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This document incorporates new and existing information relating to wildfire for citizens, policy makers, and public agencies in the Rocky Mountain Fire (RMF) service area, Boulder, Colorado. Wildfire hazard data is derived from the community wildfire hazard rating analysis (WHR) and the analysis of fire behavior potential, which are extensive and/or technical in nature. As a result, our detailed findings and methodologies can be found in their entirety in the 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 RMF wildfire hazard and risk assessment.

The RMF Community Wildfire Protection Plan (CWPP) is the result of a community-wide fire protection planning effort that includes extensive field data gathering, compilation of existing fire suppression documents, a scientific analysis of the fire behavior potential of the study area, and collaboration with various participants: homeowners, RMF officials, and the Colorado State Forest Service (CSFS). This project meets the requirements of the federal Healthy Forests Restoration Act (HFRA) of 2003 for community fire planning.

This CWPP meets the requirements of HFRA by:

1. Identifying and prioritizing fuels reduction opportunities across the landscape
2. Fuels modification recommendations can be found on pages 15-26 and 48-53 of this document.
3. Addressing structural ignitability
4. See pages 27-29.
5. Collaborating with stakeholders
6. See Appendix E

**THE NATIONAL FIRE PLAN**

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 was a document prepared by a Federal Interagency Group titled, “Review and Update of the 1995 Federal Wildland Fire Management Policy” (2001), which concluded, among other points, that the condition of America’s forests had continued to deteriorate.

The second report, issued by the Bureau of Land Management (BLM) and the United States Department of Agriculture Forest Service (USFS) and titled “Managing the Impacts of Wildfire on Communities and the Environment: A Report to the President in Response to the Wildfires of 2000”, would become known as the National Fire Plan (NFP). That report, and the ensuing congressional appropriations, ultimately required actions to:
1. Respond to severe fires
2. Reduce the impact of fire on rural communities and the environment
3. Ensure sufficient firefighting resources

Congress increased its specific appropriations to accomplish these goals. However, 2002 was another severe season, with more than 1,200 homes destroyed and seven million acres burned. In response to public pressure, Congress and the Bush administration continued to obligate funds for specific actionable items, such as preparedness and suppression. That same year, the Bush administration announced the HFRA initiative, which enhanced measures to restore forest and rangeland health and reduce the risk of catastrophic wildfires. In 2003, that act was signed into law.

Through these watershed pieces of legislation, Congress continues to appropriate specific funding to address five main sub-categories: preparedness, suppression, reduction of hazardous fuels, burned-area rehabilitation, and state and local assistance to firefighters. The general concepts of the NFP blended well with the established need for community wildfire protection in the study area. The spirit of the National Fire Plan is reflected in the Rocky Mountain Fire CWPP.

**PURPOSE**

The purpose of the risk analysis, fire behavior analysis, community wildfire hazard rating (WHR) and the resulting CWPP is to provide a comprehensive, scientifically-based assessment of the wildfire hazards and risks within the RMF.

The assessment estimates the risks and hazards associated with wildland fire in proximity to communities. This information, in conjunction with Values at Risk, defines “areas of concern” for the community and allows for prioritization of mitigation efforts. From these analyses, solutions and mitigation recommendations are offered that will aid homeowners, land managers and other interested parties in developing short-term and long-term fuels and fire management plans.

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 communities 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 human and intrinsic values identified as important to the way of life of the study area by its inhabitants, such as life safety, property conservation, access to recreation and wildlife habitat. (See pages 5-8 for a comprehensive overview.)

**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 and quality of life
In order to accomplish these goals the following objectives have been identified:

1. Establish an approximate level of risk (the likelihood of a significant wildfire event for 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 to 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:
   Quantification of 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:
   Awareness, combined with education, will help to reduce the risk of unplanned human ignitions.

3. Facilitate and prioritize appropriate hazardous fuel reduction:
   Organizing and prioritizing hazard mitigation actions into Fire Management Units (FMUs) can assist stakeholders in focusing future efforts from both a social and fire management perspective.

4. Promote improved levels of response:
   The identification of areas of concern will improve the accuracy of pre-planning, and facilitate the implementation of cross-boundary, multi-jurisdictional projects.
COLLABORATION: COMMUNITY/AGENCY/STAKEHOLDERS

Representatives involved in the development of the RMF CWPP are included in the following table. Their names, organization, and roles and responsibilities are indicated in Table 1. For more information on the collaborative process that led to the development of this CWPP, see Appendix E, RMF CWPP Collaborative Effort.

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<th>Roles / Responsibilities</th>
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<td>Mike Tombolato, Chief</td>
<td>Rocky Mountain Fire</td>
<td>Local information and expertise, including community risk and value assessment, development of community protection priorities, and establishment of fuels treatment project areas and methods.</td>
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<tr>
<td>Don Whittemore, Assistant Chief</td>
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<tr>
<td>Allen Owen, District Forester</td>
<td>Colorado State Forest Service</td>
<td>Facilitation of planning process and approval of CWPP minimum standards.</td>
</tr>
<tr>
<td>Rodrigo Moraga, Managing Member, Fire Behavior Analyst</td>
<td>Anchor Point Group LLC Consultants</td>
<td>Development of the CWPP, decision-making, community risk and value assessment, development of community protection priorities, establishment of fuels treatment project areas and methods.</td>
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<tr>
<td>Christopher White, CEO, Urban Interface Specialist</td>
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<td>Mark McLean, GIS Project Manager</td>
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<td>Marc McDonald, Project Manager</td>
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<td>Quinn MacLeod, WUI Project Specialist</td>
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<tr>
<td>Mike Tombolato, Chief</td>
<td>Rocky Mountain Fire District</td>
<td>2017 Revision Team</td>
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<td>Quinn MacLeod, Division Chief</td>
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STUDY AREA OVERVIEW

Rocky Mountain Fire (RMF) is located in Boulder County, Colorado. RMF covers an area of 78 square miles, and has approximately 35,000 residents. The district is bordered by various other suppression agencies including the City of Boulder Fire Department, Boulder Rural Fire Protection District, Mountain View Fire Protection District, Louisville Fire Department, North Metro Fire Rescue, Coal Creek Canyon Fire Department, High Country Fire Protection District, Sugarloaf Fire Protection District, and the Four Mile Fire Protection District.

FIGURE 1. Flagstaff area

For the purpose of this report, communities have been assessed for the hazards and risks that occur inside the district boundaries. Geographical Information Systems (GIS) work for this project has been extended to a project boundary beyond the district boundaries. 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 Rocky Mountain Fire.

The district has two distinct areas, the plains and the foothills. The Plains life zone, 3,500 to 5,500 feet, is where the majority of study area population resides. It is dominated by grasslands, tall grass prairie remnants and riparian vegetation (including cattails, cottonwoods and other riparian hardwoods and shrubs) growing along water courses and in drainages. The foothill area is considered to be in the Foothill/Montane life zone (6,000’-10,000’) of the eastern slope of the Northern Colorado Front Range.1 The dominant vegetation is ponderosa pine (Pinus ponderosa) and Douglas fir (Pseudotsuga menziesii). The foothill area also contains dense stands of mixed conifers primarily on north facing slopes. Dense riparian shrub corridors and open canopy woodlands broken by large grass meadows also exist in this area.

VALUES AT RISK

LIFE SAFETY AND HOMES

There are approximately 35,000 citizens residing within the Rocky Mountain Fire Protection District. The Wildland-Urban Interface areas were divided into eight communities. Of those eight

1 Elevation limits for life zones were based on life zone ranges from: Jack Carter, “Trees and Shrubs of Colorado” (Boulder, CO, Johnson Books, 1998).
communities, five are located within the foothills. The areas within each community represent
certain dominant hazards from a wildfire perspective. Fuels, topography, structural flammability,
availability of water for fire suppression, egress and access difficulties, as well as other hazards
both natural and manmade, are considered in the overall hazard ranking of these communities.
The hazard assessment identified five of the eight communities in the study area to be extreme
to high hazard areas. Under extreme burning conditions, there is a likelihood of rapid increases
in fire intensity and spread in these areas due to steep topography, fast burning or flashy fuel
components, and other topographic features that contribute to channeling winds and promotion
of extreme fire behavior. These areas may also represent a high threat to life safety due to poor
egress, the likelihood of heavy smoke, heat, and/or long response times.

With tens of thousands of people moving to Colorado each year, building in the once inaccessible
mountain areas has become a growing concern. Most of Boulder County is vulnerable to some
form of natural disturbance. 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.²

Boulder County recognizes the Wildland-Urban Interface as an area particularly at risk to wildland
fires. Fire should be recognized as a natural and/or human-caused occurrence with certain
benefits to the ecosystem. The county should strive towards balancing the natural processes of
the ecosystem with development concerns so that residents may co-exist in a fire-dependent
ecosystem.³

The population of Boulder County is growing at an average rate of 3% per year, and has increased
29% between 1990 and 2000, with increased mountain development and recreational pressures
following this increase in population. Over 154,000 people in the county live in wildfire hazard
areas.⁴

Boulder County has a recorded history of forest fires dating back to June 29, 1916, when 1,000
acres burned around Bear Mountain (See Current Risk Situation, page 8).⁵

COMMERCIAL AND INFRASTRUCTURE

Commercial property and retail business are limited within the Wildland-Urban Interface portions
of RMF, although some residents maintain home-based businesses. Agricultural properties and
livestock-related businesses also exist in some portions of the study area.

A significant component in both the Boulder County Comprehensive Plan and a majority of the
local municipal plans and programs is recognition of the importance of environmental factors,
natural and cultural amenities, or "quality of life" issues to the health of the economy. The Boulder
County economy has benefited from its legacy of careful land use decisions in its open space
lands, which include national and state parks, national and state forests, and city and county open

² Boulder County Comprehensive Plan - Boulder County Land Use Department (http://www.co.boulder.co.us/lu/bccp/introduction.htm)
³ Ibid.
⁴ http://www.ncsu.edu/project/wildfire/Colorado/boulder/BoulderCaseStudy_final.pdf
⁵ http://www.co.boulder.co.us/sheriff/fire/firehistory.htm. referenced 5-25-07
space and parks. The economy of the area is based largely on the quality of life that attracts professionals to establish residences. Wildfire, therefore, has the potential to cause significant damage to the local economy.

RECREATION AND LIFESTYLE

The culture of Boulder County emphasizes environmental values and outdoor recreation. Boulder County has intermixed land ownership. Approximately 60% of the land is owned publically with 40% owned privately. Public land is divided among a variety of local, state and federal managers including the United States Forest Service, Boulder County Parks and Open Space, City of Boulder Open Space and Mountain Parks, and Colorado State Parks.

Eldorado Canyon State Park was voted one of the top ten state parks in the country. The park offers a multitude of recreational opportunities including rock climbing, hiking, mountain biking, and many other outdoor interests. During an average summer weekend the park is filled to capacity.

The idea of a county open space program was initiated in the mid-1960s by Boulder County citizens who were interested in parks and recreation needs of the unincorporated area and in "preserving open space land in the face of rapid county development." This was at a time when Boulder County’s 750 square miles were home to a population of fewer than 130,000 people. The 1995 population was almost 260,000.

In 1978, the Boulder County Comprehensive Plan was adopted. The plan included goals and policies for preserving open space, protecting environmental resources (including both natural and cultural resources), and developing a county-wide trail system. The implementation of the open space plan has been based both on private cooperation and on the county’s financial ability to acquire an interest in these lands.

By early 1998, the county open space program comprised more than 52,000 acres of preserved land scattered throughout the county, along with 70 miles of trails. The majority of this land is open for public use. The remainder is under agricultural lease or conservation easements, which do not include public access. Most of the properties are well-suited to passive recreation (recreation development is limited to trails, parking areas/trailheads, picnic areas/shelters, outhouses, and simple boat docks or fishing piers where necessary).

Residents who live in the study area have a keen appreciation for their natural environment. Recreation and the natural beauty of the area, values which can be seriously damaged by wildfire, are frequently quoted as reasons local residents have chosen to live in the study area.

HABITAT EFFECTIVENESS & ENVIRONMENTAL RESOURCES

6 Boulder County Comprehensive Plan – Boulder County Land Use Department (http://www.co.boulder.co.us/lu/bccp/introduction.htm)
7 "Community Responses to Wildland Fire Threats in Colorado" – T. Steelman, D. Bell, Dept. of Forestry, NCSU (http://www.ncsu.edu/project/wildfire/Colorado/boulder/b_reduce.html)
9 Ibid.
Residents are clear that the preservation of wildlife and the environment is important to the quality of life of the area. Habitat effectiveness is defined as the degree to which habitat is free of human disturbance and available for wildlife to use. Effective habitat is mostly undisturbed land area, which is buffered (at least 300 feet in essentially all situations) from regular motorized and non-motorized use of roads and trails (11 or more people or vehicle trips per week). The commonly held view is that habitat effectiveness should not fall below 50%, although the best wildlife habitats have a much higher percentage. Wildfire, specifically severe wildfire, can have significant adverse effects on habitat effectiveness.

The environmental character of Boulder County is due in large measure to the abrupt altitudinal variation within a 20-mile east-west gradient. The dramatic landform changes sharply define the native ecosystems and their associations of plant and animal species.

The county’s environmental heritage includes non-renewable resources such as natural areas, historic/archaeological sites, and natural landmarks. As irreplaceable resources, they warrant preservation from destruction or harmful alteration. Wetlands are critical environmental resources that function variously as wildlife habitat, aquifer recharge areas, and linkages in the overall county wildlife system, and aids for smog control.

The goal of the Boulder County Comprehensive Plan is to maintain and monitor the forests on open space in accordance with ways that benefits the ecosystem and the public by:

- Assessing overall forest conditions through forest inventories and surveys
- Implementing prescriptions based on the results of these inventories and surveys
- Taking action to change or increase the individual tree's health and vigor
- Reducing fire danger
- Improving or maintaining wildlife habitat
- Maintaining and preserving the aesthetic and ecological value of the forest

The RMF CWPP process is in concert with these guiding comprehensive plan principles. Through public involvement, local support and a regional perspective, the fuels reduction elements described in this document can and should enhance and protect the values of the study area.

CURRENT RISK SITUATION

For the purpose 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 wildfire hazard ratings of the Wildland-Urban Interface (WUI) communities and fire behavior potential, as modeled from the fuels, weather, and topography of the study area.
The majority of the district is at a high risk for wildland fires. This assessment is based on the analysis of the following factors:

2. The area is shown in the Colorado State Forest Service WUI Hazard Assessment map to be an area of high Hazard Value (an aggregate of Hazard, Risk and Values Layers).
3. Rocky Mountain Fire responded to a total of 169 wildland incidents in the years from 2001 through 2009. In 2006 alone RMF responded to 34 wildland fires. No major fires (fires greater than 100 acres) have burned in the district since 2000 (the Walker Ranch Fire), but major fires have recently occurred near the district, including a number of large (500+ acres) grass fires in the winter of 2006. Of particular mention was the April of 2006 wildfire at Rocky Flats National Wildlife Refuge. This area contracts with RMF for emergency services. It is important to note there are over 20 fire departments in Boulder County, and many mutual aid agreements are in place. The Boulder area has a large number of well-trained resources. Ignitions in this area attract a rapid, professional response and are generally extinguished quickly.
4. Boulder County experiences an average of 100 fire starts per year. Over the past 20 years the county has seen a number of major wildland fires, and until 2001, held the Colorado record for structural losses from wildland fires. This was due largely to the 1989 Black Tiger fire, which claimed 44 homes. The Walker Ranch fire which started on September 15, 2000 was the first major fire since the Old Stage Fire in 1990. The fire burned approximately 1,100 acres. Although there were over 250 homes in the area, no structures were lost.
5. Fire history statistics from the Colorado State Forest Service (CSFS) and its cooperator fire departments reflect an active fire history for the years available. CSFS reports 100 fires in 1990, 104 in 1991, 126 in 1992, and 98 in 1993, for a total of 428 in Boulder County during the four-year period.
6. The USDA Forest Service fire regime and condition class evaluation of forest stands in the study area shows that historic fire regimes have been moderately altered. Please see the Fire Regime and Condition Class section of this report for details.
7. The surrounding federal lands report an active, but far from extreme, fire history. Fire occurrences for the Boulder Ranger District of the Arapahoe-Roosevelt National Forest (see Figure 2, page 10) were calculated from the USDA Forest Service Personal Computer Historical Archive for the thirty-nine year period from 1970-2009. These areas represent federal lands adjacent to the study area, but do not include any data from state, county, or private lands. The data have been processed and graphed using the Fire Family Plus software program and are summarized below.
FIGURE 2. USFS fire statistics from the Boulder Ranger District

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Figure 2a shows the number of fires (red bars) and the total acres burned (blue hatched bars) in the Boulder Ranger District for each year. While the number of annual fires ranges from approximately 5 to over 30 fires per year, there is little year-to-year pattern to the variation. The single largest fire for acreage burned was the Overland Fire in 2003. Of the 10,508 acres reported burned in the ranger district between 1970 and 2009, 3,869 were burned by the Overland fire. The total number of acres burned was the greatest in 1988, when two large fires accounted for 3,922 acres burned and the Boulder Ranger District had the highest number of fires during the study period. A portion of the Black Tiger Fire also burned 1,804 acres in the Boulder Ranger District in 1989.

Figure 2b shows the percentage and number of fires occurring in each month of the year. July had the greatest number of fires, followed by June and August. The fewest fires occurred between the months of November and April, a fact which reflects the climate conditions for the area.

Figure 2c shows the size class distribution of fires. Approximately 98% of the reported fires (392 of 532) were less than 10 acres in size. These statistics reflect the widely held opinion that, throughout the western US, the vast majority of fires are controlled during initial attack.

Figure 2d shows the number of fires caused by each factor. As shown in this graph, the most common cause of ignitions is lightning (50%). However, the next most common cause is campfires (30%). If we remove the miscellaneous cause category, natural causes still represent the majority of ignitions (56% natural and 44% human-caused), but it should be noted that these numbers are for national forest areas which lack the concentrated development and many other risk factors present in the portions of the study area where private land is dominant.

Figure 2e shows the number of fire starts for each day that a fire start was recorded. Most fires (422) occurred on days that only had one fire start. Approximately 9% (43) of fire days had two fire starts recorded, and days with three or more fire starts represent less than 2% of all fire start days. The statistics suggest that multiple start days are a rare occurrence compared to fire days with a single ignition.

**FIRE REGIME CONDITION CLASS**

The Fire Regime Condition Class (FRCC) is a landscape evaluation of expected fire behavior as it relates to the departure from historic norms. The data used for this study is from a national level map. The minimum mapping unit for this data is one square kilometer. FRCC is not to be confused with BEHAVE or FlamMap fire behavior models (detailed in the fire behavior section), which provide the fire behavior potential analysis for expected flame length, rate of spread, and crown fire development.

The FRCC is an expression current condition’s departure from the historical fire regime. It is used as a proxy for the probability of severe fire effects (the loss of key ecosystem components such as soil, vegetation structure, species; or alteration of key ecosystem processes, such as nutrient cycles, hydrologic regimes). Consequently, FRCC is an index of hazards to the status of many components (e.g., water quality, fish status, wildlife habitats, etc.). Figure 3 (page 12), graphically displays the return interval and condition class of the study area.
Deriving FRCC is accomplished by comparing current conditions to an estimate of the historical range that existed prior to substantial settlement by Euro-Americans. The departure of the current condition from the historical baseline serves as a proxy to likely ecosystem effects. In applying the condition class concept, it is assumed that historical fire regimes represent the conditions under which the ecosystem components within fire-adapted ecosystems evolved and have been maintained over time. Thus, if it is projected that fire intervals and/or fire severity have changed from the historical conditions, then it would be expected that fire size, intensity, and burn patterns would also be subsequently altered if a fire occurred. Furthermore, if it is assumed that these basic fire characteristics have changed, then it is likely that there would be subsequent effects to those ecosystem components that had adapted to the historical fire regimes. As used here, the potential of ecosystem effects reflect the probability that key ecosystem components would be lost if a fire were to occur within the Foothills communities of RMF. It should be noted that a key ecosystem component can represent virtually any attribute of an ecosystem (for example, soil productivity, water quality, floral and faunal species, large-diameter trees, snags, etc.).
The following categories of condition class are used to qualitatively rank the potential of effects to key ecosystem components:

<table>
<thead>
<tr>
<th>Condition Class</th>
<th>Condition Class Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fire regimes are within their historical range. The risk of losing key ecosystem components as a result of wildfire is low. Vegetation attributes (species composition and structure) are intact and functioning within an historical range. Fire effects would be similar to those expected under historic fire regimes.</td>
</tr>
<tr>
<td>2</td>
<td>Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components as a result of wildfire is moderate. Fire frequencies have changed by one or more fire-return intervals (either increased or decreased). Vegetation attributes have been moderately altered from their historical range. Consequently, wildfires would likely be larger, more intense, more severe, and have altered burn patterns, as compared with those expected under historic fire regimes.</td>
</tr>
<tr>
<td>3</td>
<td>Fire regimes have changed substantially from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have changed by two or more fire-return intervals. Vegetation attributes have been significantly altered from their historical range. Consequently, wildfires would likely be larger, more intense, and have altered burn patterns, as compared with those expected under historic fire regimes.</td>
</tr>
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</table>

The foothill communities of the study area are primarily classified under Condition Class 2. By definition, historic fire regimes have been moderately altered. As a consequence, wildfires are likely to be larger, more severe, and have altered burn patterns, as compared with those expected under historic fire regimes.

FIGURE 4. Rocky Mountain Fire Community Hazard Rating Map

TABLE 3. Study area communities

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1.</td>
<td>Kneale Road</td>
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<td>2.</td>
<td>Town of Eldorado Springs</td>
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<tr>
<td>3.</td>
<td>Pine Needle</td>
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<td>4.</td>
<td>Lakeshore park</td>
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<td>5.</td>
<td>Flagstaff Road</td>
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<td>6.</td>
<td>Superior / Rock Creek</td>
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<td>7.</td>
<td>Eldorado Springs Valley</td>
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<tr>
<td>8.</td>
<td>Town of Marshall</td>
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</table>
1. KNEALE ROAD (Extreme Hazard Rating)

**Recommendations - Homeowner**

- Adequate defensible space is *strongly advised* for all homes in the Kneale Road community. For details on defensible space, please refer to the **Home Mitigation** section, page 27.

- Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments. For details, please refer to the “Access Route Fuels Modification Recommendations,” in the **Fuels Modification Projects** section, page 39.

- Wherever possible, add pullouts for emergency apparatus on driveways and private roads longer than 300 feet. Turnarounds should be constructed at the end of all driveways and dead-end roads. An improved turnaround should be constructed at the point where Kneale Road leaves South Boulder Creek. For details, please refer to **Appendix D**.

- Add reflective addressing made of non-combustible materials to all driveways and homes.

- Ensure that all road signs and attachments are made of non-combustible materials.

- A large-animal evacuation plan should be developed if applicable.

**Kneale Road Recommendations – Rocky Mountain Fire**

- *A parcel-level analysis is recommended as soon as possible. Re-evaluation if data is older than five years.*

  **Comment:** 1/11/17 Q.M.; most homes have received a site review, the area is on the districts Tactical Maps and the area has been fully pre-planned and equipped for wildfire sprinkler set-up’s.

  **Recommendation:** Create a system for utilizing the site review information (parcel-level analysis) in the field.

- *Investigate and verify firefighter safety zone.*
  - 0.3 mile up the canyon from the Community Entrance Security Gate (near the Eldorado Canyon State Park visitor’s center)

  **Comment:** 1/17/17 Q.M. noted on Tactical Maps.
*Evacuation and Access.

- **Evacuation Route, Kneale Road to Bison Drive via the “gas line road.” Priority Level High.** This project focuses on opening up the gas line road for emergency usage from Kneale Road where it leaves the South Boulder Creek northward to the Ethel Harrold Trailhead via Martin Gulch. Emergency use would be for both citizens and emergency responders. The road surface should be evaluated to determine the feasibility of allowing non-four wheel drive vehicles in and out of the area. Road pullouts also need to be constructed. See Appendix D for details. Fuels mitigation, consisting of limbing and thinning to create a safe and effective escape route, is also recommended (see the “Access Route Fuels Modification Projects” section of this report). This project will require a cooperative effort between RMF and Boulder County Open Space. It is recommended that the route be well marked. The metal pipe boundary fence at the junction with Eldorado Canyon trail should be replaced with a locked emergency gate.

**Comment;** 1/11/17 Q.M.; this has been partially completed. The metal fence has been replaced with an operable 2-section gate. After the 2013 floods the road was greatly improved, but is still not suitable for 2-wheel drive vehicles.

**Recommendation:** The gate located at Ethel Harrold needs to be modified so the lock can be cut in case of emergency use.

- **Ensure that all Open Space access points are known to all responding agencies.**

**Comment;** 1/11/17 Q.M.; The area has been fully mapped and those have been distributed to other agencies.

- **Fuel Reduction Project.**

**Kneale Road Evacuation Route Treatment (Approximately 81 acres). Priority Level High.** This project focuses on opening up the “gas line road” for emergency usage from Kneale Road where it leaves the South Boulder Creek northward to the Ethel Harrold Open Space Trailhead via Martin Gulch, through limbing and thinning. Emergency use would be for both citizens and emergency responders. Thinning should be conducted to conform to the shaded fuel break guidelines described in the “Access Route Fuels Modification Recommendations” section. If combined with extended defensible space for the few homes in the area, this project will help protect an important escape route, as well as providing a fuel break. This project will require a cooperative effort between RMF and Boulder County Open Space.

**Comment;** 1/11/17 Q.M.; private property completed in 2011.

**Recommendation:** Review the fuels reduction status and discuss maintenance and future cuttings within the Open Space and private areas.
Water Supply

- **Priority Level High.** A medium sized (10,000 gal.) cistern is recommended for the Kneale Road community. This should be situated on a hillside where it could gravity-feed down to a valved outlet, yielding a more reliable fill rate over conventional drafting.

**Recommendation:** 1/11/17 Q.M.; talks are on-going as related to installing a permanent water pump housed at the Eldorado Canyon State Park Headquarters.

- Make certain all water sources are adequately signed.

*Areas of Special Interest.* City Open Space, County Open Space, and Eldorado State Park border the community. See Other Areas of Special Interest, pages 48-53. A responsible manager should be contacted and given these recommendations.

**Comment:** All agencies have been involved in discussions.

3/2/17 – All homes have been evaluated for structure protection needs. In 2015 the district purchased a structure protection trailer which houses the needed equipment to provide water sprinkler protection to the structures that would benefit from that set-up. This equipment is an annual firefighter training event.
2. TOWN OF ELDORADO SPRINGS (Extreme Hazard Rating)

Recommendations - Homeowner

☐ Adequate defensible space is recommended for all homes. For details, please refer to the Home Mitigation section on page 27.

☐ Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments. Please refer to the “Access Route Fuels Modification Recommendations,” in the Fuels Modification Projects section, page 39.

☐ Wherever possible, add pullouts for emergency apparatus on driveways and private roads longer than 300 feet. Turnarounds should be constructed at the end of all driveways and dead-end roads. For details, please refer to Appendix D.

☐ Where slopes rise steeply, consider creating barriers such as rock walls to protect areas from burning rolling material.

☐ Ensure that all road signs are made of non-combustible materials.

☐ Add reflective, non-combustible addressing to all driveways and homes.

Town of Eldorado Springs Recommendations – Rocky Mountain Fire

☐ *A parcel-level analysis is recommended as soon as possible.

Comment: 1/11/17 Q.M.; very few homes have received a site review, the area is on the districts Tactical Maps.

Recommendation: Create a system for utilizing the site review information (parcel-level analysis) in the field.

☐ *Fuel Reduction Project.
  ○ Town of Eldorado Aqueduct Fuelbreak (Approximately 11 acres). Priority Level High (see Figure 10). A fuelbreak needs to be created along the aqueduct on the south side of town. It will anchor into the road on the west end and extend on the uphill side of the aqueduct to the east side of the town, then extend uphill to join into the Boulder OSMP Lindsay Property project. Existing defensible space should
be incorporated and extended to help create this fuelbreak (which will include the few homes that sit above the aqueduct). Thinning to reduce ladder fuels and interrupt the crown continuity of fuels is recommended for at least 100 feet upslope. Where the fuelbreak leaves the aqueduct and turns upslope to tie in with the OSMP fuel break, it is recommended to thin back 100 feet on both sides.

**Comment;** 1/11/17 Q.M. This Fuelbreak has been fully researched. Due to multiple private ownership difficulties it is very unlikely this could ever be completed. The aqueduct was enclosed (2016) and is now a dirt / grass path 10 feet wide which provides good access between the homes and the wildland vegetation. The Lindsay Property has been re-entered for fuels reduction efforts recently by OSMP.

**Recommendation:** pursue alternate access points and a non-combustible path surface. Ownership is the Ditch Company.

☐ *Access*
  - Ensure that all Open Space access points are known to all responding agencies.

**Comment;** 1/11/17 Q.M.; The area has been fully mapped and those have been distributed to other agencies.

☐ **Improve all roads within the town limits.** 1/11/17 Q.M.; The roads are privately owned and road maintenance is a difficult subject with the owner.

☐ **Post weight restrictions on bridges.** Consult with Boulder County. 1/11/17 Q.M.; The bridges are privately owned. RMFD did pay for an engineer to determine weight limits but the land owner is refusing to post the signs.

**X Water Supply**

**Comment;** 1/17/17 Q.M. A 450 GPM water pump is housed in the Eldorado Canyon State Park lower parking lot. Draft site is excellent, hose and fittings are on-site. The pump is on a preventive maintenance cycle.

  - **Priority Level High.** The town of Eldorado Springs needs a larger capacity, reliable water supply for fire fighting. An in-depth study will determine the best course of action. **In the entire study area, this is the most critical need.**

**X Make certain all water sources are adequately signed.**

☐ **Areas of Special Interest.** City Open Space and Eldorado State Park border the community. (See **Other Areas of Special Interest**, pages 48-53.) A responsible manager should be given these recommendations.
3. PINE NEEDLE (Very High Hazard Rating)

Recommendations - Homeowner

☐ Adequate defensible space is recommended for all homes. For details, please refer to the Home Mitigation section on page 27.

☐ Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments. Please refer to the “Access Route Fuels Modification Recommendations,” in the Fuels Modification Projects section on page 39.

☐ Wherever possible, add pullouts for emergency apparatus on driveways and private roads longer than 300 feet. Turnarounds should be constructed at the end of all driveways and dead-end roads. For details, please refer to Appendix D.

☐ Add reflective, non-combustible addressing to all driveways and homes.

☐ Ensure that all road signs are made of non-combustible materials.

☐ A large-animal evacuation plan should be developed where applicable.
NEW Recommendation: Fuel Reduction Project

- Bison Road Treatment (figure 4A)

This recommended fuel break would serve to protect the subdivision from a wildfire on City of Boulder OSMP. This would be a great joint effort between RMFD & OSMP.

Wherever possible, explore options to cut off switch back road features.

Follow the most recent CSFS guidelines for fuel breaks.

Additionally, incorporate home defensible space into this fuel break where feasible.

A parcel-level analysis is recommended. Re-evaluation if data is older than five years. Comment: 1/11/17; many homes have received a site review, the area is on the districts Tactical Maps.

Investigate and verify firefighter safety zones.

Comment: 1/17/17 Q.M. noted on the Tactical Maps.

- Flagstaff Road between Bison Drive and Kossler Lake
- Flagstaff Road at the Walker Ranch Trailhead Road

Evacuation and Access.

Comment: 1/11/17 Q.M.; this has been partially completed. Most of the road has had a first entry of fuels thinning. The metal fence has been replaced with an operative 2-section gate. After the 2013 floods the road was greatly improved, but is still not suitable for 2-wheel drive vehicles.
**Recommendation:** The gate located at Ethel Harrold needs to be modified so the lock can be cut in case of emergency use.

- **Evacuation Route, Kneale Road to Bison Drive via the “gas line road.” Priority Level High.** This project focuses on opening up the gas line road for emergency usage from Kneale Road where it leaves the South Boulder Creek northward to the Ethel Harrold Trailhead via Martin Gulch. Emergency use would be for both citizens and emergency responders. The road surface should be evaluated to determine the feasibility of allowing non-four wheel drive vehicles in and out of the area. Road pullouts will also need to be constructed. Please see Appendix D for details. Fuels mitigation, consisting of limbing and thinning to create a safe effective escape route, is also recommended (see the “Access Route Fuels Modification Projects” section of this report). This project will require a cooperative effort between RMF and Boulder County Open Space. It is recommended that the route be well marked. The metal pipe boundary fence at the junction with Eldorado Canyon trail should be replaced with a locked emergency gate.

- **Evacuation Route; Bison Drive to Flagstaff Road. Priority Level High.** This project focuses on educating the homeowners in the area about the importance of allowing this road to be used as an emergency evacuation route. It is recommended that the current “private road” signs be replaced with signs that read “Emergency Evacuation Route Only” or similar wording.

- Ensure that all Open Space access points are known to all responding agencies.

**Comment;** 1/11/17 Q.M.; The area has been fully mapped and those have been distributed to other agencies.

**Fuel Reduction Projects**

- **Pika Road Treatment (Approximately 28 acres). Priority Level High** (see Figure 10).

**Comment;** 1/11/17 Q.M. This Fuelbreak has been fully researched. The majority of this resides in the Coal Creek Canyon Fire District.

**Recommendation:** Reexamine this and possibly enter into a coordinated effort with CCCFD to complete this.

- This project begins at Flagstaff Road and extends to the Ethel Harrold Open Space Trailhead along Pika Road. This project is designed to provide a fuel break along Pika Road, while protecting the egress route from this area. This will also help to protect the homes along Cougar Drive. Thinning should be conducted to conform to the shaded fuel break guidelines in the “Access Route Fuels Modification Recommendations” section.

- **Kneale Road Evacuation Route Treatment (Approximately 81 acres). Priority Level High** (see Figure 10).
Comments; 1/17/17 Q.M. See comments above in the Evacuation and Access section.

- This project focuses on opening up the “gas line road” for emergency usage from Kneale Road where it leaves the South Boulder Creek northward to the Ethel Harrold Open Space Trailhead via Martin Gulch, through limbing and thinning. Emergency use would be for both citizens and emergency responders. Thinning should be conducted to conform to the shaded fuel break guidelines described in the “Access Route Fuels Modification Recommendations” section. If combined with extended defensible space for the few homes in the area, this project will help protect an important escape route, and provide a fuel break. This project will require a cooperative effort between RMF and Boulder County Open Space.

- Water Supply

  Comment; 1/17/17 Q.M. Discussions with Boulder County officials have centered around installing a cistern at the Ethel Harrold trailhead parking area.

  Recommendation: It is recommended to revisit this subject and investigate a viable funding source.

    - Priority Level High. A medium-sized (10,000 gal.) cistern is recommended for the Bison Drive area within the Pine Needle community. This should be situated on a hillside where it could gravity-feed down to a valved outlet. This will yield a more reliable fill rate over conventional drafting, and will help to maintain an adequate spacing of water sources within the study area.

X Investigate the capabilities of the private pond located at 1564 Bison Drive. What steps would be necessary to make this an emergency water source?

Comment; 1/17/17 Q.M. This pond has been used as a water source, unfortunately during times of dry weather or drought the pond is reduced significantly. In these conditions a portable pump is all that can access the edge.

- Areas of Special Interest. City Open Space and County Open Space border the community. See Other Areas of Special Interest, pages 48-53. A responsible manager should be contacted and distributed those recommendations.
4. LAKESHORE PARK (Very High Hazard Rating)

Lakeshore Park Recommendations - Homeowner

☐ Adequate defensible space is recommended for all homes. For details, please refer to the Home Mitigation section on page 27.

☐ Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments. For details, please refer to the “Access Route Fuels Modification Recommendations,” in the Fuels Modification Projects section on page 39.

☐ Wherever possible, add pullouts for emergency apparatus on driveways and private roads longer than 300 feet. Turnarounds should be constructed at the end of all driveways and dead-end roads. For details, please refer to Appendix D.

☐ Add reflective, non-combustible addressing to all driveways and homes.

☐ Ensure that all road signs and attachments are made of non-combustible materials.

☐ A large-animal evacuation plan should be developed where applicable.

Lakeshore Park Recommendations – Rocky Mountain Fire

☐ A parcel-level analysis is recommended. Re-evaluation if data is older than five years. Comment; 1/11/17; many homes have received a site review, the area is on the districts Tactical Maps.

X Investigate and verify firefighter safety zone.

Comment; 1/17/17 Q.M. noted on the Tactical Maps.

○ Lakeshore Drive and Gross Dam Road, southeast of the intersection (Walker Ranch burn area).

☐ Fuel Reduction Projects.

○ Flagstaff Road Treatment (Approximately 115 acres). Priority level High (see Figure 10). This project focuses on limbing and thinning along Flagstaff Road from Bison Drive to the west end of the Lakeshore Park community via Lakeshore Park Road. (This project will eventually tie into the efforts of the Boulder OSMP...
Flagstaff Road project. See Figure 10.) Thinning should be conducted to conform to the shaded fuelbreak guidelines described in the “Access Route Fuels Modification Recommendations” section. Extra depth should be considered below the road in the drainages (200 to 300 feet). If combined with defensible space for all homes, this project will help protect a critical access route and will interrupt the continuity of fuels near the road. This treatment will also help to protect the individual homes north-northeast of the Lakeshore Park community. Special consideration should be given to the homes along the south side of Lakeshore Park Road. Linked defensible space would help to protect this area from an ignition along the shore of Gross Reservoir.

**Comment:** 30% of this project on the private property. Unfortunately some property owners do not allow for mitigation to the current standard. Efforts continue to educate these property owners.

- **Lakeshore Drive Treatment (Approximately 9 acres), Priority Level High (see Figure 10).** This project focuses on providing a fuel break by linking together extended defensible space between all the homes along Lakeshore Drive. This project builds upon the Flagstaff Road/Lakeshore Park Road project (Recommendation A). Thinning should be conducted to conform to the shaded fuel break guidelines described in the “Access Route Fuels Modification Recommendations” section. This treatment will also help to protect the individual homes north-northeast of the Lakeshore Park community.

- **Water Supply**
  - **Priority Level High.** A few private cisterns were noted within the Lakeshore Park community (see Figure 10). One appeared to be very new and has a large diameter fitting (storz) attached to it. These cisterns should be investigated and deemed useable or not. Be sure to label to indicate their capabilities/capacities.
  - Make certain all water sources are adequately signed.

- **Areas of Special Interest.** City Open Space, County Open Space, and Gross Reservoir border the community. See Other Areas of Special Interest, pages 48-53. A responsible manager should be contacted and given these recommendations.
5. FLAGSTAFF ROAD (High Hazard Rating)

Recommendations - Homeowner

☐ Adequate defensible space is recommended for all homes. For details, please refer to the Home Mitigation section on page 27.

☐ Thin vegetation along access roads and driveways. This is especially important for narrow driveways and road segments. For details, please refer to the “Access Route Fuels Modification Recommendations,” in the Fuels Modification Projects section on page 39.

☐ Wherever possible, add pullouts for emergency apparatus on driveways and private roads longer than 300 feet. Turnarounds should be constructed at the end of all driveways and dead-end roads. For details, please refer to Appendix D.

☐ Add reflective addressing made of non-combustible materials to all driveways and homes.

☐ Ensure that all road signs and attachments are made of non-combustible materials.

☐ A large-animal evacuation plan should be developed where applicable.

Flagstaff Road Recommendations – Rocky Mountain Fire

☐ A parcel-level analysis is recommended. Re-evaluate if data is older than 5 years. Comment; 1/11/17; many homes have received a site review. The area is on the districts Tactical Maps.

X Investigate and verify firefighter safety zone.
Comment; 1/17/17 Q.M. noted on the Tactical Maps.
   o Flagstaff Road between Bison Drive and Kossler Lake
   o East side of Flagstaff Road, 0.75 mile north of the Pika Road / Flagstaff Road intersection. 6941 Flagstaff Road or GPS coordinates 39º 5755.20’ N, 105º 2014.21’ W
   o Flagstaff Road at the Walker Ranch Trailhead Road

☐ Evacuation and Access.
   o Access Route; Chapman Drive to Boulder Canyon Drive. Priority Level High. This project is meant to enhance fire district access to the area between Flagstaff Road and Boulder Canyon via Chapman Drive. It is recommended that the road surface be improved and the adjacent fuels brushed back to allow larger all-wheel drive fire apparatus. This project will also be recommended in the Boulder Fire Department CWPP. It is suggested that a joint effort be made to implement and complete this project between the agencies involved.
Comment; 3/6/2017, as of this writing Chapman Road has been repaired from the flood damage and fuels have been thinned. Piles are scheduled to be burned this year.
Ensure that all Open Space access points are known to all responding agencies.

Comment; 1/11/17 Q.M.; The area has been fully mapped and those have been distributed to other agencies.

- Fuel Reduction Projects.
  - Flagstaff Road Treatment (Approximately 115 acres). Priority level High (see Figure 10). This project focuses on limbing and thinning along Flagstaff Road from Bison Drive to the west end of the Lakeshore Park community via Lakeshore Park Road. (This project will eventually tie into the efforts of the Boulder OSMP Flagstaff Road project. See Figure 10.) Thinning should be conducted to conform to the shaded fuelbreak guidelines described in the “Access Route Fuels Modification Recommendations” section. Extra depth should be considered below the road in the drainages (200 to 300 feet). If combined with defensible space for all homes, this project will help protect a critical access route and will interrupt the continuity of fuels near the road. This treatment will also help to protect the individual homes north-northeast of the Lakeshore Park community. Special consideration should be given to the homes along the south side of Lakeshore Park Road. Linked defensible space would help to protect this area from an ignition along the shore of Gross Reservoir.

Comment; 30% of this project on the private property. Unfortunately some property owners do not allow for mitigation to the current standard. Efforts continue to educate these property owners.

X Water Supply

Comment; 1/17/17 Q.M. noted on the Tactical Maps.
  - Make certain all water sources are adequately signed.

- Areas of Special Interest. City Open Space and County Open Space border the community. See Other Areas of Special Interest, pages 48-53. A responsible manager should be contacted and given these recommendations.
6. SUPERIOR / ROCK CREEK (Moderate Hazard Rating)

Recommendations - Homeowner

☐ Adequate defensible space is recommended for all homes, especially those located on the perimeter. For details, please refer to the Home Mitigation section on page 27.

☐ Add reflective addressing made of non-combustible materials to all driveways and homes.

☐ Ensure that greenbelts remain irrigated.

Superior / Rock Creek Recommendations – Rocky Mountain Fire

☐ Access: Ensure that Open Space access points are known to all responding agencies. Comment; 1/11/17 Q.M.; The area has been fully mapped and those have been distributed to other agencies.

☐ Areas of Special Interest. City Open Space, County Open Space, National Renewable Energy Laboratory, and Rocky Flats Wildlife Refuge border the community. See Other Areas of Special Interest, pages 48-53. A responsible manager should be given these recommendations.

7. ELDORADO SPRINGS VALLEY (Moderate Hazard Rating)

Recommendations - Homeowner

☐ Adequate defensible space is recommended for all homes. For details, please refer to the Home Mitigation section on page 27.

☐ Wherever possible, add pullouts for emergency apparatus on driveways and private roads longer than 300 feet. Turnarounds should be constructed at the end of all driveways and dead-end roads. For details, please refer to Appendix D.

☐ Add reflective, non-combustible addressing to all driveways and homes.

☐ A large-animal evacuation plan should be developed where applicable.

Eldorado Springs Valley Recommendations – Rocky Mountain Fire

☐ Access: Ensure that all Open Space access points are known to all responding agencies. Comment; 1/11/17 Q.M.; The area has been fully mapped and those have been distributed to other agencies.
X  Water Supply
   ○ Make certain all water sources are adequately signed.

☐  Areas of Special Interest. City Open Space borders the community. See Other Areas of Special Interest, pages 48-53. A responsible manager should be given these recommendations.
8. TOWN OF MARSHALL (Moderate Hazard Rating)

Recommendations - Homeowner

□ Adequate defensible space is recommended for all homes. For details, please refer to the Home Mitigation section, page 27.

□ Wherever possible, add pullouts for emergency apparatus on driveways and private roads longer than 300 feet. Turnarounds should be constructed at the end of all driveways and dead-end roads. For details, please refer to Appendix D.

□ Add reflective addressing made of non-combustible materials to all driveways and homes.

□ A large-animal evacuation plan should be developed where applicable.

Town of Marshall Recommendations – Rocky Mountain Fire

□ Access
  o Ensure that all Open Space access points are known to all responding agencies.
  Comment; 1/11/17 Q.M.; The area has been fully mapped and those have been distributed to other agencies.

□ Water Supply
  o Make certain all water sources are adequately signed.

□ Areas of Special Interest. City Open Space borders the community. See Other Areas of Special Interest, pages 48-53. A responsible manager should be contacted and given these recommendations.
GENERAL RECOMMENDATION GUIDELINES

HOME MITIGATION

To improve life safety and preserve property, every home in the study area must 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 fire-safe or improve existing home mitigation efforts. Defensible space must be maintained throughout the year.

- Trees and shrubs are properly thinned and pruned within the defensible space. 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.
- 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 your house number are posted and easily visible.
- There is an easily accessible tool storage area with rakes, hoes, axes, and shovels.
- Attic, roof, eaves, and foundation vents are screened and in good condition. Stilt foundations and decks are enclosed, screened or walled up.
- Trash and debris accumulations are removed from the defensible space. Firewood is staked on a side contour, at least 50 feet away from structures.
- Propane tanks should be located at least 30’ from all structures. The area around the tank must be free of combustible material such as yard debris, weeds, etc.
- Maintain your defensible space constantly:
  - Mow non-irrigated grass to a low height. 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.
Defensible Space Zones (Timber and Brush Lands)\textsuperscript{12}
Defensible Space Zones (Grass Lands)

ZONE 1 (within 15 feet of the home), shown as Home Ignition Zone, 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.¹³

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.

¹³ [http://www.ext.colostate.edu/PUBS/natres/06302.html](http://www.ext.colostate.edu/PUBS/natres/06302.html), referenced 9/10/07
BRUSH AND SHRUBS

Brush and shrubs are smaller than trees, often formed by a number of vertical or semi-upright branches arising close to the ground. On nearly level ground (increase 1.5 times for slope and windy areas), minimum spacing recommendations between clumps of brush or shrubs is 2 1/2 times the height of the vegetation. Maximum diameter of clumps should be 2 times the height of the vegetation. All measurements are made from the edges of vegetation crowns.

For example: For shrubs 6 feet high, spacing between shrub clumps should be 15 feet or more apart (measured from the edges of the crowns of vegetation clumps). The diameter of shrub clumps should not exceed 12 feet (measured from the edges of the crowns). Branches should be pruned to a height of 3 feet.

PUBLIC EDUCATION

The area around Boulder is experiencing continuing development. Spiraling property values and a limited number of building sites have resulted in recently-constructed high-value residences mixed in with older homes, rental properties, and historic buildings in various states of decay. There is likely to be a varied understanding among property owners of the intrinsic hazards associated with building in these areas. An approach to wildfire education that emphasizes safety and hazard mitigation on an individual property level should be undertaken, in addition to community and emergency services efforts at risk reduction. Combining community values such as quality of life, property values, ecosystem protection, and wildlife habitat preservation with the hazard reduction message will increase the receptiveness of the public.

Field contacts and interviews indicate that some homeowners in the study area are very supportive and proactive with regards to wildfire mitigation efforts. Unfortunately there are still homeowners and landowners who refuse to acknowledge the fact that they live in an area at risk of wildfires. Continued attempts to provide educational materials through personal contact should be conducted. Property owner education and the wildfire hazard mitigation message should be an ongoing effort in the foothill portions of RMF and throughout the front-range interface.
RECOMMENDATIONS

☐ Update/upgrade Rocky Mountain Fire’s web site. 3/2/17, complete.

☐ Visit these web sites for a list of public and homeowner education materials:
  - http://www.firewise.org
  - http://csfs.colostate.edu/protecthomeandforest.htm
  - http://www.rockymountainfire.org
  - http://www.firesafecouncil.org/homeowner/index.cfm

☐ Provide citizens with the findings of this study including: 3/2/17, added to website in 2012.
  - Levels of risk and hazard
  - Values of fuels reduction programs
  - Consequences and results of inaction for ignitions within the community

☐ Create a Wildland-Urban Interface (WUI) citizen advisory council to provide peer level communications for the community. Too often, government agency advice can be construed as self-serving. Consequently, there is poor internalization of information by the citizens. The council should be used to:
  - Bring the concerns of residents to the prioritization of mitigation actions
  - Select demonstration sites
  - Assist with grant applications and awards

☐ A number of public recreation areas are present within RMF (see Other Areas of Special Interest, pages 48-53). A common recommendation is for those areas to provide wildfire education to the public via verbal contact, published literature, and signage.

ADDRESSING

A number of areas within RMF were found to have poor and/or inconsistent street signage and addressing of properties. In the worst cases, addressing was missing altogether or attached to combustible objects (see Figure 5). In the foothill areas of Rocky Mountain Fire with its intricate mountain roads and driveways, proper standardized reflective signage is critical to effective response. The time saved, especially at night and in difficult conditions, can make a huge difference in the effectiveness of response. 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 volunteer operators who do not have the opportunity to familiarize themselves on access issues as often as career responders.

NOTE: In 2014 RMFD began a Rural Addressing Program. This program provides a metal, blue, reflective address sign at a very low cost to district residents. This service also includes the Fire Crew setting the sign in place in coordination with the resident.
General Recommendation

Every building should have a permanently posted, reflective address marker mounted on a non-combustible pole. The sign should be placed and maintained at each driveway entrance. Care should be taken to ensure that the location will not become obscured by vegetation, snow, or other features, whether natural or manmade. It is critical that the location and markings are adequate for easy night-time viewing. It is preferable to locate markers in a consistent manner within each community. A good guideline for this practice is to place the markers five feet above ground level on the right side of every driveway. Where multiple homes are accessed by a single driveway, all addresses that are accessed via that driveway should be clearly listed on the driveway marker. Where multi-access driveways split, each fork should indicate all residences accessed by that fork, and the proper direction of travel to arrive at a given address. It is not adequate to simply mark addresses on a common pole in the center of the fork. Residential homes should have an additional reflective address marker permanently attached to the home in clear view of the driveway or access road. Homes that are marked by lot number while under construction should have the lot number removed and a permanent address marker posted before granting a certificate of occupancy.

LOCAL PREPAREDNESS AND FIREFIGHTING CAPABILITIES

Rocky Mountain Fire (RMF) provides suppression services for the study area. The district has six fire stations:

- Station 1 (includes the administrative offices) is located at 7700 Baseline Road.
  - Staffed 24/7 by career firefighters.
  - Apparatus: 1 type-1 engine, 1 type-1 Tactical Tender and 1 type-6 engine.
- Station 2 is located at 961 Cherryvale Road and is not staffed.
  - Apparatus: 1 type-1 engine and 1 type-3 engine.
- Station 3 is located at 206 Coal Creek Drive in old town Superior and is not staffed.
  - Apparatus: 1 type-1 engine.
- Station 4 is located at 5748 Flagstaff Road and is not staffed.
Comment; 3/2/17 – this station is now staffed with a crew 12 months of the year. A 10 person crew is on from April thru October.
   o Apparatus: 1 type 2-engine, 1 type 6 engine and 1 type-1 water tender.
   o Bobcat, dump trailer and chipper for fuels mitigation work.

Station 5 is located at 2701 S. Indiana Street in the Rock Creek subdivision.
   o Staffed 24/7 by career firefighters.
   o Apparatus: 1 type-1 engine, 1 aerial, and 1 type-6 engine.

Station 6 is located at 4390 Eldorado Springs Drive (Hwy 170).
Comment; 3/2/17 – this station is staffed with a 2-person Fire Medic unit.
   o Apparatus: 1 type-2 engine, 1 type-6 engine and 1 type-3 water tender.
   o RMFD wildfire structure protection trailer.

Water handling accessories include:
   □ 3, 2000 gallon portable water tanks.
   □ Trailer mounted 1000 GPM pump (currently located at station 6).

The fire district survey revealed that communication “holes” exist in small portions of the study area. Although relatively small areas are affected, communication problems are very commonly linked to tragic results with regard to firefighter safety.

NOTE: In 2010 a 800 MHZ radio system was secured by the district. This system allows for better communications in the mountain areas.

As mentioned in other sections of this CWPP, RMF has taken proactive steps forward in terms of preplanning their WUI response areas. Good mapping coupled with individual home assessments (created with Red Zone software) is one reason that RMF has been successful with initial fire attack outcomes.

RMF firefighters are highly trained and experienced in wildland fire. The district adheres to the National Wildfire Coordinating Group (NWCG) curriculum for training. Of RMF’s 40 members all are trained to the NWCG S-130/190 standard (basic wildland fire fighting and weather). Approximately 20 firefighters are qualified at the Crew Boss/Engine Boss level or higher.

RMF hires and trains a seasonal wildfire mitigation crew. This crew is comprised of 3 to 5 members with a range of qualifications. Their primary goal is threefold: first, to provide a rapid and effective response to wildfires (including other department incidents); second, to provide mitigation efforts by mechanically thinning fuels on individual home properties; third, to provide wildfire education to the property owners of Rocky Mountain Fire.

NOTE: In 2014 the crew size was increased to 10 total including supervisors.

Of special note is that some chief officers with RMF possess more advanced wildfire qualifications. These chief officers currently participate on regional and national incident management teams and respond to wildfire incidents across the country. The experience they gain while assigned to a large on-going wildfire incidents provides numerous and important benefits. These benefits will also greatly enhance the effectiveness of RMF when confronted with larger all-hazard type incidents.

Mutual aid is available from the City of Boulder Fire Department, Boulder Rural Fire Protection District, Mountain View Fire Protection District, Louisville Fire Department, North Metro Fire Rescue, Coal Creek Canyon Fire Department, High Country Fire Protection District, Sugarloaf Fire Protection District, and the Four Mile Fire Protection District.
RECOMMENDATIONS

Firefighter Training: NOTE: The recommendations below have been attained and will continue.

- **Priority Level High**: Continue providing education and experience for all firefighters including:
  - NWCG S-130/190 for all new department members
  - Annual wildland fire refresher and “pack testing” (physical standards test)
  - S-215 Fire Operations in the Urban Interface for all members
  - S-290 Intermediate Fire Behavior for all members
  - I-200 and I-300 – Basic and Intermediate ICS (including the appropriate level of NIMS courses) to all members
  - S-230/231 Single Resource Boss/Engine Boss to all officers
  - Encourage personnel to seek higher wildfire qualifications
  - Encourage personnel to participate in out of district wildfire assignments
  - Encourage prescribed burn participation
  - Encourage incident management team participation

Equipment: NOTE: The below items have been purchased.

- **Priority Level High**. Adequately stock a reserve equipment cache.

- **Priority Level High**. Provide gear bags for wildland PPE and bunker gear to be placed on apparatus responding to fire calls. This will help ensure that firefighters have both bunker gear and wildland PPE available when the fire situation changes.

Communications: NOTE: The below items have been secured thru Boulder County Communications center.

- **Priority Level High**. A mobile radio repeater is in the initial phase of purchasing. This piece of equipment should be approved and ordered/received as soon as possible.

- **Priority Level High**. A complement to any communications system is the acquisition of a mobile frequency “patch” device. This device quickly allows the ability to patch together multiple radio frequencies into one common channel.

As in any fire district, firefighters’ response time to emergency calls varies throughout the jurisdiction. Within Rocky Mountain Fire, the most important variable in response time is the home’s distance from the nearest fire station staffed with personnel. Stations 1 and 5 are staffed 24/7. Figure 6 (page 35) shows the distance from the nearest fire station to the communities of the study area. Distances were calculated in ArcGIS and take into account the road distance to a given area, rather than merely the “flight distance.” For the purposes of this report, this is not an Insurance Services Office (ISO) issue but one of defining response distance, and therefore time,
to fire ignitions. This distance analysis calculates *drivable distance, not drive time*, although distance was used as a factor in rating neighborhood hazards. Response times may vary greatly over the same distance due to road conditions, steepness, curvature of roads, and evacuation traffic. However, poor road conditions and steep terrain were found to be most common in neighborhoods located furthest from the nearest fire station.

Most fire service leaders agree that response time is composed of three distinct elements.

1. **Call processing time**: the time it takes for dispatchers to ascertain the location and nature of the emergency and initiate the appropriate response.
2. **Turnout or staffing time**: the time it takes for personnel to respond to the dispatch, board apparatus, and begin traveling to the scene.
3. **Travel time**: the actual time it takes to travel from the station to the scene.

Further, the National Fire Protection Agency (NFPA) has established the following time objectives for 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.\(^\text{14}\)

If turnout time of one minute is met, and average driving speed is estimated at 30 MPH, then the engine company could drive two miles in the four minutes established by NFPA 1710. Therefore, neighborhoods with mean distances greater than two miles from a fire station fall outside the NFPA established time objectives and are more hazardous (more likely to experience significant damage from a moderately advancing wildfire) than those located less than two miles from the nearest station. A significant portion of the most hazardous communities in the study area have mean distances greater than two miles from the nearest staffed fire station. A thorough understanding of wildfire hazards is crucial to the safety of residents in these areas. Proper defensible space and hazard mitigation is the single most important factor in limiting fire damage in areas where response by fire suppression forces is inevitably delayed.

\(^{14}\) [http://www.iaff.org/academy/content/online/modules/1710/summary.html](http://www.iaff.org/academy/content/online/modules/1710/summary.html)
FIGURE 6. Distances to nearest fire stations

Distance to Nearest Fire Station (mi)
- < 1.0
- 1.1 - 2.0
- 2.1 - 3.0
- 3.1 - 4.0
- 4.1 - 5.0
- > 5.0

Legend:
- Fire Station
- RMF Boundary
- Roads

Scale:
0 1 2 3 Miles

Map showing distances to nearest fire stations with color coding for different distance ranges.
SAFETY ZONES

NOTE: NWCG is in the process of modifying these guidelines. 3/2/17.

When pre-planning for a wildfire incident, designating safety zones for use by the responding firefighters should be top priority. More than one safety zone is advised, since fire operations can be spread out over a large geographical area. When evaluating areas to be used, they must be easily accessible and adhere to current guidelines recommended by NWCG (see Figure 7).

FIGURE 7. Safety zone guidelines

<table>
<thead>
<tr>
<th>Flame Height</th>
<th>Distance Separation (firefighter to flame)</th>
<th>Area in Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 feet</td>
<td>40 feet</td>
<td>1/10 acre</td>
</tr>
<tr>
<td>20 feet</td>
<td>80 feet</td>
<td>1/2 acre</td>
</tr>
<tr>
<td>50 feet</td>
<td>200 feet</td>
<td>3 acres</td>
</tr>
<tr>
<td>75 feet</td>
<td>300 feet</td>
<td>7 acres</td>
</tr>
<tr>
<td>100 feet</td>
<td>400 feet</td>
<td>12 acres</td>
</tr>
<tr>
<td>200 feet</td>
<td>800 feet</td>
<td>50 acres</td>
</tr>
</tbody>
</table>

(1 acre = 208 feet x 208 feet, or the approximate size of a football field)

Distance separation is the radius from the center of the safety zone to the nearest fuels.¹⁵

Note: The size of safety zones recommended by Figure 7 are the minimum separation distances for a three-person engine crew and take into account only radiant heat transfer. Convective heat transfer (hot gases blown by winds and funneled by terrain features) is not considered. The suitability of any area for use as a safety zone must be determined on a case-by-case basis using the current and expected fire behavior and adjusted as appropriate for the expected number of resources.

EVACUATION/ACCESS ROUTES

Three evacuation/access routes are recommended. Two roads have been identified as evacuation route alternatives to the primary access. Both may be compromised by land ownership issues. One road is identified to enhance fire district emergency access. These routes are highlighted in Figure 8, and specific recommendations follow.

FIGURE 8. Evacuation routes
OTHER ACCESS ROUTE RECOMMENDATIONS

□ In order to reduce conflicts between evacuating citizens and incoming responders, it is desirable to have nearby evacuation centers for citizens and staging areas for fire resources. 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. Local responders are encouraged to preplan the use of potential staging areas with property owners.

□ Identify and pre-plan alternate escape routes and staging areas. 1/17/17, staging areas identified on the Tactical Maps.

□ Perform response drills to determine the timing and effectiveness of fire resource staging areas.

□ Educate citizens on the proper escape routes, and evacuation centers to use in the event of an evacuation.

□ Use a reverse 911 system or call lists to warn residents when an evacuation may be necessary. Notification should also be carried out by local television and radio stations. Any existing disaster notification systems, such as tornado warnings, should be expanded to include wildfire notifications. 3/2/17, this has been completed and augmented with the Everbridge notification system which includes alerts to cellphones and Email. Everbridge is a voluntary sign-up system the resident must undertake.

□ Emergency management personnel should be included in the development of preplans for citizen evacuation.

□ Post placards clearly marking "fire escape route." This will provide functional assistance during an evacuation and communicate a constant reminder of wildfire to the community. Be sure to mount signage on non-combustible poles, preferably under the street name sign. The placards should start from the furthest point into the subdivision and work outward. These placards greatly assist responding firefighters from other agencies who may not be familiar with the layout of the subdivision.
FUELS MODIFICATION PROJECTS

INTRODUCTION

One of the most effective forms of landscape scale fuels modification is the fuelbreak (sometimes referred to as “shaded fuelbreak”). A fuelbreak is an easily accessible strip of land of varying width, depending on fuel and terrain, in which fuel density is reduced, thus improving fire control opportunities. Vegetation is thinned, removing diseased, fire-weakened, and most standing dead trees. Thinning should select for the more fire resistant species. Ladder fuels, such as low limbs and heavy regeneration, are removed from the remaining stand. Brush, dead and down materials, logging slash, and other heavy ground fuels are removed and disposed of to create an open park-like appearance. The use of fuelbreaks under normal burning conditions can limit the uncontrolled spread of fires and aid firefighters in slowing the spread rate. Under extreme burning conditions, where spotting occurs for miles ahead of the main fire, and probability of ignition is high, even the best fuelbreaks are not effective. That said, fuelbreaks have proven to be effective in limiting the spread of crown fires in Colorado. Factors to be considered when determining the need for fuelbreaks in mountain subdivisions include:

- The presence and density of hazardous fuels
- Slope
- Other hazardous topographic features
- Crowning potential
- Ignition sources

With the exception of Aspen, all of Colorado’s major timber types represent a significant risk of wildfire. Increasing slope causes fires to move from the surface fuels to crowns more easily, due to preheating. A slope of 30% causes the fire-spread rate to double when compared to the fire-spread rate (with the same fuels and other conditions being equal) on flat ground. Chimneys, saddles, and deep ravines are all known to accelerate fire spread and influence intensity. Communities with homes located on or above such features, as well as homes located on summits and ridge tops, are good candidates for fuel breaks. Crown fire activity values for Rocky Mountain Fire were generated by the FlamMap model and classified into four standard ranges. In areas where independent and dependent crown fire activity is likely to exist, fuelbreaks should be considered. If there are known likely ignition sources (such as railroads and recreation areas that allow campfires) present in areas where there is a threat of fire being channeled into communities, fuelbreaks should be considered.

Fuelbreaks should always be connected to a good anchor point like a rock outcropping, river, lake, or road. The classic location for fuelbreaks is along the tops of ridges, in order to stop fires from backing down the other side or spotting into the next drainage. This is not always practical from a WUI standpoint, because the structures firefighters are trying to protect are usually located at the tops of ridges or mid-slope. Mid-slope positioning is considered the least desirable for fuelbreaks, but it may be easiest to achieve as an extension of defensible space work or off existing roads and escape routes. One tactic would be to create fuelbreaks on slopes below

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homes located mid-slope and on ridge tops, so that the area of continuous fuels between the
defensible space of homes and the fuelbreak is less than ten acres. Another commonly employed
tactic is to position fuelbreaks along the bottom of slopes. It would make sense to locate
fuelbreaks mid-slope below homes to break the continuity of fuels into the smaller units mentioned
above, even though this position is considered the least desirable from a fire suppression point of
view.

Fuelbreaks are often easiest to locate along existing roadbeds (see the description of the fuels
modification project for access routes below). The minimum recommended fuelbreak width is
usually 200 feet. As spread rate and intensity increases with slope angle, the size of the fuelbreak
should also be increased, with an emphasis on the downhill side of the roadbed or centerline
employed. The formulas for slope angles of 30% and greater are as follows: below road distance
= 100' + (1.5 x slope %); above road distance = 100’ – slope % (see Table 4). Fuelbreaks that pass
through hazardous topographic features should have these distances increased by 50%. Since
fuelbreaks can have an undesirable effect on the aesthetics of the area, crown separation should be
emphasized over stand density levels. In other words, isolating groupings rather than cutting for
precise stem spacing will help to mitigate the visual impact of the fuelbreak.

It is important to note that in Colorado’s dry climate, slash decomposes very slowly. One
consequence of failing to remove slash is to add to the surface fuel loading, potentially making
the area more hazardous than before treatment. It is imperative that all materials be disposed of
by piling and burning, chipping, physical removal from the area, or lopping and scattering. Of all
of these methods lopping and scattering is the cheapest, but it is also the least effective, since it
adds to the surface fuel load.

It is important to consider that fuelbreaks must be maintained to be effective. Thinning usually
accelerates the process of regenerative growth. The effectiveness of the fuelbreak may be lost in
as little as three to four years if ladder fuels and regeneration are not controlled.

One of the most difficult issues in establishing and maintaining fuelbreaks is securing the
cooperation and participation of landowners. Ownership maps of the area indicate that
implementation of fuels reduction projects recommended here would require the approval of
public land management agencies as well as private landowners.

ACCESS ROUTE FUELS MODIFICATION RECOMMENDATIONS

A fuel modification project for the primary access corridor should be implemented. Flagstaff Road
is the primary transportation corridor through the critical sections of the district. In general, this
road has adequate openings. However, some communities in the study area would benefit from
fuels reduction along their principal access route.

Thinning along primary access roads of the communities should include an area of at least 100'
on either side of the centerline of the road where practical. This distance should be modified to
account for increased slope and other topographic features that increase fire intensity (see Table
4). This is especially important in communities with steep, narrow roads and few turnouts. In these
areas, safer access for firefighters would make a positive impact on the number of structures that
could be defended in a wildfire. Existing and natural barriers to fire should be incorporated into
the project dimensions.
The cooperation of adjacent, contiguous landowners should be secured. If this is not possible, more intensive thinning may need to occur within the road easement. Landowner participation allows the project to be more flexible in selecting trees for removal. It allows greater consideration for the elements of visual screening and aesthetics. Enlarging the project dimensions allows more options for tree selection while still protecting the access/egress corridor.

Elements of the fuels modification space for access and egress routes should include:
- Tree crown separation of at least 10’ with groups of trees and shrubs interspersed as desired.
- Tree crown separation greater than 10’ may be required to isolate adjacent groups or clumps of trees.
- Limb all remaining trees to a height of 8’ or 1/3 of the tree height (whichever is less).
- Clean up ground fuel within the project area.

**TABLE 4. Recommended treatment distances for mid-slope roads**

<table>
<thead>
<tr>
<th>% Slope</th>
<th>Distance Above Road</th>
<th>Distance Below Road</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>70 feet</td>
<td>145 feet</td>
</tr>
<tr>
<td>35</td>
<td>65 feet</td>
<td>153 feet</td>
</tr>
<tr>
<td>40</td>
<td>60 feet</td>
<td>160 feet</td>
</tr>
<tr>
<td>45</td>
<td>55 feet</td>
<td>168 feet</td>
</tr>
<tr>
<td>50</td>
<td>50 feet</td>
<td>175 feet</td>
</tr>
</tbody>
</table>
CURRENT AND PROPOSED CROSS-BOUNDARY PROJECTS

A very important purpose of this CWPP is to make known other agencies’ fuel reduction projects which may affect Rocky Mountain Fire.

Figure 9 shows those known projects from 2010 and their last known status. Figure 9A shows currently known projects (2017).

Recommendations follow the figures. The purpose would be to strengthen those projects by combining efforts with those agencies or simply building off of them within RMFD.

NOTE: Priority projects within RMFD should be on properties that agree to mitigate to the current standard (2017 uses the CSFS standard).

FIGURE 9A. Current and proposed projects near RMFD (2017)

2017 Recommendations to enhance the cross-boundary fuel reduction efforts.

- Give priority to residents/property owners that agree to mitigate to the current standard.
- Give priority to residents/property owners who agree to connect their mitigated properties. The zone 3 areas should be mitigated to standard.
- Give priority to groups of residents/property owners who agree to connect all mitigated areas together. The zone 3 areas should be mitigated to standard.
RECOMMENDATIONS (Updates)

- **Boulder City OSMP (Flagstaff Road treatment). Priority Level High (see Figure 10).** This is a Boulder OSMP project which focuses on improving this very important access route. The project is being implemented as of this writing. This project will have a direct effect on access to the Flagstaff area and is an adjoining project described below in Recommendation A of RMF’s fuels reduction projects.

  Comment; 3/2/17 – OSMP has completed most of their project area. RMFD has completed 30% of this project on the private property. Unfortunately, some property owners do not allow for mitigation to the current standard. Efforts continue to educate these property owners.

- **Boulder County Open Space (Walker Ranch Projects). Priority Level High (see Figure 10).** These Boulder County projects which focus on fuels reduction work are mostly complete. The NE section of the project east of the Walker Ranch trailhead is in the final stages of cutting as of this writing. These projects will have a direct effect on the protection of the Pine Needle and Flagstaff communities.

  Comment; 3/2/17 – Even though this area is within the Coal Creek Fire District some cross-boundary projects have occurred. RMFD has tried unsuccessfully to include these 12 properties into the district. The intent was to be able to treat the entire area as approval was granted.

- **Boulder City OSMP (Lindsay Property) Fuel breaks. Priority Level Moderate (see Figure 10).** These projects have been completed for the most part. A fuels reduction project recommended below (see Recommendation E of RMF’s fuels reduction projects) will tie into a section of this completed fuel break. The fuel break will need to be evaluated to see if it needs re-entry or maintenance.

  Comment; 3/2/17 – This complimenting project know as the Town of Eldorado Springs Aqueduct Fuelbreak was researched. In 2012, the major land owner was contacted and declined to allow any level of fuels mitigation to be carried out on the land. This affectively rendered this project unattainable. In 2016 the water company who owns the aqueduct completed a full enclosure of the aqueduct which helps to serve as a partial fuelbreak.

- **USFS and CSFS Treatment Projects. Priority Level Moderate (see Figure 10).** There are numerous USFS and CSFS projects which will have direct effect on the protection of communities within RMF. The CSFS also manages projects within Eldorado Canyon State Park. It is therefore recommended that RMF assist with these projects when possible.

  Comment; 3/2/17 – In 2011 a fuelbreak was completed along a 1 1/2 mile portion of the Kneale Road Evacuation Route. This is from the driveway of 1006 Kneale Road west and north to the private/Walker Ranch boundary. This included a fuel break that connects South Boulder Creek to the “Gas Line” portion of this project.
The following recommendations are in addition to, not in place of, the fuels reductions mentioned in the Safety Zones, Addressing, Evacuation/Access Routes FMU. It is important to note that the boundaries shown on the maps in this document are only approximate. Exact boundaries will be determined when treatment agreements are negotiated with the involved land owners and/or land managers.

FIGURE 10. Proposed fuel reduction projects

2017 Comments:
- All proposed projects have had some level of completion. These updates are elaborated on in the above pages.
- The Lakeshore Drive Treatment has had numerous residential home mitigation efforts some of which have been linked together.
WATER SUPPLY

In the RMF study area, like in many of the mountainous areas of Colorado’s Front Range, water is a critical fire suppression issue. Although most of the plains communities are serviced by an adequate hydrant network, the following communities are not serviced by a municipal hydrant network:

- Town of Eldorado Springs
- Pine Needle
- Kneale Road
- Lakeshore Park
- Flagstaff Road
- Eldorado Springs Valley
- Town of Marshall

Additional (not municipal hydrants) water supplies currently used by RMF are shown in Figures 11 and 12. Table 5 gives a brief description of these water sources.

**FIGURE 11. RMF water sources (west)**
FIGURE 12. RMF water sources (east)

2017 Updates:

- The Kossler Lake draft site pump has been replaced with a permanent pump housed inside of a building. Permanent piping allows for a “hydrant” located at station 4 to be utilized throughout the year.

- A pump house has been placed in the lower parking lot of Eldorado Canyon State Park. This pump (exact model as the Kossler Lake pump) has a permanent draft site and is equipped to fill tenders and engines. This pump site directly serves the needs of the Town of Eldorado Springs.

- The Marshall cistern located at the Marshall Mesa Trailhead has been removed.
### TABLE 5. RMF water sources

<table>
<thead>
<tr>
<th>Water Source Name</th>
<th>Address / Location</th>
<th>Capacity (Gallons)</th>
<th>Type</th>
<th>Delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Kneale Road cistern</td>
<td>1100 Kneale Road</td>
<td>500</td>
<td>private cistern</td>
<td>2 1/2” draft</td>
</tr>
<tr>
<td>2. Kneale Road Dry Hydrant</td>
<td>781 Kneale Road</td>
<td>unlimited</td>
<td>creek</td>
<td>2 1/2' draft</td>
</tr>
<tr>
<td>3. Eldorado Canyon State Park</td>
<td>Picnic area</td>
<td>unlimited</td>
<td>creek</td>
<td>draft</td>
</tr>
<tr>
<td>4. Town of Eldorado draft point</td>
<td>West side of town</td>
<td>Unlimited*</td>
<td>creek</td>
<td>draft</td>
</tr>
<tr>
<td>5. Town of Eldorado cistern</td>
<td>West side pool parking lot, underneath</td>
<td>1000</td>
<td>cistern</td>
<td>draft</td>
</tr>
<tr>
<td>6. Mesa trailhead</td>
<td>Mesa trailhead &amp; Eldorado Springs Dr.</td>
<td>unlimited</td>
<td>creek</td>
<td>draft</td>
</tr>
<tr>
<td>7. RMF Fire Station #6</td>
<td>Eldorado Springs Drive</td>
<td>10,000</td>
<td>cistern</td>
<td>2 1/2” &amp; 6” draft</td>
</tr>
<tr>
<td>8. Prado Drive draft point #1</td>
<td>West end of Prado Drive</td>
<td>unlimited</td>
<td>creek</td>
<td>draft</td>
</tr>
<tr>
<td>9. Prado Drive draft point #2</td>
<td>Middle of Prado Drive</td>
<td>unlimited</td>
<td>creek</td>
<td>draft</td>
</tr>
<tr>
<td>10. Prado Drive draft point #3</td>
<td>East end of Prado Drive</td>
<td>unlimited</td>
<td>creek</td>
<td>draft</td>
</tr>
<tr>
<td>11. La Mesa draft point</td>
<td>2221 La Mesa</td>
<td>unlimited</td>
<td>creek</td>
<td>draft</td>
</tr>
<tr>
<td>12. Marshall cistern</td>
<td>SE corner of Hwy 93 &amp; Hwy 170</td>
<td>12,000</td>
<td>cistern</td>
<td>2 ½” pressurized</td>
</tr>
<tr>
<td>13. Marshall hydrant</td>
<td>Hwy 170 &amp; Marshall Road</td>
<td>Unlimited*</td>
<td>hydrant</td>
<td>2 ½” pressurized</td>
</tr>
<tr>
<td>14. Lakeshore Park Cistern</td>
<td>Lakeshore Drive &amp; Gross Dam Road</td>
<td>10,000</td>
<td>cistern</td>
<td>2 1/2” draft</td>
</tr>
<tr>
<td>15. Meyers Homestead trailhead</td>
<td>Meyers Homestead Trailhead – Flagstaff Road</td>
<td>10,000</td>
<td>cistern</td>
<td>2 ½” draft</td>
</tr>
<tr>
<td>16. Kossler lake draft point</td>
<td>Across from Station 4</td>
<td>unlimited</td>
<td>volume pump</td>
<td>draft</td>
</tr>
<tr>
<td>17. Bison Drive pond</td>
<td>1564 Bison Drive – private</td>
<td>¼ acre</td>
<td>pond</td>
<td>draft</td>
</tr>
<tr>
<td>18. Gross Dam Road hydrant</td>
<td>Gross Dam Road, approx. 2 1/2 mi south of Lakeshore Drive.</td>
<td>unlimited</td>
<td>hydrant</td>
<td>Unknown fitting size, gravity pressure **</td>
</tr>
</tbody>
</table>

* When creek flow is low these water sources may not be reliable. See recommendations.
** This hydrant has a significant elevation drop without a pressure relief device; therefore the static hydrant pressure is approximately 200 psi.
There are private cisterns scattered throughout the district, but they are not maintained or used by the RMF.

All water sources need to be labeled to indicate their location, capabilities, and capacities. This information needs to be distributed to all mutual aid agencies. In addition all water sources should be inspected and preventive maintenance performed at least annually.

**AREAS OF SPECIAL INTEREST**

**INTRODUCTION**
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, where applicable, designed to address concerns specific to the individual property. These recommendations are in addition to, not in place of, other recommendations in this report concerning the community or area where these properties are located.

**BOULDER COUNTY OPEN SPACE – Walker Ranch**
Walker Ranch offers a rich mosaic of mountain habitats. Ponderosa pines and Douglas firs are interspersed with open meadows and aspen groves. Small streams dissect the hills before joining South Boulder Creek. On September 15th, 2000, the Walker Ranch Fire burned about 1,062 acres, almost exclusively on Walker Ranch. The historic Walker Ranch was one of the largest cattle ranches in this region of Colorado. This homestead is now the focal point of the Park's designated historic district. The homestead is closed to the public except for special events. The County now owns 2,566 acres and leases an additional 1,212 acres from the Bureau of Land Management. This open space property is listed on the National Register of Historic Places.\(^\text{17}\)

**RECOMMENDATIONS**

- An Emergency Response plan should be developed including a wildfire management component.
- All buildings and improvements adjacent to wildland fuels should follow the recommendations as outlined in the Home Mitigation section.
- All Open Space employees should attend wildland firefighting training. This will serve to educate the employees as well as provide an additional resource for RMF.
- Additional fuel reduction projects should be pursued, with priorities being cross-boundary projects with RMF. Completed projects will need to be maintained and inspected annually.
- The public should be provided with wildfire educational materials available at all the information kiosks located on Open Space properties.

\(^{17}\) [http://www.co.boulder.co.us/openspace/recreating/public_parks/walker.htm](http://www.co.boulder.co.us/openspace/recreating/public_parks/walker.htm)
Fire danger signage should also be posted at the kiosks. The fire danger for the day should be displayed, and this information will need to be kept current.

CITY OF BOULDER: Open Space and Mountain Parks, Kossler Lake

Over 43,000 acres of City Open Space land is located in and around the City of Boulder. Some of the land is in agricultural production, while the vast majority of the lands are open to passive recreational uses which include an extensive trail system available for hikers and horseback riders. Bicyclists enjoy riding on designated trails. Picnicking and fishing areas can also be found. With annual visitation of 5.3 million per year, human caused wildfire ignitions are a legitimate concern. There is a large amount of Open Space land adjacent to Rocky Mountain Fire communities. Kossler Lake is technically a water reservoir for the City of Boulder water supply system and is not open to the public.

RECOMMENDATIONS

- An Emergency Response plan should be developed including a wildfire management component.
- All buildings and improvements adjacent to wildland fuels should follow the recommendations as outlined in the Home Mitigation section.
- Mow grass and weeds to a low height along boundaries to a width of 30 feet.
- Remove/reduce the accumulation of dead grass and weeds (tumbleweeds) from fence rows.
- Additional fuel reduction projects should be pursued, with priorities being cross-boundary projects with RMF. Completed projects will need to be maintained and inspected annually.
- All Open Space employees should attend wildland firefighting training. This will serve to educate the employees as well as provide an additional resource for RMF.
- The public should be provided with wildfire educational materials available at all the information kiosks located on Open Space properties.
- Fire danger signage should also be posted at the kiosks. The fire danger for the day should be displayed, and this information will need to be kept current.
- The area adjacent to Kossler Lake has had fuel reduction work. This area needs to be evaluated annually and maintained.

http://www.bouldercolorado.gov/index.php?option=com_content&task=view&id=1167&Itemid=1082
GROSS RESERVOIR, Denver Water Board

Gross Reservoir serves as combination storage and regulating facility for water that flows under the Continental Divide through the Moffat Tunnel. It has a surface area of 440 acres and 10.9 miles of shoreline. The area is now open to non-motorized boats (canoes, kayaks, and rowboats). No contact with the water is allowed. Picnicking, fishing, hiking, and camping are other recreational activities commonly enjoyed in the area.19 There are a number of established and “social” hiking trails that allow access into the area of the reservoir near the Lakeshore Park community. The Gross Dam Road serves as an important access route into and out of the area.

RECOMMENDATIONS

- An Emergency Response plan should be developed including a wildfire management component.
- All buildings and improvements adjacent to wildland fuels should follow the recommendations as outlined in the Home Mitigation section.
- The public should be provided with wildfire educational materials available at all the information kiosks located at the boat ramp and picnicking area.
- Fire danger signage should also be posted at the kiosks. The fire danger for the day should be displayed, and this information will need to be kept current.
- The parking area located at the west end of the Lakeshore Community is situated on USFS lands. This trailhead should have fire danger signage and literature.
- The Gross Dam Road needs to be evaluated to legitimize it as a viable secondary access route. The road surface is dirt but of sufficient width. The CSFS has coordinated the fuels reduction efforts in this area. A number of projects have been completed and are proposed.

19 http://www.denverwater.org/recreation/gross.html
ELDORADO CANYON STATE PARK

The Eldorado Canyon State Park occupies 885 acres within Boulder County. Eldorado is a very popular state park, and during the summer it is often filled to capacity, especially on weekends. Fire and rescue services are provided by Rocky Mountain Fire. The park administration headquarters are located in the upper end of the park. The structures themselves have been grouped with the Kneale Road community.

RECOMMENDATIONS

- According to park personnel, Eldorado’s Emergency Response plan has a limited wildfire component. A true fire management plan should be written.
- Agreements for emergency services should be created or updated.
- All buildings and improvements adjacent to wildland fuels should follow the recommendations as outlined in the Home Mitigation section.
- All park employees should attend wildland firefighting training provided by RMF. This will serve to educate the park employees, and it will provide an additional resource for RMF.
- The public should be provided with wildfire educational materials upon entrance into the park.
- Fire danger signage should be posted at the park entrance and visitors center (park administration headquarters) to show the current fire danger.
- The road into the park should be improved.
- The CSFS coordinates fuels thinning and prescribed fire efforts. A number of projects have been completed. As of this writing the CSFS has thinning projects (mostly mastication) planned five years into the future for all the accessible forest acres within ECSP.

20 http://parks.state.co.us/Parks/eldoradocanyon
The National Wind Technology Center (NWTC) is managed by NREL for the U.S. Department of Energy. This facility sits on 305 acres located on the southeast corner of Hwy 93 and Hwy 128. NWTC researchers work with members of the wind energy industry to advance wind power technologies that lower the cost of wind energy through research and development of state-of-the-art wind turbine designs. The NWTC’s location is ideal for research and development testing of wind turbines because it experiences distinct wind patterns. A pressurized hydrant system is supplied from a 75,000 gallon cistern on-site.

RECOMMENDATIONS

- All buildings and improvements adjacent to wildland fuels should follow the recommendations outlined in the Home Mitigation section.
- Employees should attend a basic wildfire awareness class provided by RMF (this could be incorporated into the “all-hazard” preplan mentioned below). This will also serve to educate the employees as to the procedures to follow in the event of a wildfire within the NREL grounds or neighboring Rocky Flats Wildlife Refuge.
- The access route to Hwy 93 should be labeled as an emergency exit. The gate should be accessible by NREL employees and firefighters in case of emergency.
- RMF should assist NREL with the creation of an “all-hazard” pre-plan, which includes wildland fire.

21 RMF contracts emergency response to this area outside the district boundary. Wildfire Mitigation planning is not part of the contract.
22 http://www.nrel.gov/visiting_nrel/nwtc.html
ROCKY FLATS NATIONAL WILDLIFE REFUGE

The Rocky Flats site is located at the intersection of Jefferson, Boulder, and Broomfield counties. The Rocky Flats site is a 6,240-acre former nuclear defense facility. All weapons manufacturing was performed in a 600-acre area in the middle of the site known as the Industrial Area. Under the Refuge Act, most of the 6,240-acre Rocky Flats site will become a Refuge following certification from the EPA that cleanup and closure have been completed. Many areas of the Rocky Flats site have remained relatively undisturbed for the past 30-40 years, allowing them to retain diverse natural habitat and associated wildlife. Visitor use facilities will include 12.8 miles of multi-use trails, 3.8 miles of hiking only trails, a visitor contact station, interpretive overlooks, viewing blinds, and associated access and parking facilities (see Figure 14). This site is sure to become a popular recreational draw. An increase in human caused ignitions will most likely occur.

FIGURE 13. Rocky Flats National Wildlife Refuge

RECOMMENDATIONS

- RMF and FWS planners should create an “all-hazard” preplan that includes wildland fire.
- All improvements adjacent to wildland fuels should follow the recommendations outlined in the Home Mitigation section.
- All access routes should be well-signed to ensure quick access.

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23 RMF contracts emergency response to this area outside the district boundary. Wildfire Mitigation planning is not part of the contract.
The area should be mapped with geographical features and common intersections named and labeled. This will help to eliminate confusion during emergency responses.

Area details (maps, access routes, preplans) should be distributed to other responding emergency agencies. On-site tours will need to be arranged.

GLOSSARY

The following definitions apply to terms used in the Rocky Mountain Fire Community Wildfire Protection Plan.

1 hour Timelag fuels: Grasses, litter and duff; <1/4 inch in diameter.

10 hour Timelag fuels: Twigs and small stems; ¼ inch to 1 inch in diameter.

100 hour Timelag fuels: Branches; 1 to 3 inches in diameter.

1000 hour Timelag fuels: Large stems and branches; >3 inches in diameter.

Active Crown Fire: 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: Geographic Information System (GIS) software 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).

Crown Fire (Crowning): The movement of fire through the crowns of trees or shrubs, which 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): 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 ¼ 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. Fire Behavior Potential is derived from fire behavior modeling programs using the following inputs: fuels, canopy cover, historical weather averages, elevation, slope, and aspect.

Fire Danger: Not used as a technical term in this document 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. Fire Hazard 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): 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.

FMU (Fire Management Unit): A method of prioritizing fire mitigation work efforts. Units can be defined by function (e.g., public education efforts) or geography (e.g., fuel reduction projects in a given area).

Fuelbreak: A natural or constructed discontinuity in a fuel profile 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. Fuel breaks 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 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 discontinuous 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.

Shelter-in-Place Areas: A method of protecting the public from an advancing wildfire by 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 which 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. For a more complete discussion of the application and limitations of shelter-in-place concepts see the Addressing, Evacuation, and Shelter-In-Place FMU section of this report.
Slash: Debris left after logging, pruning, thinning, or brush cutting; includes logs, chips, bark, branches, stumps, and broken understory trees or brush.
Spotting: 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 on the surface litter, debris, and small vegetation on the ground.
Timelag: Time needed under specified conditions for a fuel particle to lose 63 percent 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 of the study area and are specifically susceptible to damage from undesirable fire outcomes.
WHR (Community Wildfire Hazard Rating, AKA Community Assessment): A fifty-point scale analysis designed to identify factors which 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. Sometimes referred to as Urban Wildland Interface, or UWI.