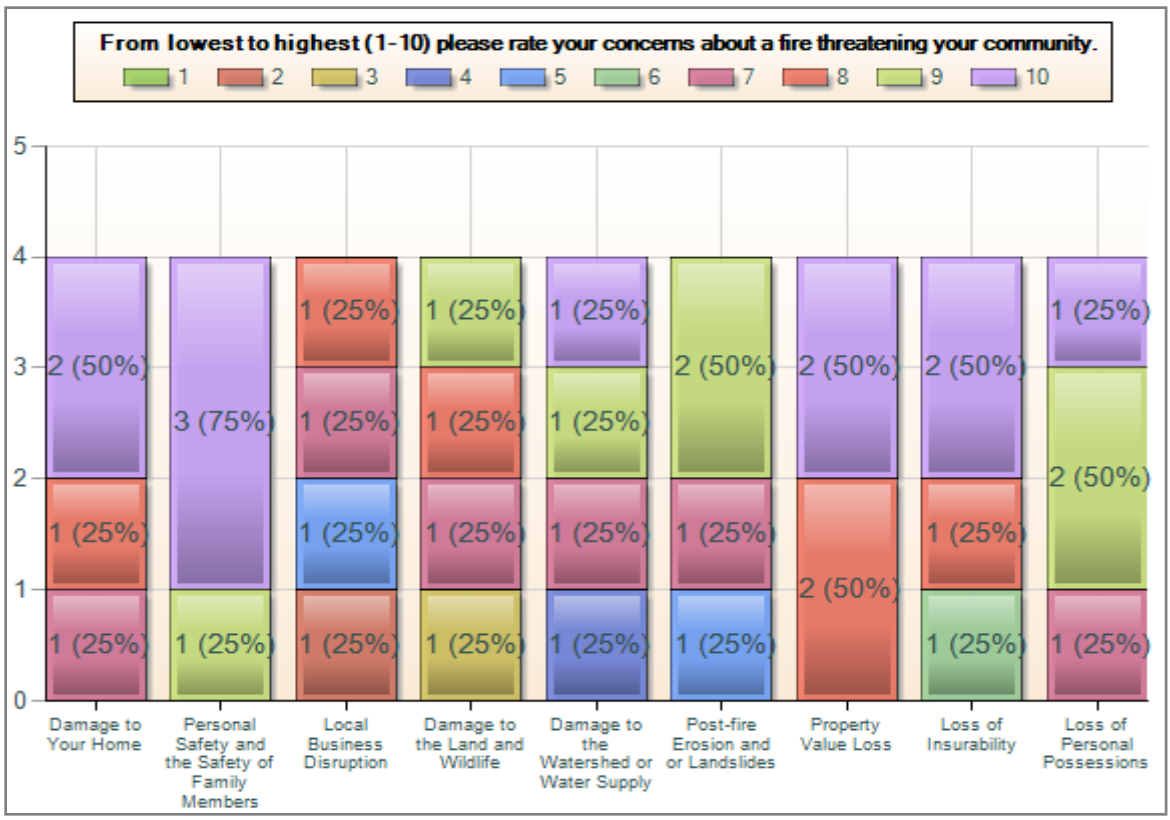
Overall the following values were expressed by the residents who completed the survey and were common themes with the stakeholder group:

- Rural living in close proximity to urban settings, along with access to public lands and recreational opportunities
- The highest concerns related to potential fire damage are personal safety and the safety of family members. Of equal concern are damage to the home, loss of personal possessions, loss of insurability, post-fire erosion, and a decrease in property values
- Three respondents feel concerned about the threat of wildfire, two feel reasonably safe, and one had no opinion
- Everyone that took the survey knows of an alternative evacuation route that could be used if the main road was obstructed during a fire
- Most respondents support mitigation work, whether funding is provided or not. Others are willing to do mitigation work if they are convinced it will improve the survivability of their home, is available by way of cost-share, or is government mandated.
- Residents are comfortable working with other homeowners, large landowners, and allowing supervised hand crews to work on their land and public land adjacent to their property
- The majority of respondents feel that SMFRA is well-equipped and capable of handling a wildfire in the area

The graphics below provide a visual summary of the respondents' answers to the posted survey.


How safe do you feel from wildland fire?
No Opinion
Not Safe
Concerned
Reasonably Safe
Very Safe
1 (17%)
3 (50%)
2 (33%)
0
0.5
1
1.5
2
2.5
3
3.5


Please rate from low to high (1 to 10) what you value most about where you live?
1
2
3
4
5
6
7
8
9
10
Recreation Opportunities
Maintaining Property Values
Wildlife
Views / Natural Beauty
Access to Public Lands
Rural Living in Proximity to Urban Ameniti ...


From lowest to highest (1-10) please rate your concerns about a fire threatening your community.
1
2
3
4
5
6
7
8
9
10
5
4
3
2
1
0
2 (50%)
1 (25%)
1 (25%)
3 (75%)
1 (25%)
1 (25%)
1 (25%)
1 (25%)
1 (25%)
1 (25%)
1 (25%)
1 (25%)
1 (25%)
1 (25%)
1 (25%)
2 (50%)
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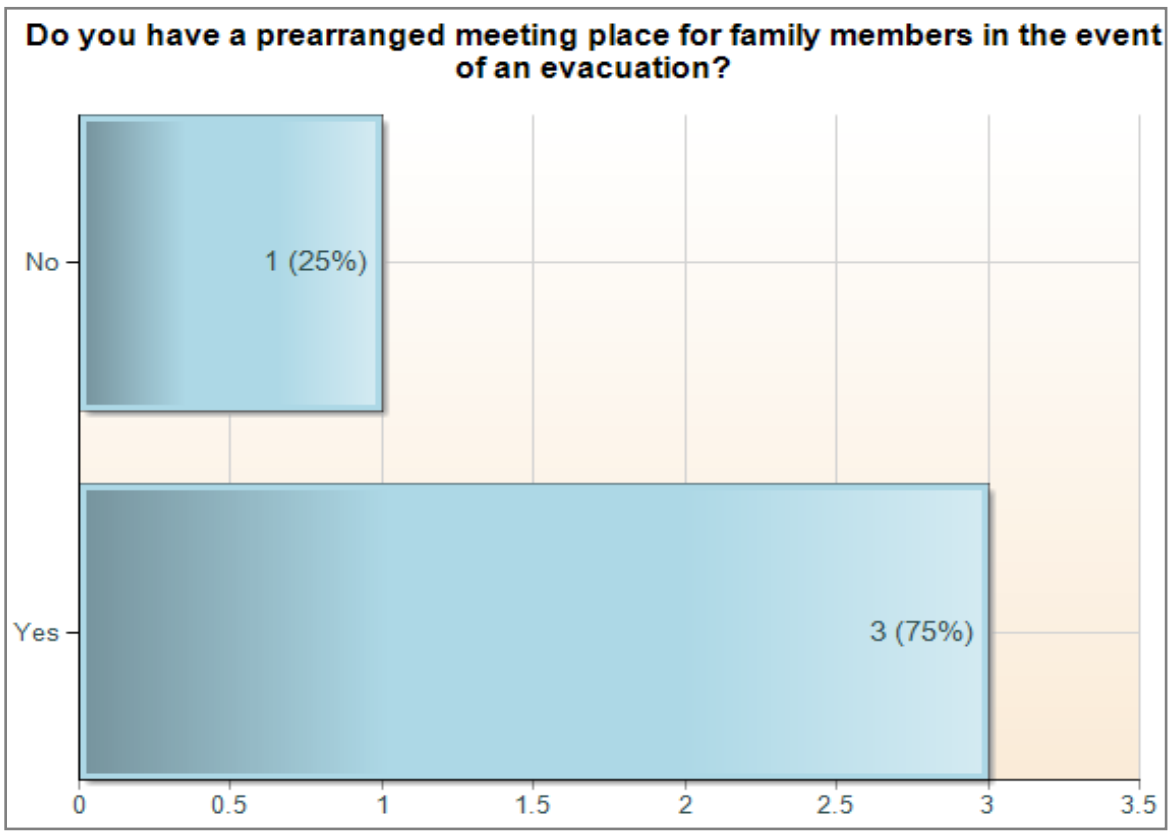
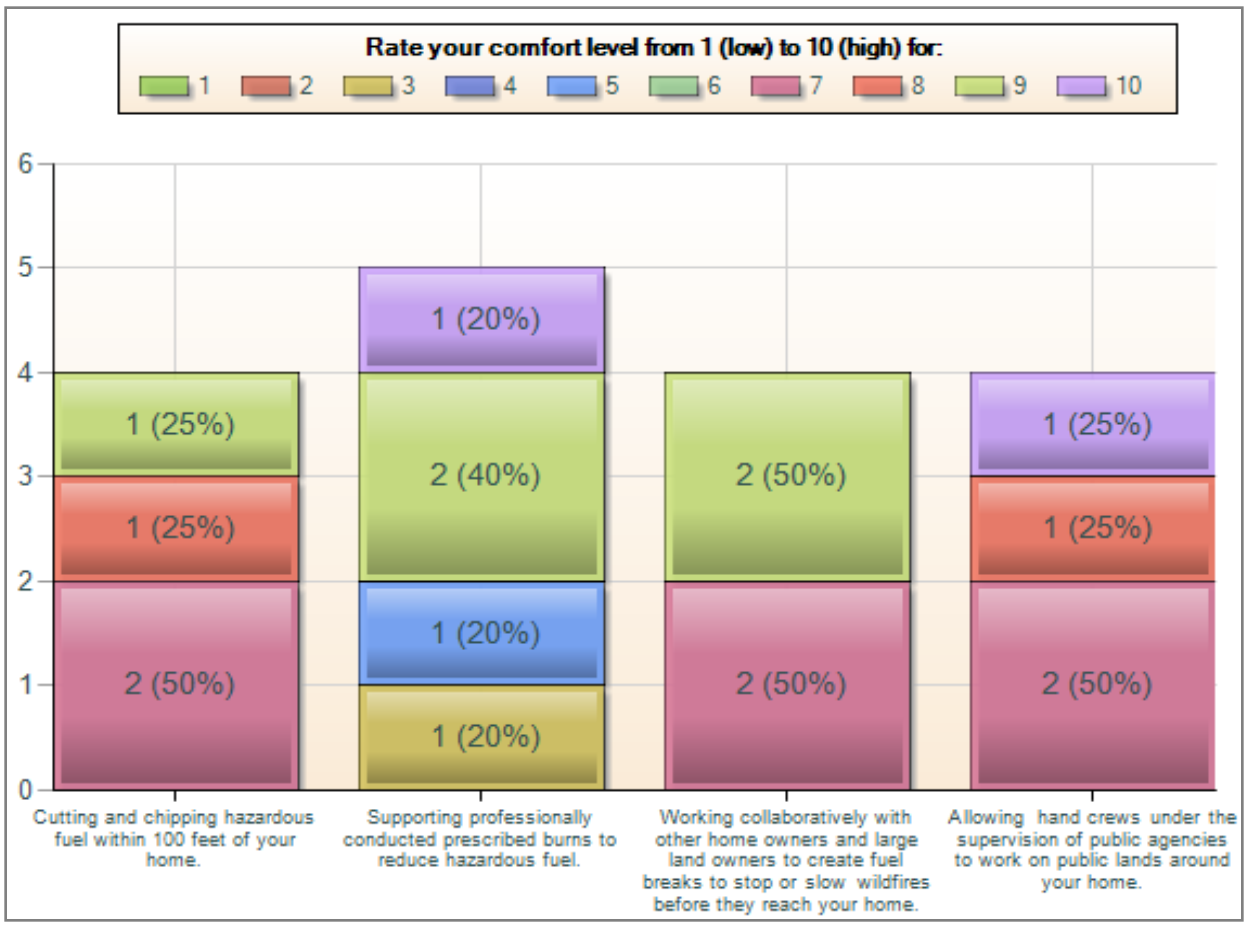
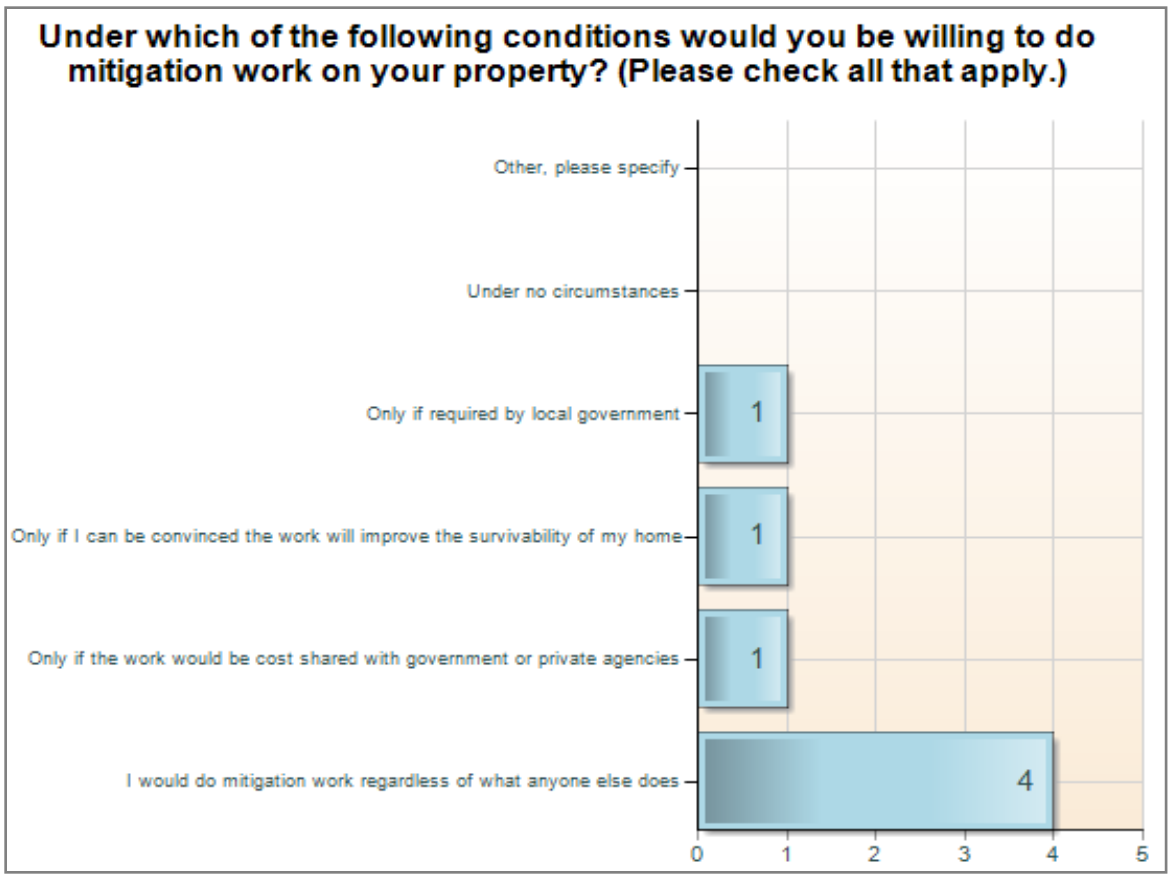
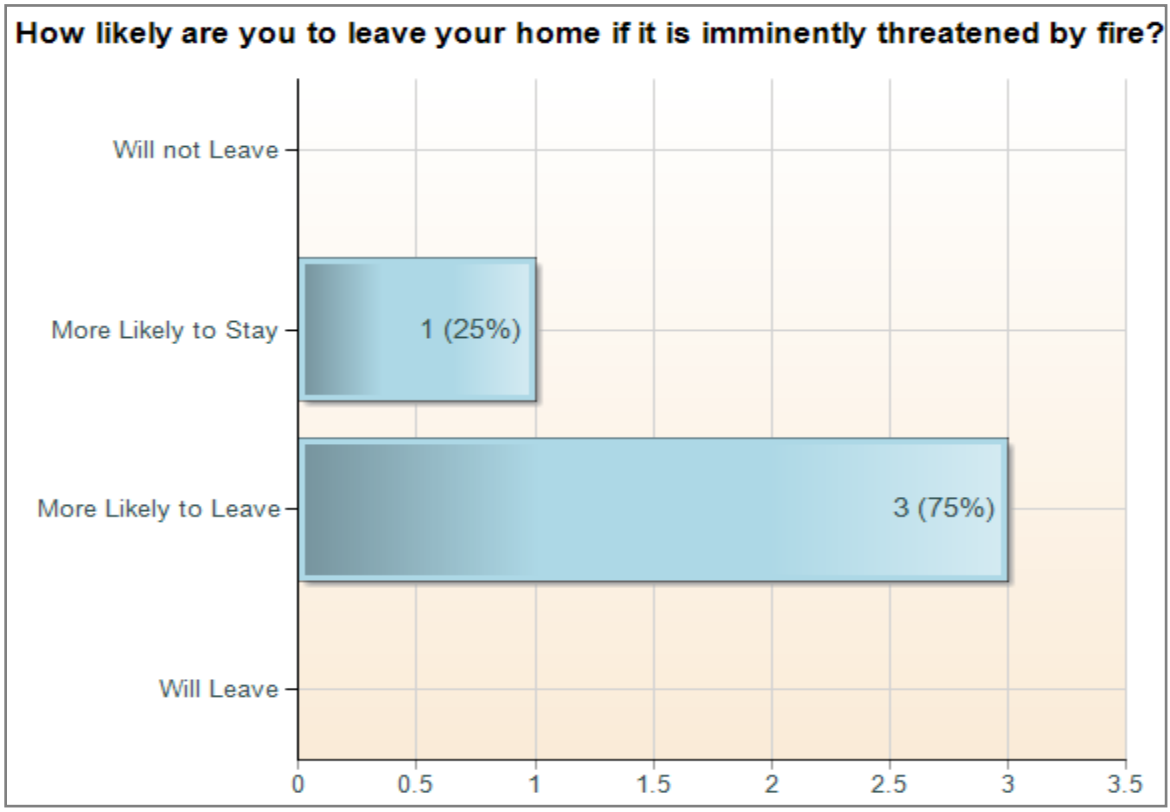
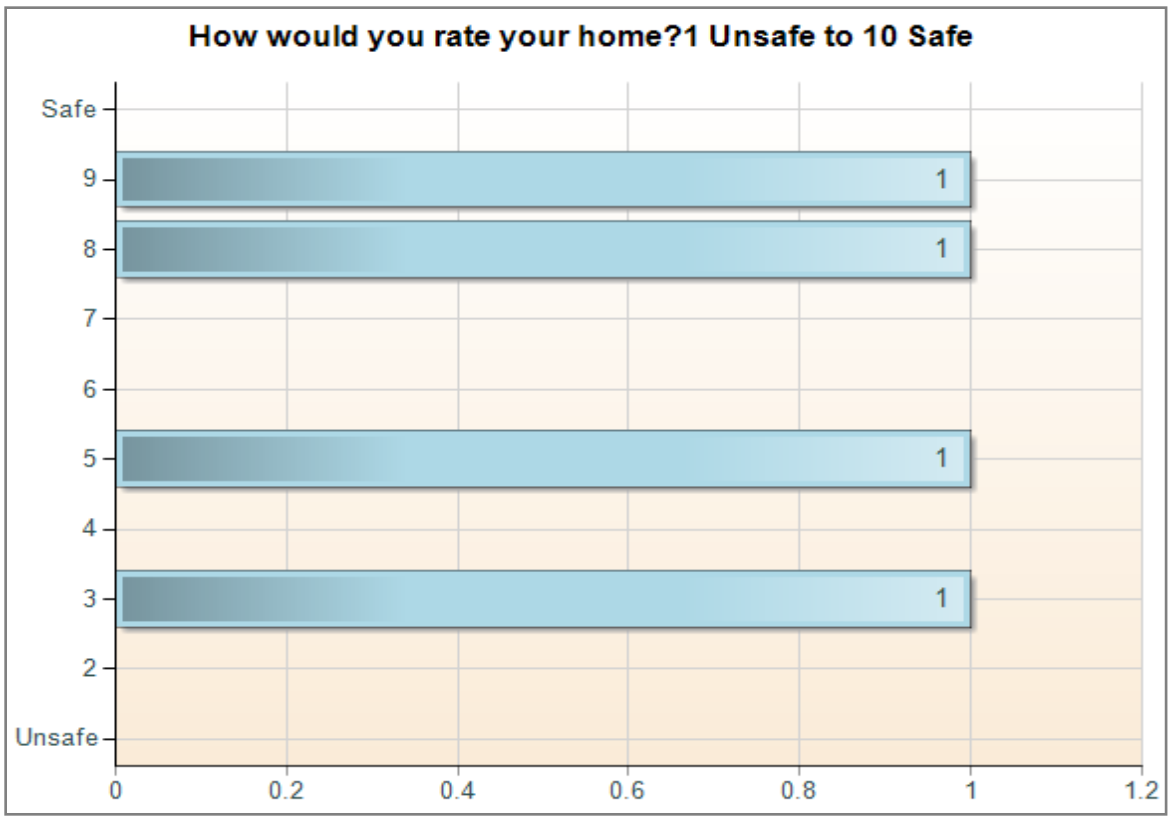
1 (25%)
2 (50%)
2 (50%)
1 (25%)
1 (25%)
2 (50%)
1 (25%)
1 (25%)
Damage to Your Home
Personal Safety and the Safety of Family Members
Local Business Disruption
Damage to the Land and Wildlife
Damage to the Watershed or Water Supply
Post-fire Erosion and or Landslides
Property Value Loss
Loss of Insurability
Loss of Personal Possessions

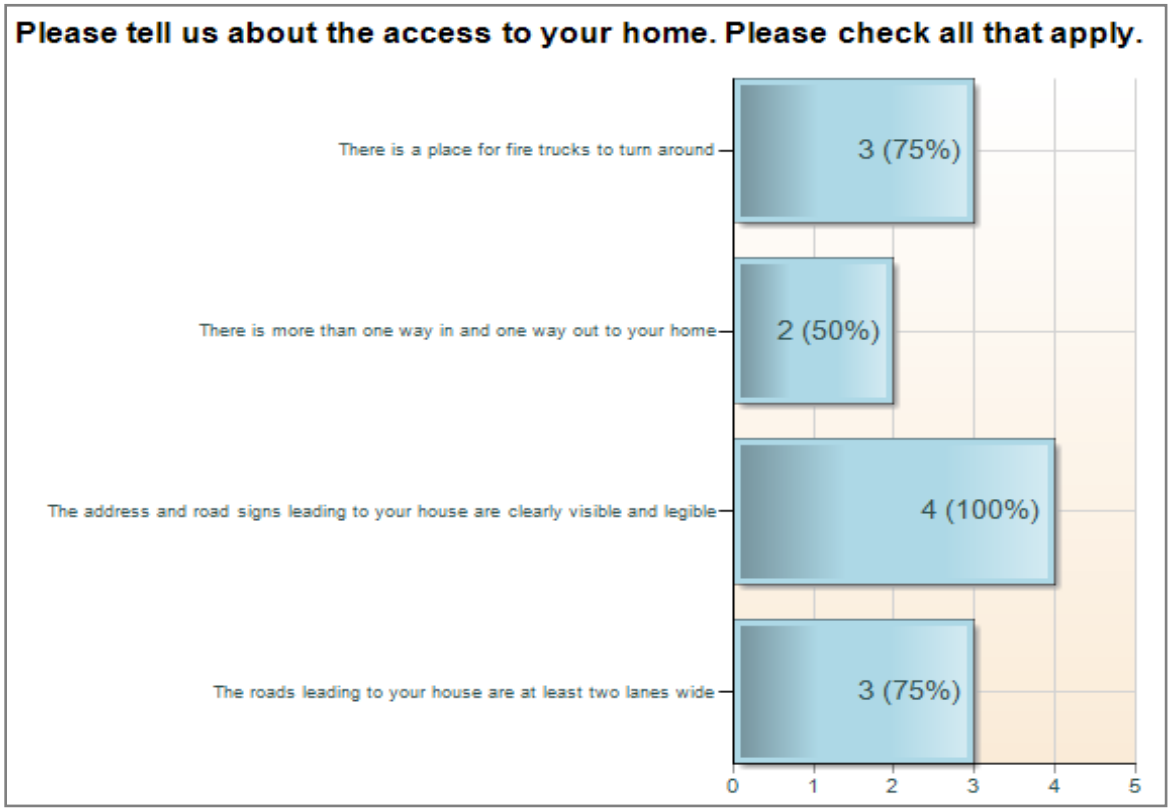

Do you have a prearranged meeting place for family members in the event of an evacuation?
No
Yes
1 (25%)
3 (75%)
0
0.5
1
1.5
2
2.5
3
3.5

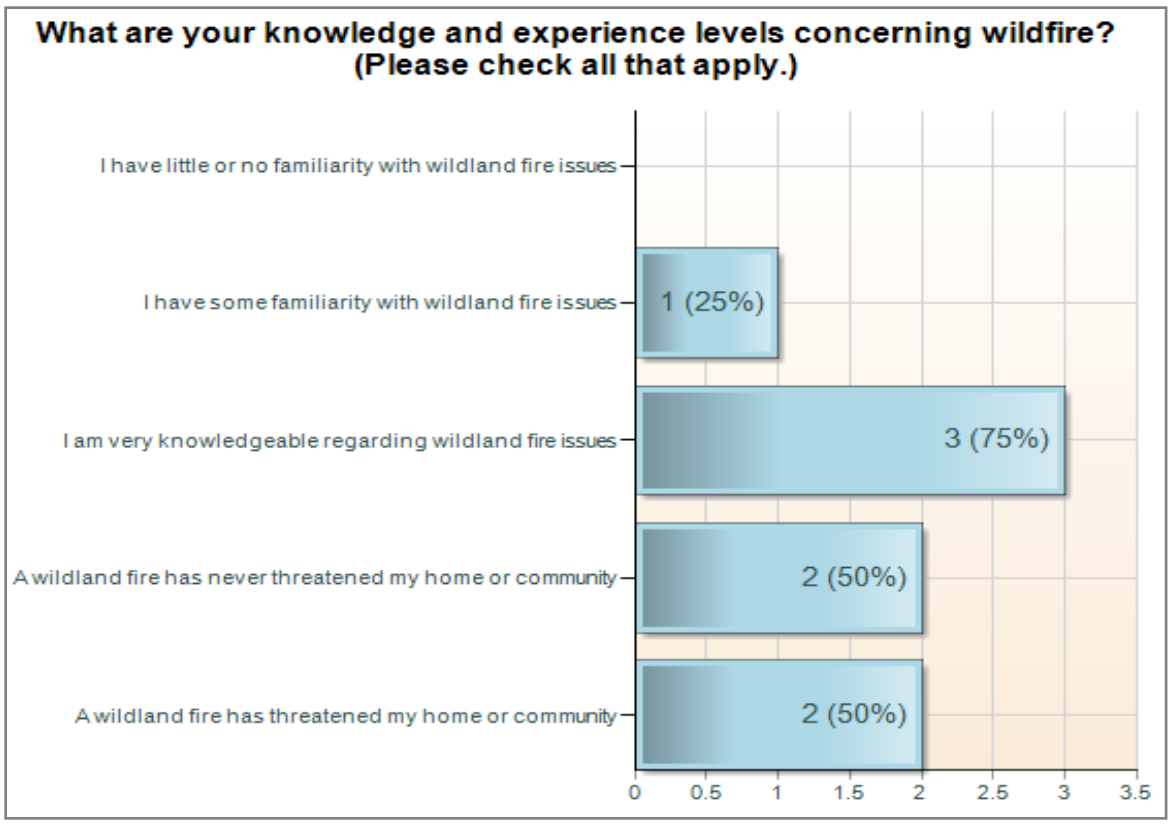

Rate your comfort level from 1 (low) to 10 (high) for:
1
2
3
4
5
6
7
8
9
10
6
5
4
3
2
1
0
1 (25%)
1 (25%)
2 (50%)
1 (20%)
2 (40%)
1 (20%)
1 (20%)
2 (50%)
2 (50%)
1 (25%)
1 (25%)
2 (50%)
Cutting and chipping hazardous fuel within 100 feet of your home.
Supporting professionally conducted prescribed burns to reduce hazardous fuel.
Working collaboratively with other home owners and large land owners to create fuel breaks to stop or slow wildfires before they reach your home.
Allowing hand crews under the supervision of public agencies to work on public lands around your home.

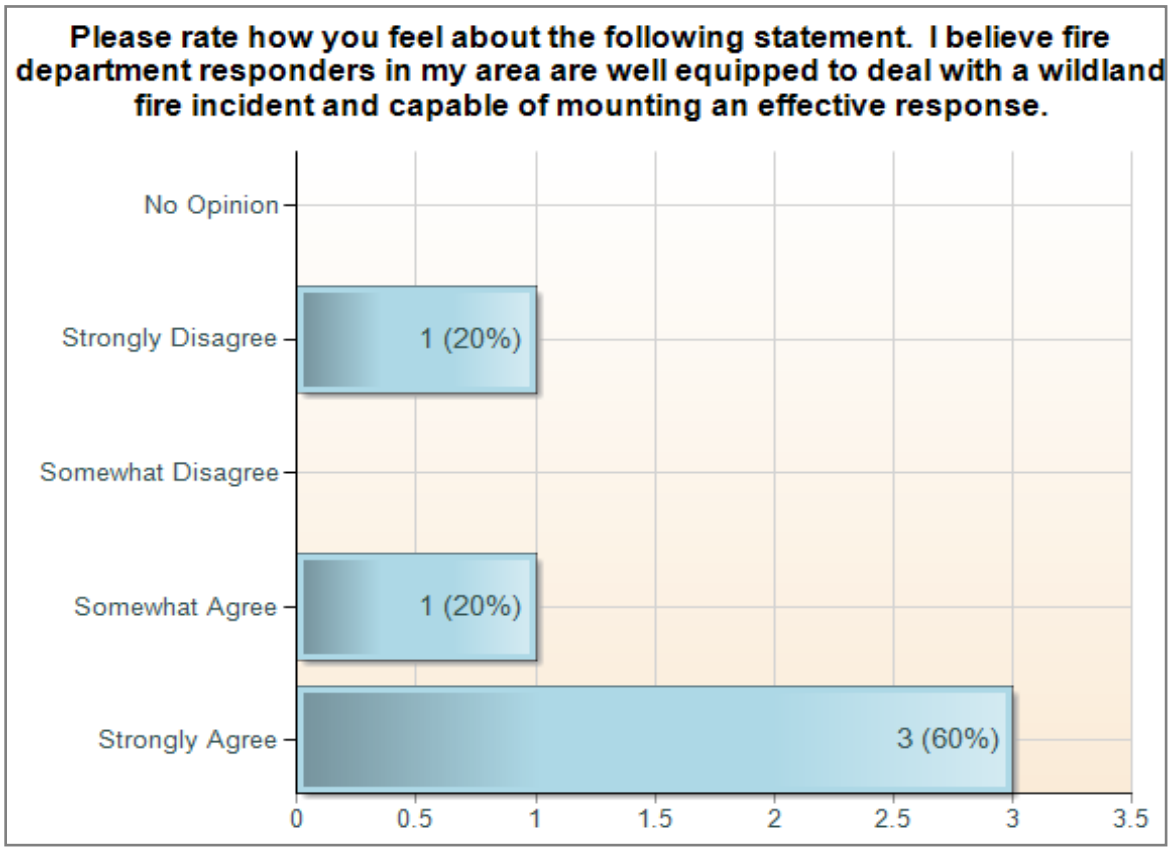

Under which of the following conditions would you be willing to do mitigation work on your property? (Please check all that apply.)
Other, please specify
Under no circumstances
Only if required by local government
1
Only if I can be convinced the work will improve the survivability of my home
1
Only if the work would be cost shared with government or private agencies
1
I would do mitigation work regardless of what anyone else does
4
0
1
2
3
4
5


How likely are you to leave your home if it is imminently threatened by fire?
Will not Leave
More Likely to Stay
1 (25%)
More Likely to Leave
3 (75%)
Will Leave
0
0.5
1
1.5
2
2.5
3
3.5


How would you rate your home?1 Unsafe to 10 Safe
Safe
9
8
7
6
5
4
3
2
Unsafe
1
1
1
1
0
0.2
0.4
0.6
0.8
1
1.2


Please tell us about the access to your home. Please check all that apply.
There is a place for fire trucks to turn around
3 (75%)
There is more than one way in and one way out to your home
2 (50%)
The address and road signs leading to your house are clearly visible and legible
4 (100%)
The roads leading to your house are at least two lanes wide
3 (75%)
0
1
2
3
4
5


What are your knowledge and experience levels concerning wildfire? (Please check all that apply.)
I have little or no familiarity with wildland fire issues
I have some familiarity with wildland fire issues
1 (25%)
I am very knowledgeable regarding wildland fire issues
3 (75%)
A wildland fire has never threatened my home or community
2 (50%)
A wildland fire has threatened my home or community
2 (50%)
0
0.5
1
1.5
2
2.5
3
3.5


Please rate how you feel about the following statement. I believe fire department responders in my area are well equipped to deal with a wildland fire incident and capable of mounting an effective response.
No Opinion
Strongly Disagree
1 (20%)
Somewhat Disagree
Somewhat Agree
1 (20%)
Strongly Agree
3 (60%)
0
0.5
1
1.5
2
2.5
3
3.5

## CWPP FUNDING RECOMMENDATIONS

There are many sources of funds available for implementing the recommendations within the CWPP. Some available grants and websites where more information can be found are provided below.

- **Agency: Colorado State Forest Service**
  - Purpose: to help individuals, landowners, fire departments, community groups and others secure grant assistance for projects that promote healthy forests in Colorado, whenever opportunities arise.
  - More information: http://csfs.colostate.edu/pages/funding.html
  - Local office: 2068 N. State Hwy. 83
    Franktown, CO 80116-0485
    (303) 660-9625
    Fax (303) 688-2919

- **Agency: US Department of Homeland Security, Office for Domestic Preparedness**
  - Purpose: to assist local, state, regional, or national organizations in addressing fire prevention and safety. The Fire Prevention and Safety Grant Program is the important grant program for Fire Safe Councils.
  - More information: http://www.firegrantsupport.com/

- **Agency: Federal Emergency Management Agency (FEMA)**
  - Purpose: to improve firefighting operations, purchase firefighting vehicles, equipment, and personal protective equipment, fund fire prevention programs, and establish wellness and fitness programs.
  - More information: http://www.usfa.dhs.gov/fireservice/grants/

- **Agency: Community Facilities Grant Program**
  - Purpose: to help rural communities. Funding is provided for fire stations
  - More information: http://www.rurdev.usda.gov/rhs/cf/Emerg_Responder/rural_emergency_responders_initi.htm

- **Agency: Firehouse.com**
  - Purpose: emergency services grants
  - More information: www.firehouse.com/funding/grants.html

- **Agency: Forest Service, Economic Action Programs**
  - Purpose: Economic Action Programs that work with local communities to identify, develop, and expand economic opportunities related to traditionally under-utilized wood products and to expand the utilization of wood removed through hazardous fuel reduction treatments.
    - More information: http://www.forestsandrangelands.gov/communities/

# APPENDIX D
# Implementation Plan

## Community Outreach

As illustrated in the table below, the South Metro Fire Rescue Authority's (SMFRA) Community Wildfire Protection Plan (CWPP) identified 42 communities with low, moderate, high or very high wildfire hazards.

| | |
|---|---|
| CPV F – Very High | Ponderosa Hills - Moderate |
| CPV G – Very High | The Retreat – Moderate |
| CPV H – Very High | Windy Hills – Moderate |
| Homestead Hills - High | CPV B - Moderate |
| The Pinery – High | CPV C – Moderate |
| Democrat Road - High | CPV E - Moderate |
| Lemon Gulch – High | Buffalo Ridge – Moderate |
| Black Forest – High | Charter Oaks – Moderate |
| The Timbers – High | Chatfield – Moderate |
| CPV A – High | Forest Park – Moderate |
| CPV D – High | Happy Canyon Ranches – Moderate |
| CPV J – High | Louviers – Moderate |
| CPV K – High | McArthur Ranch North - Moderate |
| Happy Canyon – High | Plum Valley Heights - Moderate |
| McArthur Ranch South – High | Titan Road – Moderate |
| Surrey Ridge – High | Cherokee Ridge Estates - Low |
| Colorado Golf Club – Moderate | Castle Pines North – Low |
| Hidden Village - Moderate | Pine Bluffs – Low |
| Johnson Road - Moderate | Romar West – Low |
| Parker East – Moderate | Whisper Canyon – Low |
| Ponderosa East - Moderate | CPV I – Low |

Three of those communities – Happy Canyon, Happy Canyon Ranches and Hidden Village – are currently implementing individual CWPPs. Pine Ridge, a subdivision of the City of Castle Pines North, has been implementing its own CWPP as well. However, this umbrella document did not make that distinction; instead Pine Ridge is treated as part of the City of Castle Pines North. Additionally Castle Pines Village has a CWPP in draft form that is influencing their landscaping and development priorities.

SMFRA and other core stakeholders (CSFS and Douglas County Wildfire Section) worked with the City of Castle Pines North to develop its CWPP, which was adopted formally by the city, metropolitan district and master homeowners association in October 2009. That CWPP includes the above-mentioned communities of Buffalo Ridge, Charter Oaks, Forest Park, The Retreat, Romar West and Whisper Canyon. The stakeholders will meet with representatives of the city's subdivisions in the first quarter of 2010 to discuss specific mitigation goals and strategies.

SMFRA attempted to contact each of the other communities to determine whether each was interested in developing their own CWPP utilizing the data in this umbrella plan. Life Safety Educator Einar Jensen emailed several existing homeowner association contacts in early September 2009 and mailed an informational letter to each HOA in October 2009 asking them about their level of interest in the CWPP process. Since communities within the umbrella plan were mainly grouped geographically instead of by homeowner association (in most instances) we decided to take two different approaches to contacting communities. The first approach was to contact existing HOAs in the project area. For those communities who do not have a formal HOA (Titan Road, Johnson Road, Black Forest and Democrat Road) SMFRA will contact the residents in advance of planning mitigation projects in those areas.

By the end of November 2009, Einar received favorable responses from The Pinery, McArthur Ranch (North and South), Louviers, Surrey Ridge, Ponderosa Hills and Homestead Hills. Each community designated a contact person to assist with recruiting other local stakeholders and sharing information with the neighborhood. By December 2009, he had received no negative feedback, but was waiting to hear from the other communities. Because none of the letters was returned as un-deliverable, he believes each reached its target community.

Working with the representatives of those communities who expressed interest in the program, SMFRA and the other core stakeholders will develop fuel treatment priorities specific to each community based on an analysis that accounts for local ecology, the fire regime, ownership/stewardship and local input. The interested high hazard neighborhoods will be our top priority followed by the moderate and low hazard communities. We plan to meet with each during the first quarter of 2010 depending on that level of priority. Within each community, those stakeholders will identify open space or other shared parcels with heavy vegetation capable of carrying surface fires into aerial fuels and those with enough horizontal continuity to carry fire from vegetation to homes and infrastructure or vice versa. Additionally, we will target heavy vegetation along roadways that could impede citizen evacuation as well as our ingress and escape routes for treatment. SMFRA also will work with individual property owners to identify how they can break the horizontal and vertical continuity of fuels on their land and improve the ignition resistance of their homes and other buildings.

During the second quarter of 2010, we will assist the aforementioned communities that are interested in developing their own CWPPs (as well as assisting Castle Pines North with implementing its CWPP) by meeting with local stakeholders to identify fuel treatment priorities. By year's end, each community should have its own plan in place and be able to apply for CSFS or other grants to begin mitigation work on those shared parcels.

SMFRA personnel will provide ongoing life safety education catered to individual property owners and communities for defensible space, safe evacuations and emergency communications (including consistent posting of addresses) through a variety of media and presentations. Our operations personnel may be available to assist with mitigation work depending on the project and availability. For example, SMFRA's successful prescribed burn in Bayou Gulch in the fall of 2009 may create similar opportunities in other areas of the district.

**Timeline Summary:**

- Contact communities that are interested in the CWPP process by first quarter 2010
- Identify fuel treatment priorities in those communities during second quarter of 2010
- Finish CWPPs for interested communities by end of 2010

## Fuel Treatment Priorities

Using the guidance in this document, SMFRA and its core stakeholders identified several community-based fuel treatment priorities. The top priority is to work with the City of Castle Pines North and its residents on the projects listed in their CWPP because of the opportunity for impact, participation and marketing.

Additionally, SMFRA has prioritized the creation of four landscape-scale fuel breaks identified in the umbrella plan: Happy Canyon, Surrey Ridge, Louviers and Chatfield. That ranking is based on wildfire risk and hazard as determined by this document and the experience of the core stakeholders. Six mowing projects are priorities for the district: North Lariat (Happy Canyon), Romar West, Titan Road, West Louviers, Plum Valley's perimeter and Highway 85 adjacent to Cherokee Ridge Estates.

Although this document identifies five major fuels reduction projects in Castle Pines Village, those projects are a low priority for SMFRA because that community is taking the lead for implementing those projects. Other projects such as the fuel break under the transmission line adjacent to Charter Oaks and the Tire Dump on Titan Estates Road will be completed as opportunities arise and the above projects completed.

## Wildland Firefighting Program

SMFRA's wildland firefighting program, which is based on National Fire Protection Association (NFPA) and National Wildfire Coordinating Group (NWCG) standards, has committed substantial resources to prepare, equip, and train all of its members to safely respond to and stabilize wildland or wildland/urban interface incidents. All line members

receive basic wildland firefighter training (S-130/190) as part of their recruit academy, and receive annual wildland firefighter refresher training (RT-130), all in accordance to NWCG standards.

As part of this progressive and proactive approach toward wildland firefighting, SMFRA also supports a specialized wildland firefighting team, under the Special Operations Bureau, that continues to receive advanced training, certifications, and qualifications above the annual baseline training all other authority suppression members receive. All wildland team members maintain national qualifications in accordance to the National Interagency Incident Management System Wildland Fire Qualification System Guide (PMS 310-1).

The authority's wildland firefighting team has made provisions for callback of personnel for emergency response to wildland fire incidents within the authority that may require additional qualified fire line supervisors, or personnel, to meet the objectives of a wildland fire incident that require support beyond daily staffing of on-duty resources. There also are provisions made for callback of personnel for emergency response to wildland fire incidents external to the authority to include mutual aid agreements with the Colorado State Forest Service, United States Forest Service (including other land management agencies), and FEMA (National Response Plan- ESF4a) that provide NWCG trained and qualified personnel, and associated resources, to regional and national levels when available and requested as noted in the Agency's Cooperative Resource Rate Form (CRRF) Agreement.

The wildland fire program also assists the Agency's Community Safety Division in providing support to various wildland fire public education and awareness programs, wildland fire prevention and mitigation efforts, as well as assisting with authority-wide planning such as CWPPs.

## Summary

In 2010, SMFRA personnel will provide all interested communities with general wildfire mitigation information and they will provide increasingly specific guidance and assistance to communities determined to be high priorities. As a result, by the end of 2010 SMFRA will have acted upon several of the official action items recommended by Anchor Point:

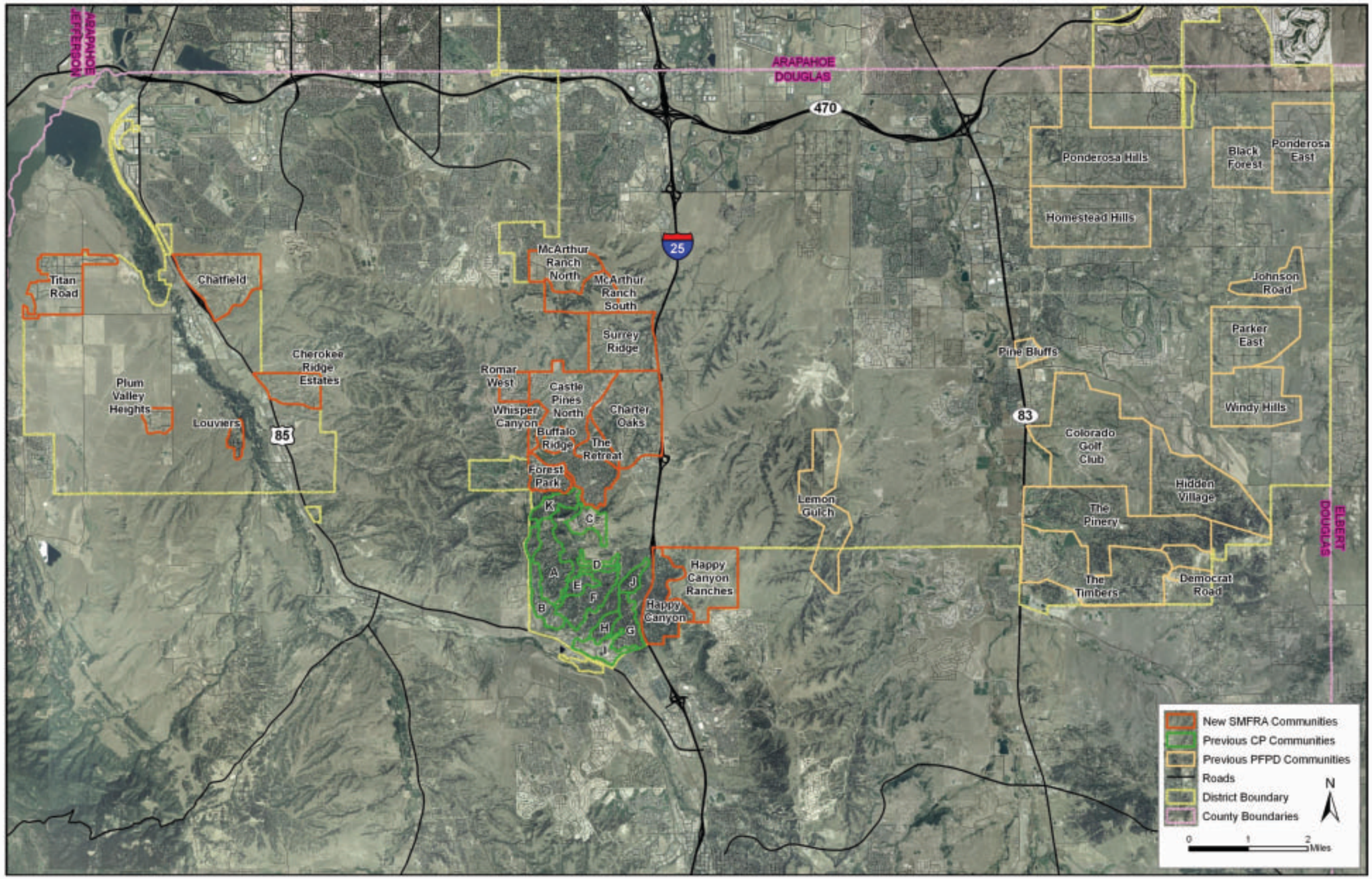
- Improving the way addresses are determined and posted in the district from the community level
- Developing evacuation guidelines from an operations perspective
- Identifying evacuation routes, beginning with the high priority communities
- Planning for emergency evacuations as individual residents and as communities
- Continuing to conduct life safety education, such as the Ready-Set-Go curriculum
- Continuing to promote defensible space programs
- Continuing to empower firefighters to work safely through training with proper equipment
- Updating local-level assessments for both homeowner and firefighter audiences
- Developing awareness and buy-in from public officials

- Developing an approach to determine future water supply needs

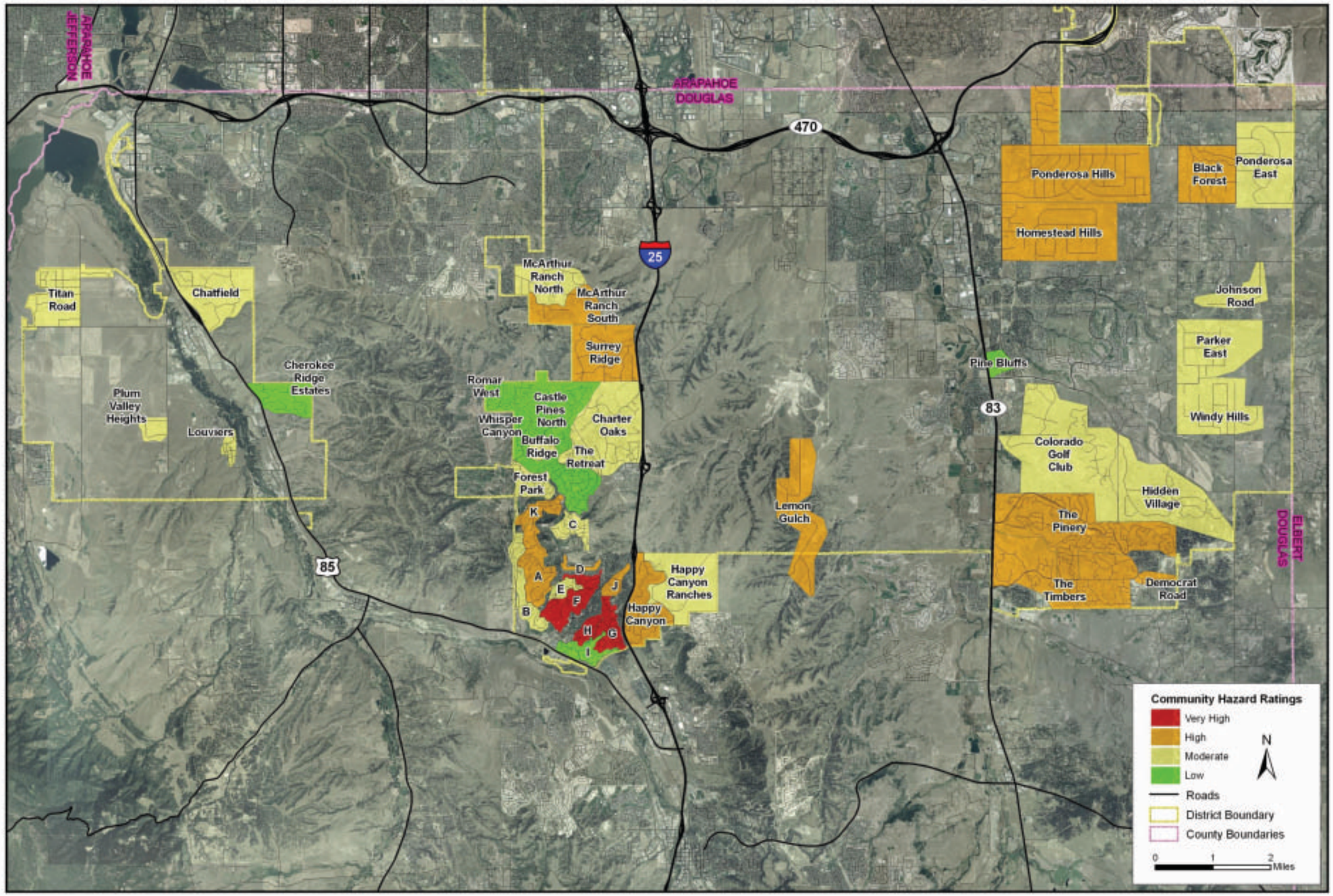
As the list suggests, implementation will be an ongoing process that lasts beyond 2010. The process of implementation will be organic, adjusting based on future growth in the district, fire conditions and behavior, stakeholder interest, stakeholder budgets, funding opportunities and other factors.

## APPENDIX E
## 11” x 17” Maps

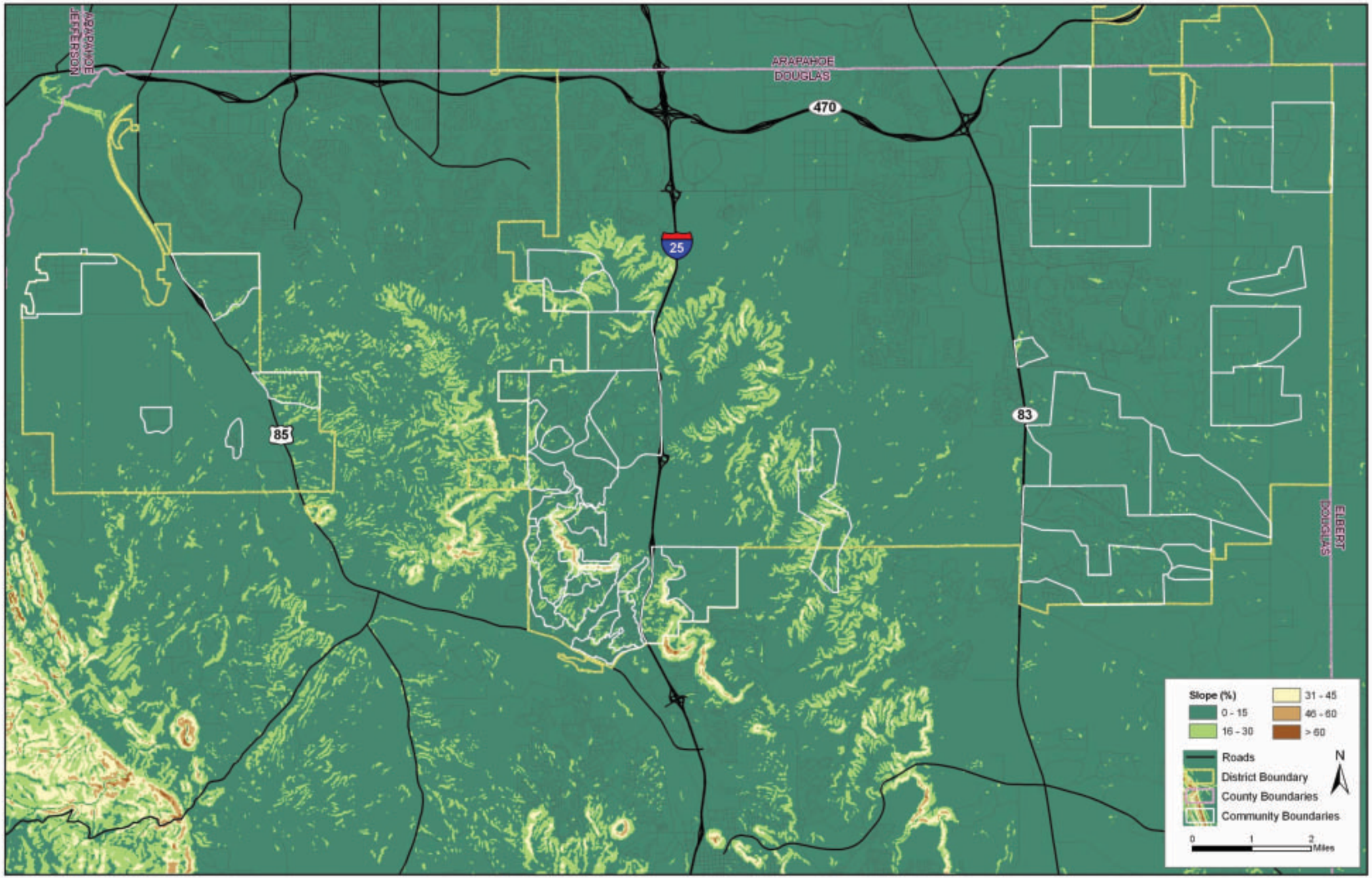
Overview of the Communities in the Study Area



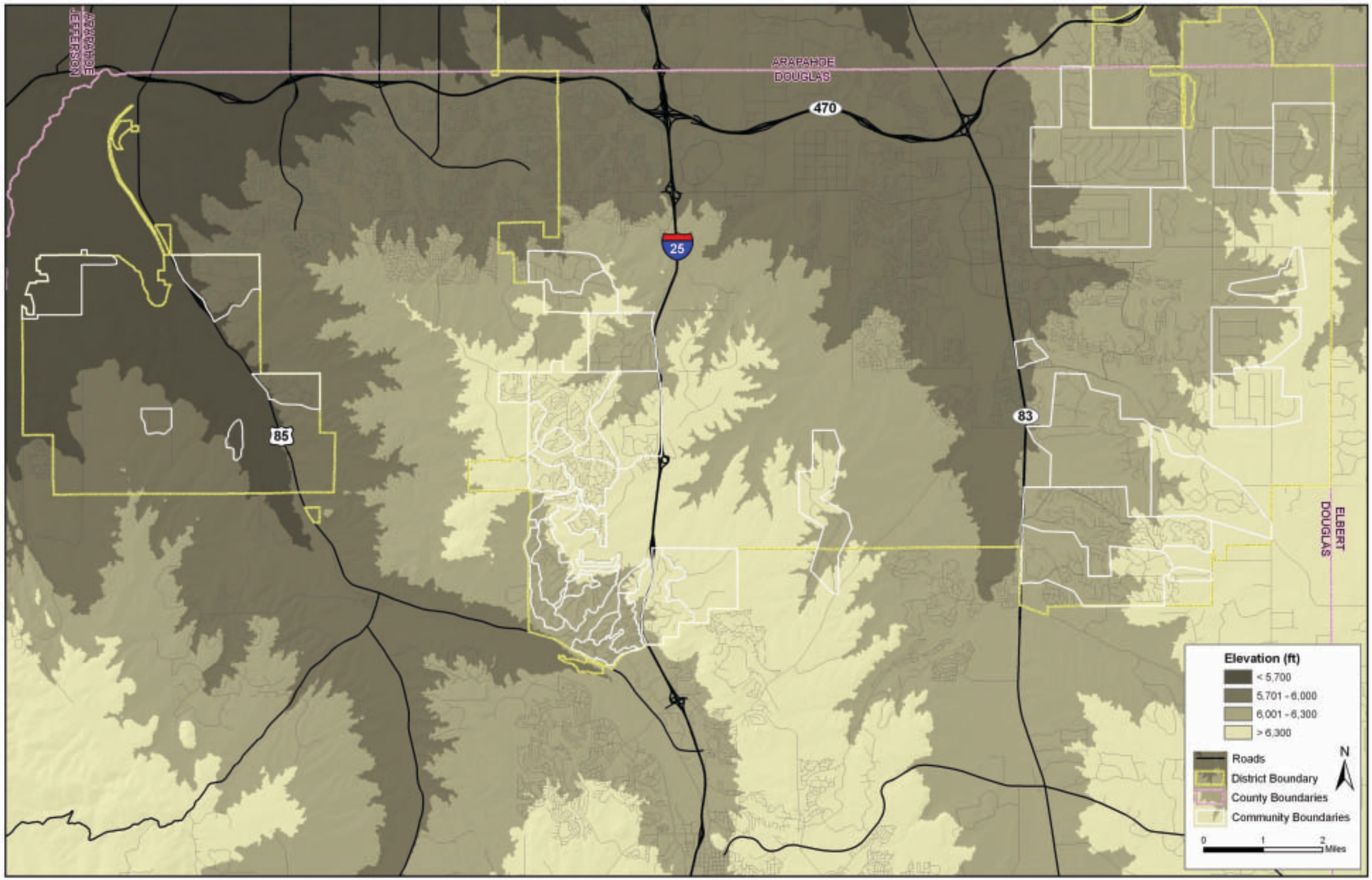
Hazard Ratings for the Communities within the Study Area



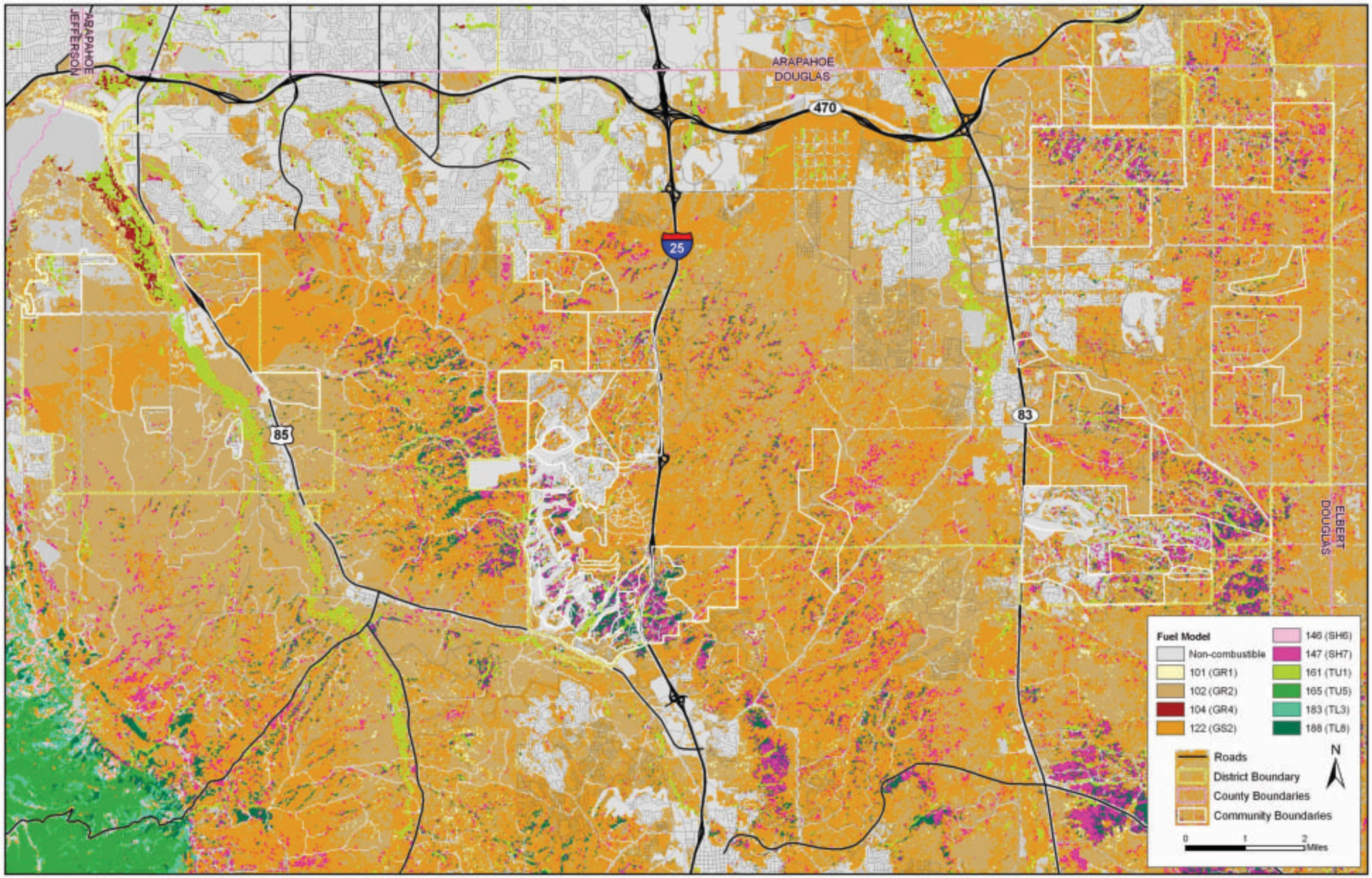
Percent Slope Percent Slope in the Study Area



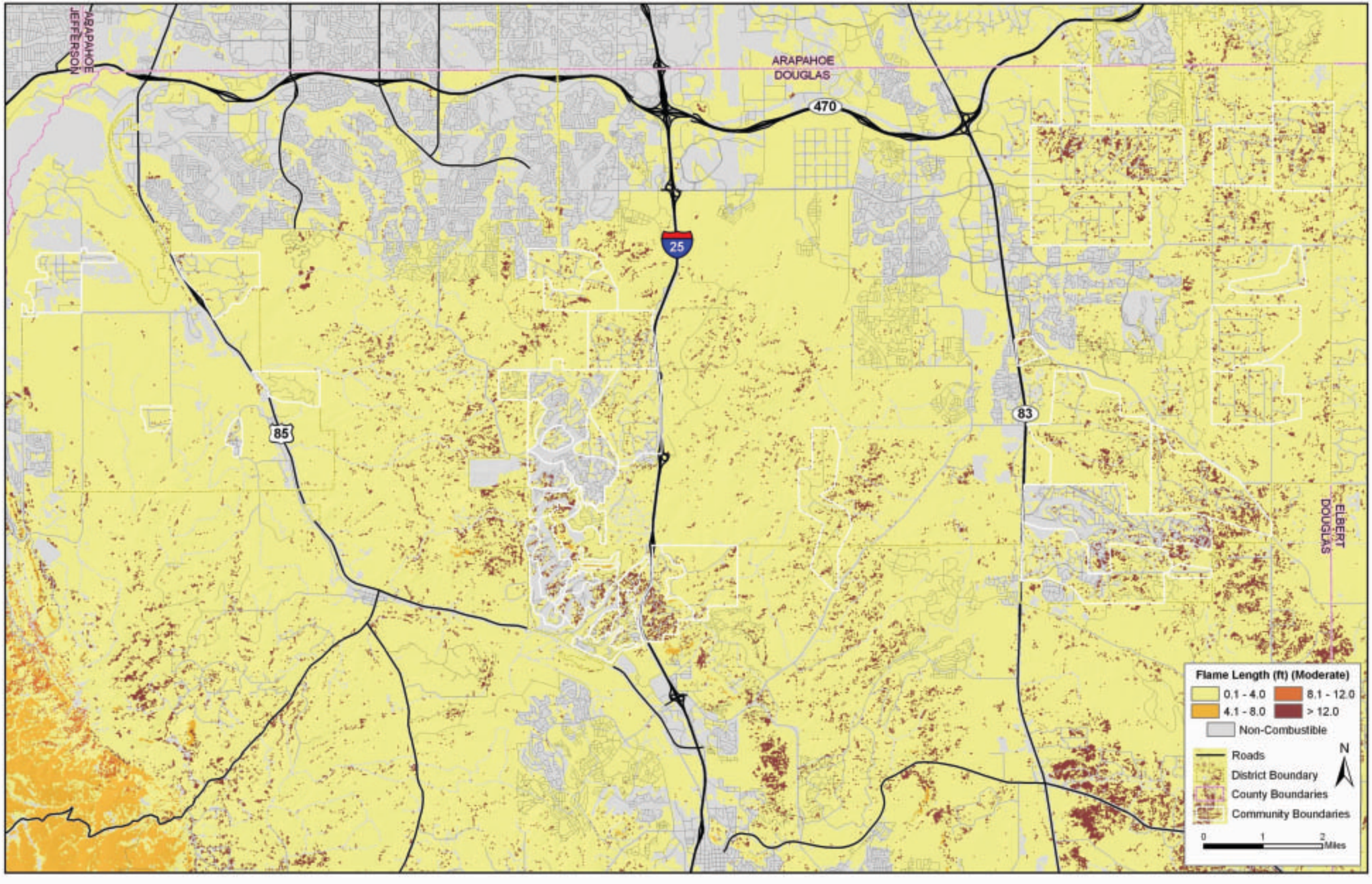
Elevation Profile for the Study Area



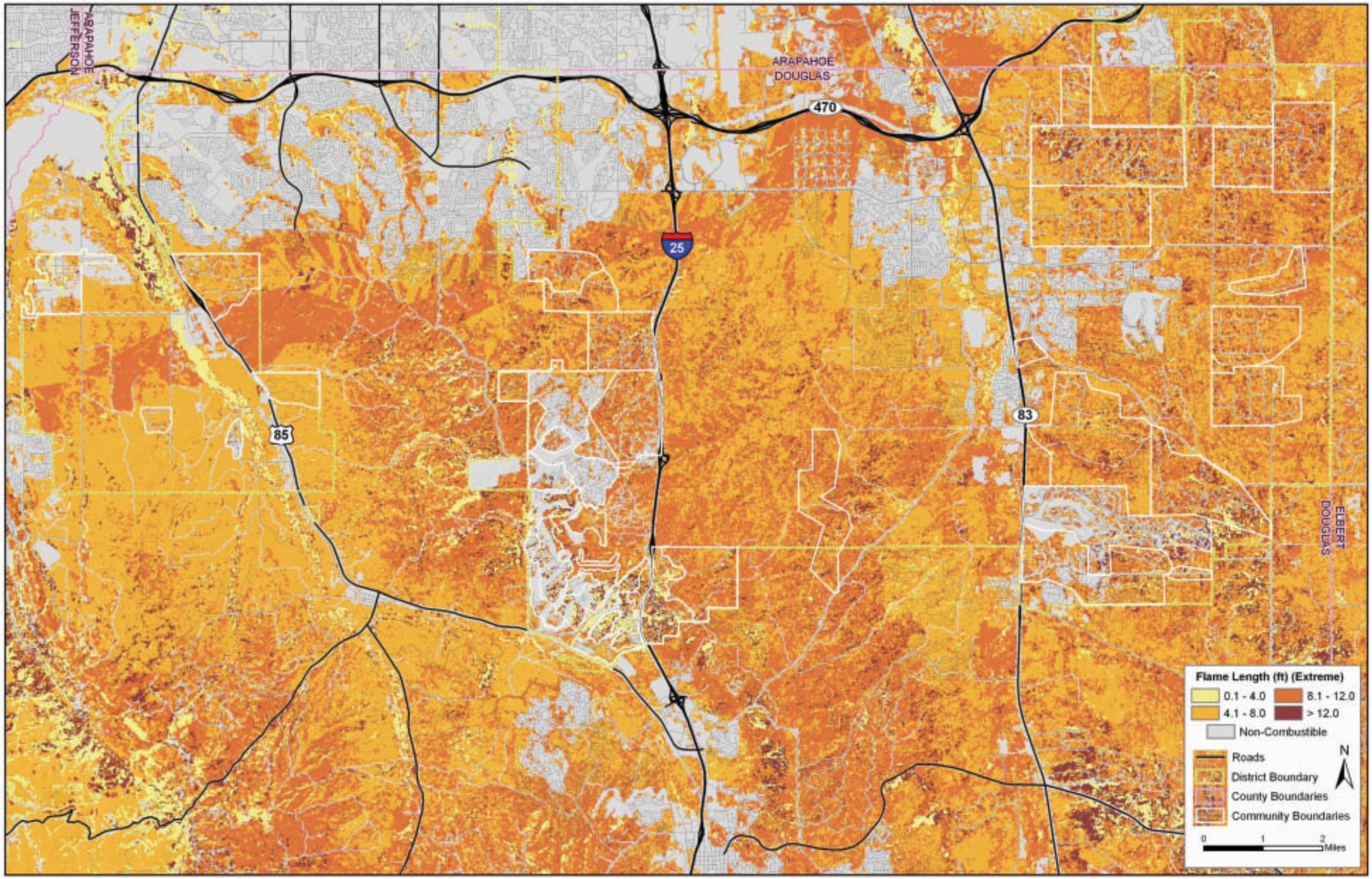
Fuel Models within the Study Area



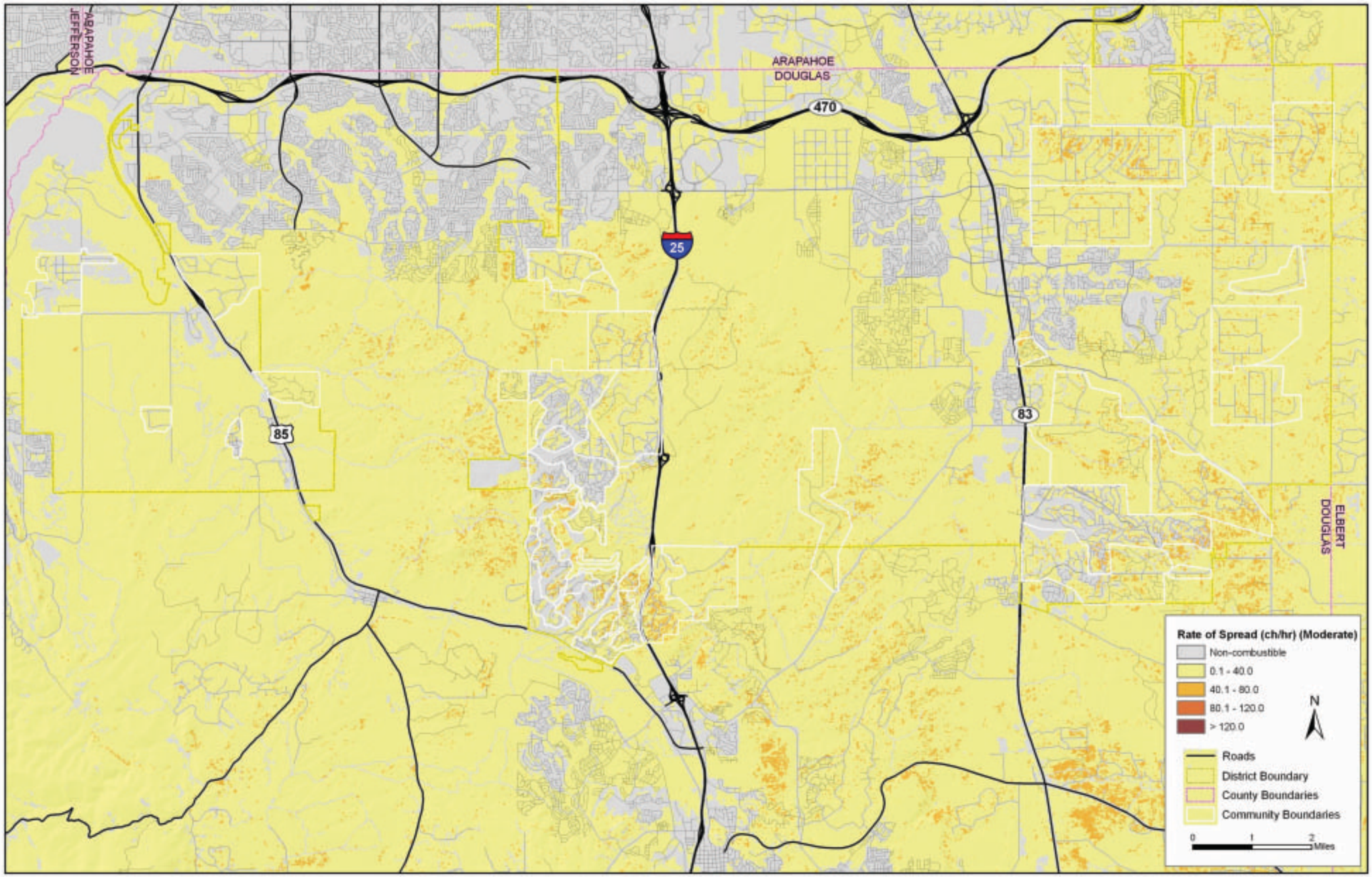
Predicted Flame Length assuming Moderate Weather Conditions



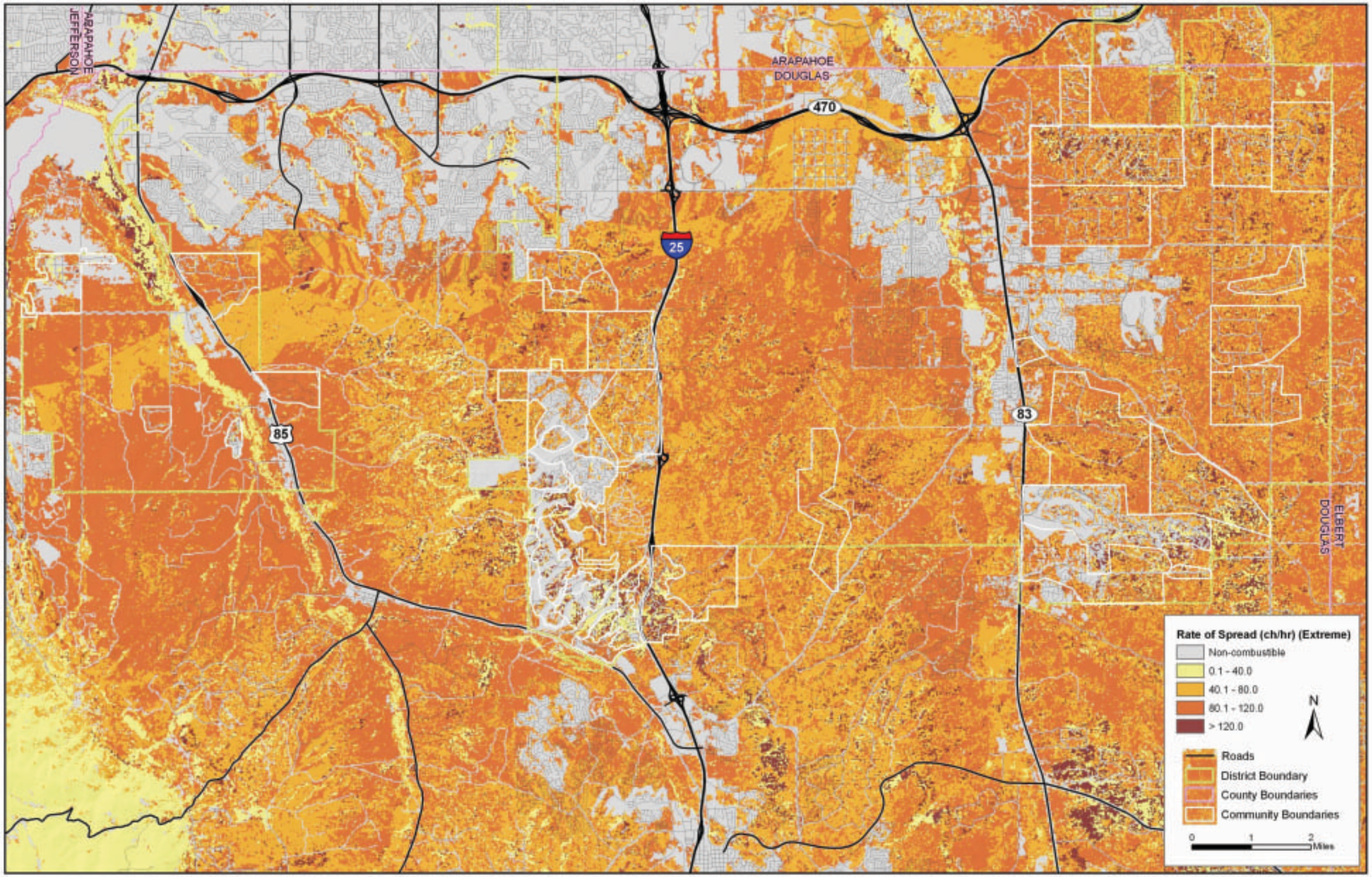
Predicted Flame Length assuming Extreme Weather Conditions



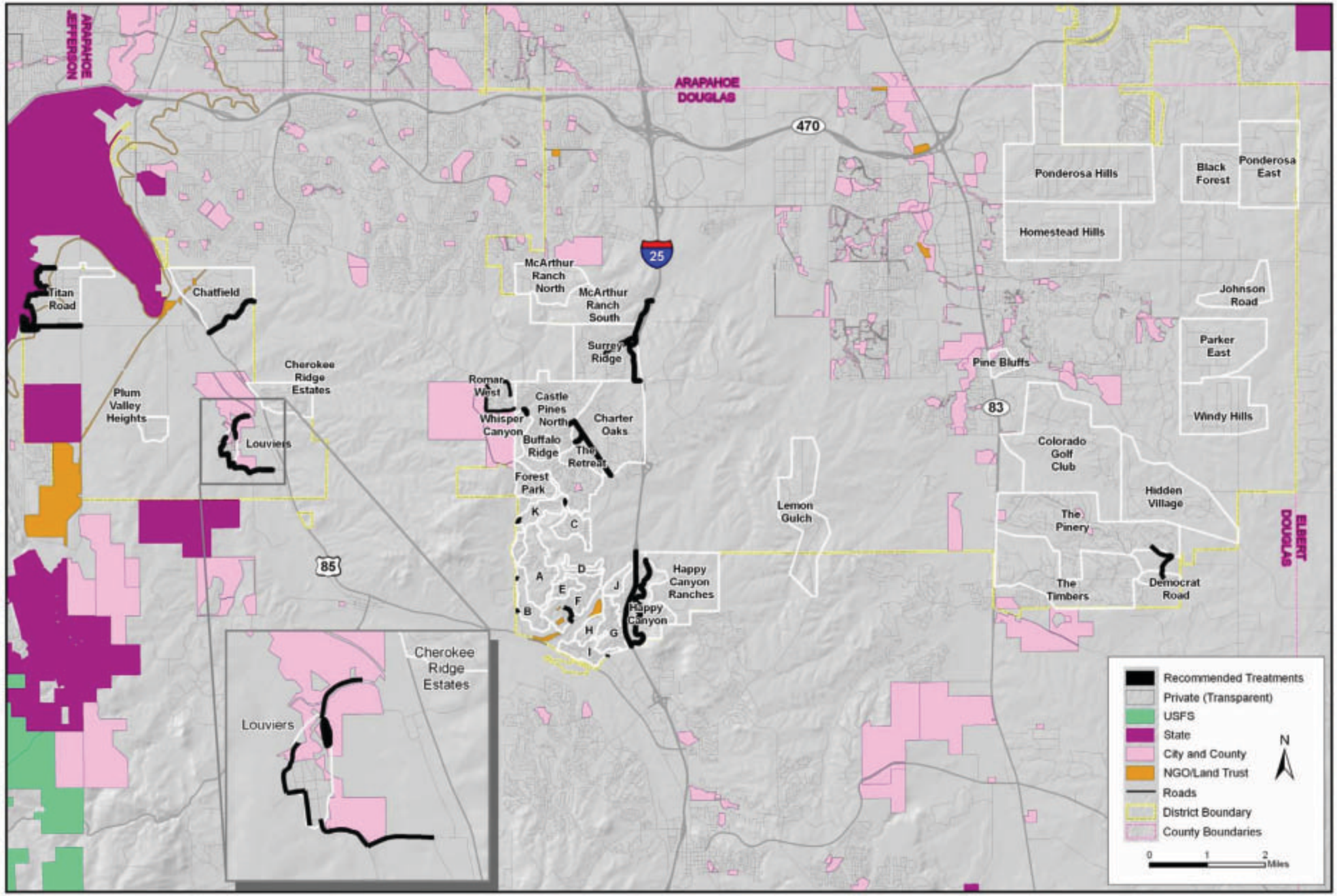
Predicted Rate of Spread assuming Moderate Weather Conditions



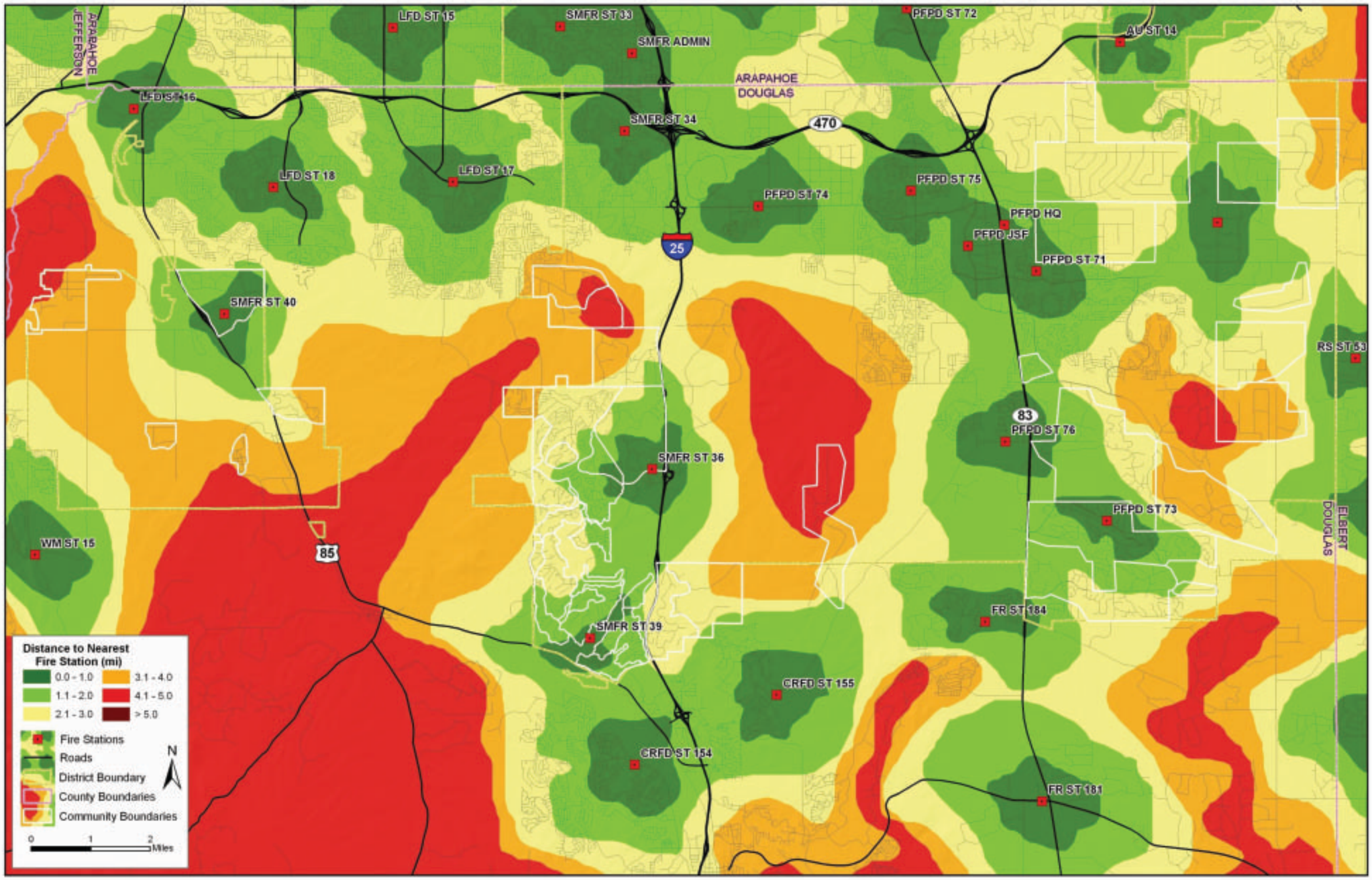
Predicted Rate of Spread assuming Extreme Weather Conditions



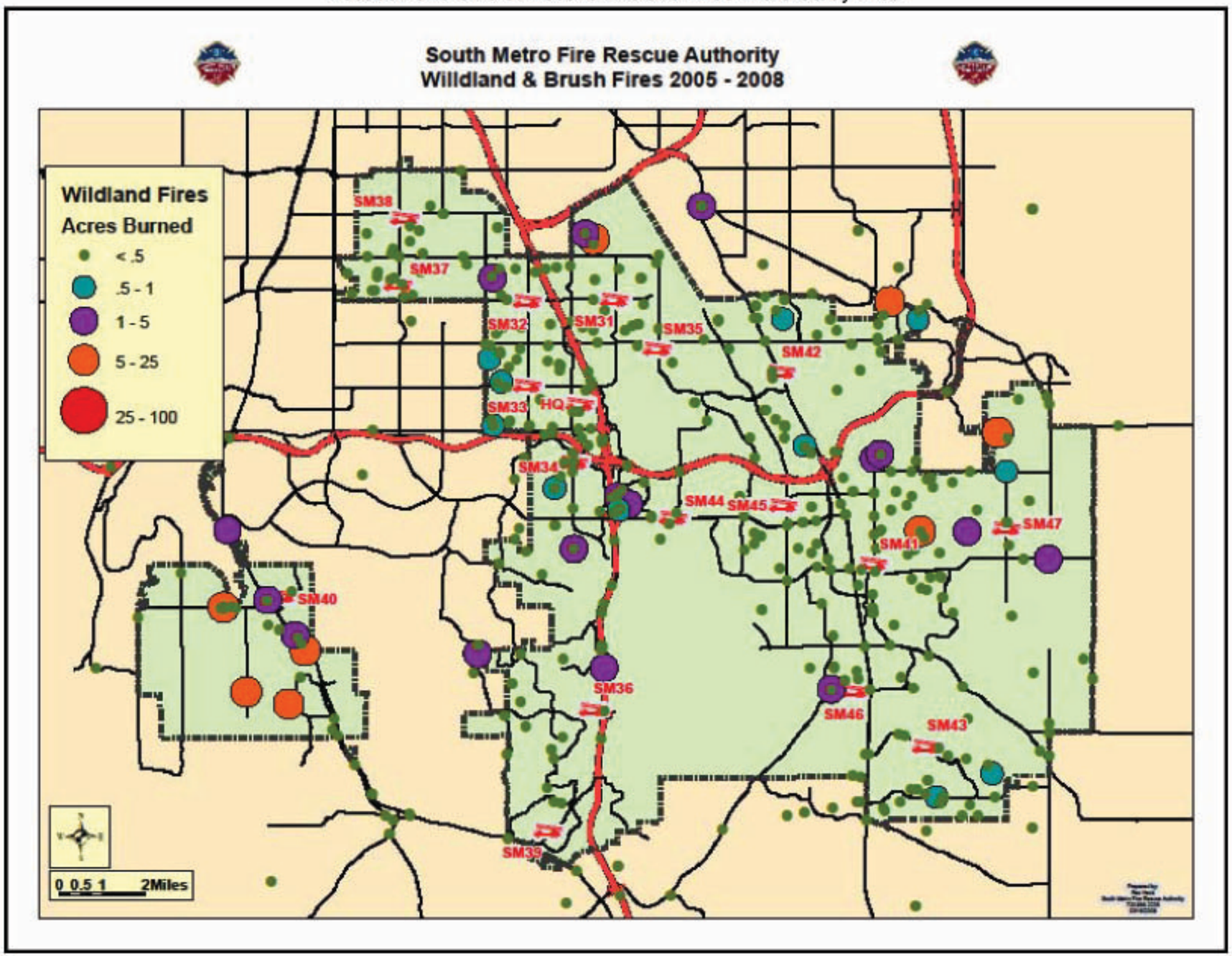
Recommended Fuels Reduction Projects and Land Ownership



Distance of to Nearest Fire Stations



Location and Size of Recent Wildland Fires in the Study Area



## APPENDIX F
## Colorado State Forest Service Minimum Standards for Community Wildfire Protection Plans

**Colorado State Forest Service**
**Minimum Standards for Community Wildfire Protection Plans (CWPP)[*]**

## 1. Participants

- Local government, local fire authority, and a representative of the Colorado State Forest Service must agree on the CWPP.
- In addition to the above, the core planning team should include relevant federal land management agency representatives and community members.
- Input from interested non-governmental stakeholders must be sought as community protection priorities are being set and treatment areas and methods are planned.

## 2. Plan Components

- Community Wildfire Protection Plans must include the following components:
  - A definition of the community's wildland-urban interface (WUI), preferably outlined on a map with an accompanying narrative.
  - A discussion of the community's *preparedness* to respond to wildland fire.
  - A community risk analysis that considers, at a minimum, fuel hazards, risk of wildfire occurrence and community values to be protected – both in the immediate vicinity and the surrounding zone where potential fire spread poses a realistic threat.
  - Identification of fuels treatment priorities, including locations on the grounds and preferred methods of treatment.
  - Recommendations regarding ways to reduce structural ignitability.
  - An implementation plan.

## 3. Level of Specificity

- A CWPP may be developed for any level of "community," (e.g., homeowner's association, mountain town, county, metropolitan city, or fire protection district).
- Risks must be assessed, and treatment priorities implemented, that will protect the community.
- The plan must be diversely collaborative.
- County level plans can be used as an umbrella for plans in smaller communities, but should not be considered a substitute. A county plan must identify specific projects and implementation methods and must reflect collaborative input from a variety of stakeholders.

## 4. Adapting Existing Plans and Combining Related Plans

- If a community has an existing plan that already meets the majority of the CWPP criteria, it is preferable to work with the community to adapt that plan to meet the remainder of the criteria. However, plan adaptations must be collaborative as described in (1) above and include stakeholder representation. This is particularly important if the adaptation involves establishing fuels treatment priorities.
- Communities are encouraged to combine CWPPs with related documents such as FEMA All-Hazard Mitigation Plans where appropriate.

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[*] Minimum standards are to be used in combination with the national publication titled, "Preparing a Community Wildfire Protection Plan: A Guide for Wildland Urban Interface Communities." Maximum flexibility should be sought in meeting individual community needs.