Coal Creek Canyon Fire Protection District Community Wildfire Protection Plan

August 15, 2008
Walsh Project Number: 7404-070

Walsh

Jefferson County Sheriff Emergency Management

Colorado State Forest Service

Fire Dept.

Walsh
Environmental Scientists and Engineers, LLC

COAL CREEK CANYON
FIRE PROTECTION DISTRICT
COMMUNITY WILDFIRE PROTECTION PLAN

August 15, 2008

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WALSH Project Number: 7404-070

Community Wildfire Protection Plan

Coal Creek Canyon Fire Protection District
Jefferson County, Boulder County, Gilpin County, Colorado

August 15, 2008

Introduction

This Community Wildfire Protection Plan was developed for the Coal Creek Canyon Fire Protection District with guidance and support from the Jefferson County Division of Emergency Management, the Colorado State Forest Service, and the Coal Creek Canyon Fire Protection District. The Community Wildfire Protection Plan was developed according to the guidelines set forth by the Healthy Forests Restoration Act (2003) and the Colorado State Forest Service's Minimum Standards for Community Wildfire Protection Plans (2004). This Community Wildfire Protection Plan supplements the Jefferson County Annual Operating Plan and the Jefferson County Fire Plan.

Wildfire Prevention and Fire Loss Mitigation

The Jefferson County Division of Emergency Management, the Jefferson County Fire Council, and the Coal Creek Canyon Fire Protection District support and promote Firewise activities as outlined in the Jefferson County Fire Plan.

Protection Capability

Initial response to all fire, medical, and associated emergencies within the Coal Creek Canyon Fire Protection District is the responsibility of the Coal Creek Canyon Fire Department. Wildland fire responsibilities of local fire departments, Jefferson County, the Colorado State Forest Service, U.S. Forest Service, Bureau of Land Management, and the U.S. Fish and Wildlife Service are described in the current Jefferson County Annual Operating Plan. All mutual aid agreements, training, equipment, and response are the responsibility of the local fire department and the agencies listed above.

The following agencies have reviewed and agree to this Community Wildfire Protection Plan.

USDA Forest Service, Arapaho/Roosevelt National Forest

Golden District, Colorado State Forest Service

Boulder District, Colorado State Forest Service

Jefferson County Division of Emergency Management

Coal Creek Canyon Fire Protection District

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List of Acronyms and Abbreviations

AOP	Annual Operating Plan
BTU	British thermal unit
CAPCD	Colorado Air Pollution Control Division
CCCFD	Coal Creek Canyon Fire Department
CCCFPD	Coal Creek Canyon Fire Protection District
CDPHE	Colorado Department of Public Health and Environment
CRWB	Crew Bosses
CSFS	Colorado State Forest Service
CWPP	Community Wildfire Protection Plan
DIVS	Division Group Supervisor
DMP	Denver Mountain Parks
DOI	Department of the Interior
ENGB	Engine Bosses
ERC	Energy Release Component
F	Fahrenheit
FBFM	Fire Behavior Fuel Model
FEMA	Federal Emergency Management Agency
FPD	Fire Protection District
GIS	Geographic Information System
HFRA	Healthy Forests Restoration Act
HOA	Homeowners Association
ICT	Incident Command Team
ICT3	Incident Commander Type 3
IMT	Incident Management Team
ISO	Insurance Service Office
JFDRS	Jefferson County Fire Danger Rating System
mph	miles per hour
NEPA	National Environmental Policy Act
NFDRS	National Fire Danger Rating System
NFPA	National Fire Protection Association
NWCG	National Wildfire Coordinating Group
PPE	Personal Protective Equipment
PTB	Position Task Books
RAWS	Remote Automated Weather Stations
STPS	Structure Protection Specialist
TFLD	Taskforce Leaders
USFS	U.S. Forest Service
WALSH	Walsh Environmental Scientists and Engineers, LLC
WFU	Wildland Fire Use
WUI	Wildland-Urban Interface

List of Fire Behavior Terms

Aerial Fuels All live and dead vegetation in the forest canopy or above surface fuels, including tree branches, twigs and cones, snags, moss, and high brush.

Aspect Direction a slope faces.

Chain A unit of linear measurement equal to 66 feet.

Chimney A steep gully or canyon conducive to channeling strong convective currents, potentially resulting in dangerous increases in rates of fire spread and fireline intensity.

Crown Fire The movement of fire through the crowns of trees or shrubs more or less independently of the surface fire.

Dead Fuels Fuels with no living tissue in which moisture content is governed almost entirely by atmospheric moisture (relative humidity and precipitation), dry-bulb temperature, and solar radiation.

Defensible Space An area either natural or manmade where material capable of causing a fire to spread has been treated, cleared, reduced, or changed to act as a barrier between an advancing wildland fire and values at-risk, including human welfare. In practice, "defensible space" is defined as an area a minimum of 30 feet around a structure that is cleared of flammable brush or vegetation.

Direct Attack A method of fire suppression where actions are taken directly along the fire's edge. In a direct attack, burning fuel is treated directly, by wetting, smothering, or chemically quenching the fire or by physically separating burning from unburned fuel.

Fire Behavior The manner in which a fire reacts to the influences of fuel, weather, and topography.

Fire Danger The broad-scale condition of fuels as influenced by environmental factors.

Fire Front The part of a fire within which continuous flaming combustion is taking place. Unless otherwise specified the fire front is assumed to be the leading edge of the fire perimeter. In ground fires, the fire front may be mainly smoldering combustion.

Fire Hazard The presence of ignitable fuel coupled with the influences of terrain and weather.

Fire Intensity	A general term relating to the heat energy released by a fire.
Fire Regime	The characterization of fire's role in a particular ecosystem, usually characteristic of particular vegetation and climatic regime, and typically a combination of fire return interval and fire intensity (i.e., high frequency low intensity/low frequency high intensity).
Fire Weather	Weather conditions that influence fire ignition, behavior, and suppression.
Flame Length	The distance from the base to the tip of the flaming front. Flame length is directly correlated with fire intensity.
Flaming Front	The zone of a moving fire where combustion is primarily flaming. Behind this flaming zone combustion is primarily glowing. Light fuels typically have a shallow flaming front, whereas heavy fuels have a deeper front.
Forest Improvement District	A special district created pursuant to Article 18 of the Colorado State Revised Statutes that protects communities from wildfires and improves the condition of forests in the District.
Fuel Loading	The amount of fuel present expressed quantitatively in terms of weight of fuel per unit area.
Fuel Model	Simulated fuel complex (or combination of vegetation types) for which all fuel descriptors required for the solution of a mathematical rate of spread model have been specified.
Fuel Type	An identifiable association of fuel elements of a distinctive plant species, form, size, arrangement, or other characteristics that will cause a predictable rate of fire spread or difficulty of control under specified weather conditions.
Fuel	Combustible material that includes vegetation such as grass, leaves, ground litter, plants, shrubs, and trees that feed a fire. Not all vegetation is necessarily considered fuel. Deciduous vegetation such as aspen actually serve more as a barrier to fire spread and many shrubs are only available as fuels when they are drought-stressed.
Ground Fire	Fire that consumes the organic material beneath the surface litter ground, such as a peat fire.
Ground Fuel	All combustible materials below the surface litter, including duff, tree or shrub roots, punchy wood, peat, and sawdust that normally support a glowing combustion without flame.

Indirect Attack	A method of fire suppression where actions are taken some distance from the active edge of the fire due to intensity, terrain, or other factors that make direct attack difficult or undesirable.
Intensity	The level of heat radiated from the active flaming front of a fire, measured in British thermal units (BTUs) per foot.
Ladder Fuels	Fuels that provide vertical continuity between strata, thereby allowing fire to carry from surface fuels into the crowns of trees or shrubs with relative ease. Ladder fuels help initiate and ensure the continuation of crowning.
Live Fuels	Living plants, such as trees, grasses, and shrubs, in which the seasonal moisture content cycle is controlled largely by internal physiological mechanisms, rather than by external weather influences.
National Fire Danger Rating System (NFDRS)	A uniform fire danger rating system that focuses on the environmental factors that control the moisture content of fuels.
One-Hour Timelag Fuels	(a.k.a. one-hour fuels) Fuels consisting of dead herbaceous plants and roundwood less than about ¼ inch (6.4 mm) in diameter. Also included is the uppermost layer of needles or leaves on the forest floor.
One-Hundred -Hour Timelag Fuels	(a.k.a. hundred-hour fuels) Dead fuels consisting of roundwood in the size range of 1 to 3 inches (2.5 to 7.6 cm) in diameter and very roughly the layer of litter extending from approximately ¾ of an inch (1.9 cm) to 4 inches (10 cm) below the surface.
One-Thousand -Hour Timelag Fuels	(a.k.a. thousand-hour fuels) Dead fuels consisting of roundwood 3 to 8 inches in diameter and the layer of the forest floor more than about 4 inches below the surface.
Prescribed Fire	Any fire ignited by management actions under certain predetermined conditions to meet specific objectives related to hazardous fuels or habitat improvement. A written, approved prescribed fire plan must exist, and National Environmental Policy Act (NEPA) requirements must be met prior to ignition.
Rate of Spread	The relative activity of a fire in extending its horizontal dimensions. It is expressed as a rate of increase of the total perimeter of the fire, rate of forward spread of the fire front, or rate of increase in area, depending on the intended use of the information. Usually it is expressed in chains or acres per hour for a specific period in the fire's history.

	Sometimes it is expressed as feet per minute; one chain per hour is equal to 1.1 feet per minute.
Risk	The probability that a fire will start from natural- or human-caused ignition.
Surface Fire	Fire that burns loose debris on the surface, which includes dead branches, leaves, and low vegetation.
Surface Fuels	Loose surface litter on the soil surface, normally consisting of fallen leaves or needles, twigs, bark, cones, and small branches that have not yet decayed enough to lose their identity; also grasses, forbs, low and medium shrubs, tree seedlings, heavier branchwood, downed logs, and stumps interspersed with or partially replacing the litter.
Ten-Hour Timelag Fuels	(a.k.a. ten-hour fuels) Dead fuels consisting of roundwood ¼ to l inch (0.6 to 2.5 cm) in diameter and, very roughly, the layer of litter extending from immediately below the surface to ¾ inch (1.9 cm) below the surface.
Topography	Referred to as "terrain." The term also refers to parameters of the "lay of the land" that influence fire behavior and spread. Key elements are slope (in percent), aspect (the direction a slope faces), elevation, and specific terrain features such as canyons, saddles, "chimneys," and chutes.
Torching	(a.k.a. passive crown fire) The burning of the foliage of a single tree or a small group of trees, from the bottom up.
Wildfire	An unplanned and unwanted wildland fire that is not meeting management objectives and thus requires a suppression response.
Wildland Fire	Any fire burning in wildland fuels, including prescribed fire, fire use, and wildfire.
Wildland Fire Use	The management of naturally ignited wildland fires to accomplish specific pre-stated resource management objectives in pre-defined geographic areas outlined in fire management plans.

Source: NWCG 1996

EXECUTIVE SUMMARY

The Community Wildfire Protection Plan (CWPP) is a strategic plan that identifies specific wildland fire hazard and risks facing communities and neighborhoods, and provides prioritized mitigation recommendations that are designed to reduce those hazards and risks. Once the CWPP is finalized and adopted, it is the responsibility of the community or neighborhood to move forward and implement the action items. This may require further planning at the project level, acquisition of funds, or simply motivating individual homeowners. It should be emphasized that the CWPP is a living document to be revisited on a regular basis and revised as needed.

This CWPP is not a legal document. There is no legal requirement to implement the recommendations herein. However, treatments on private land may require compliance with county land use codes, building codes, local covenants, and treatments on public lands will be carried out by appropriate agencies and may be subject to federal, state, and county policies and procedures such as adherence to the Healthy Forests Restoration Act (HFRA) and National Environmental Policy Act (NEPA).

The HFRA of 2003 provides the impetus for local communities to engage in comprehensive forest and wildfire management planning as well as incentive for public land management agencies to consider these recommendations as they develop their own strategic management plans. The HFRA provides communities with a flexible set of assessment procedures and guidelines that facilitate a collaborative standardized approach to identify wildfire risks and prioritize mitigation actions. The CWPP addresses such factors as:

- Stakeholder collaboration;
- Public agency and local interested party engagement;
- Mapping;
- Risk assessment – fuels, historical ignitions, infrastructure, structural ignitability, local resources, and firefighting capability;
- Hazard reduction recommendations; and
- Strategic action plans.

This CWPP provides wildfire hazard and risk assessments and mitigation recommendations for select neighborhoods and subdivisions within the Coal Creek Canyon Fire Protection District (CCCFPD), situated between 5,900 and 9,400 feet elevation in the Front Range foothills between Boulder and Golden, Colorado. The geography and vegetation within the district is extremely diverse with high plains and prairie grasses in the eastern portion and steep rugged topography with dense forest dominating the central and western portions. Of the 224 miles of roadway within the district, 85 percent are unpaved and a portion of these require 4-wheel drive. A major railway bisects the district through rugged and remote forested terrain. The district is home to over 7,000 residents as well as a significant number of daily tourist and

recreational visitors to the area's parks and open space lands. With a significant residential population, a high potential for ignition, a heavy fuel load, and challenging access, the CCCFPD typifies the high wildfire risk of the Front Range wildland-urban interface (WUI).

A WUI is defined as the area where development encroaches on undeveloped natural areas and represents the zone of greatest potential for loss resulting from wildfire. For the purposes of accurate CWPP community assessment surveys, the CCCFPD has been subdivided into a number of individual WUIs, each with common predominant construction, access, topography, and fuel type characteristics.

Natural resource management policies and changing ecological conditions have converged to create hazardous fuel situations throughout the assessment area. Decades of aggressive fire suppression practices have resulted in very dense and weakened timber stands. Years of drought have further stressed the forests, setting the stage for the devastating insect and disease infestations the area is experiencing today. Shrubs have expanded into traditional grasslands, resulting in accumulating hazardous amounts of woody surface fuel. The diversity of native grasses has succumbed to aggressive non-native plant species and noxious weeds. In many areas these fire-dependent ecosystems have grown unchecked by fire for more than a century. The collective result is a pronounced increase in the potential for catastrophic wildfire.

Field surveys, interviews with public lands managers, and close collaboration with the CCCFPD and other stakeholders were utilized for data collection, hazard identification, and treatment recommendations. All information was gathered, analyzed, and prepared in the CWPP format by Walsh Environmental Scientists and Engineers, LLC (WALSH) and Alpenfire, LLC. A project website (http://jeffco.us/sheriff/sheriff_T62_R191.htm) is maintained by Jefferson County Division of Emergency Management and provides access to CWPP reports for public review, project updates, meeting notices, and related project information.

The success of any CWPP hinges on community involvement. Although an important component during the drafting of the report, this type of involvement is especially critical when it comes to implementing recommended actions. Public meetings were convened to educate residents about the CWPP process, project goals and objectives, assessment methodology, and wildfire mitigation techniques. These meetings also provided an opportunity for the public to share concerns and ideas regarding wildfire with the Core Team and consultants, which were incorporated into the CWPP process.

Questionnaires were distributed to district residents by the CCCFPD in order to ascertain public opinion concerning the level of wildfire risk, evaluate values at risk, and assess mitigation practices needed to reduce risk. Colorado State Forest Service (CSFS) safety pamphlets and brochures explaining fire resistant home construction and landscaping practices designed to reduce the risk of wildfire were also made available. CWPP documentation is posted on Jefferson County's Emergency Management website to encourage public review and comment.

The National Fire Protection Association (NFPA) Form 1144, Standards for Protection of Life and Property from Wildfire, 2002 Edition, was utilized to assess the level of risk and hazard to individual neighborhoods. Form 1144 provides a means to assess predominant characteristics within individual neighborhood communities as they relate to structural ignitability, fuels, topography, expected fire behavior, emergency response, and ultimately human safety and welfare. Scores are assigned to each element and totaled to determine the overall level of risk. Low, moderate, high, and extreme hazard categories are determined based on the total score. This methodology provides a standardized basis for wildfire hazard assessment and a baseline for future comparative surveys. Fourteen subdivisions and neighborhoods were identified as areas of concern and were surveyed according to NFPA Form 1144 protocols during November, 2007 and May, 2008. A summary of the community hazard ratings is provided in Table ES-1.

Table ES-1. Community Hazard Rating Summary

NEIGHBORHOOD/ SUBDIVISION	HAZARD RATING
Burke	EXTREME
Wondervu	
Nadm	HIGH
Chute Road	
Lyttle Dowdle	
Camp Eden	
Coal Creek Heights	
Stanton	
Crescent Park	
Copperdale	
Miramonte	
Vonnie Claire	
Hilltop	MODERATE
Blue Mountain	

In addition to the larger-scale treatments recommended in this report, the most effective wildfire hazard reduction depends largely on the efforts of individual landowners making common sense modifications to their own homes and property. The creation of effective defensible space and the utilization of fire-resistant construction materials significantly reduce the risk of life and property loss in the event of a wildfire. The entire community benefits when these common-sense practices become the predominant model in a neighborhood.

Continued coordination with the Jefferson County Annual Operating Plan (AOP) is also recommended. This provides important information concerning county and regional fire

operations, policies, and procedure definitions. Information is available through the Jefferson County Department of Emergency Management website.

The CCCFPD CWPP is a strategic planning document, developed with and approved by the Core Team. An important component of the development process includes building a stakeholder group that will move the plan forward, implement prioritized recommendations, and maintain the CWPP as the characteristics of the WUI change over time. Organizing and maintaining this team is often the most challenging component of the CWPP process. It is, however, essential in the process of converting the CWPP from a strategic plan into action. This team will oversee the implementation and maintenance of the CWPP by working with fire authorities, community organizations, private landowners, and public agencies to coordinate and implement hazardous fuels treatment projects management and other mitigation projects. Building partnerships among neighborhood-based organizations, fire protection authorities, local governments, public land management agencies, and private landowners is necessary in identifying and prioritizing measures to reduce wildfire risk. Maintaining this cooperation is a long-term effort that requires the commitment of all partners involved. The CWPP encourages citizens to take an active role in identifying needs, developing strategies, and implementing solutions to address wildfire risk by assisting with the development of local neighborhood wildfire plans and participating in local fire prevention activities.

COAL CREEK CANYON FIRE PROTECTION DISTRICT COMMUNITY WILDFIRE PROTECTION PLAN

1 INTRODUCTION

1.1 Community Wildfire Protection Plan Purpose

The Community Wildfire Protection Plan (CWPP) is a strategic plan that identifies specific wildland fire hazards and risks facing communities and neighborhoods and provides prioritized mitigation recommendations that are designed to reduce those hazards and risks. Once the CWPP is adopted, it is the community's responsibility to move forward and implement the action items. This may require further planning at the project level, enhanced cooperation with other agencies, acquisition of funds, or simply motivating individual homeowners.

Decades of aggressive fire suppression practices in fire-adapted ecosystems have removed a critical natural cleansing mechanism from the vegetation regeneration cycle. Fire exclusion has altered historic forest and shrubland conditions and contributed to an unprecedented buildup of naturally occurring flammable woody fuels. Such management tactics have also led to an alteration of prairie habitats, supporting the invasion of aggressive and highly flammable noxious weeds and grasses that, in many areas, have entirely replaced naturally occurring species. In addition, years of persistent drought have resulted in weakened timber and regional epidemics of disease and insect infestation. At the same time, demographic trends have shifted the nation's population growth centers to western and southwestern states where these ecosystems are predominant. The region where human development is pushing into these stressed ecosystems is known as the wildland-urban interface (WUI) and represents the area where risk of loss due to wildfire is the greatest. The potential consequences are devastating and costly, and in recent years have drawn the attention of the U.S. Congress in the pursuit of an effective solution.

Precipitated by over a decade of increasing wildfire activity, related losses, and spiraling suppression costs, the National Fire Plan was developed by the federal government in 2000. The Healthy Forests Restoration Act (HFRA) of 2003 helps implement the core components of the plan and provides the impetus for wildfire risk assessment and planning at the county and community level. The HFRA refers to this level of planning as the CWPP process. This empowers the participating community to take advantage of wildland fire and hazardous fuel management opportunities offered under HFRA legislation. The CWPP includes a framework for hazard evaluation and strategic planning, prioritized access to federal grants supporting hazard reduction projects, and a basis for collaboration with local, state, and federal land management agencies.

1.2 Need for a Community Wildfire Protection Plan

This CWPP provides wildfire hazard and risk assessments and mitigation recommendations for select neighborhoods and subdivisions within the Coal Creek Canyon Fire Protection District (CCCFPD), situated between 5,900 and 9,400 feet elevation in the Front Range foothills between Boulder and Golden, Colorado. The geography and vegetation within the district is extremely diverse with high plains and prairie grasses in the eastern portion and steep rugged topography with dense forest dominating the central and western portions. Of the 224 miles of roadway within the district, 85 percent are unpaved and a portion of these require 4-wheel drive. A major railway bisects the district through rugged and remote forested terrain. The district is home to over 7,000 residents as well as a significant number of daily tourist and recreational visitors to the area's parks and open space lands. With a significant residential population, a high potential for ignition, a heavy fuel load, and challenging access, the CCCFPD typifies the high wildfire risk of the Front Range WUI.

Historically, natural wildfire would pass through these same areas these with relative frequency allowing forests, shrublands, and grasslands to adapt morphology, growth and reproductive patterns to a periodic cleansing by fire. Land management policies centered on fire suppression have altered this cycle and exacerbated the potential for high-intensity wildfire by allowing fuels to build up and facilitating the decline of forest health.

Weather plays a critical role in determining fire frequency and behavior. A dry climate and available fuels in an area prone to strong gusty winds can turn an ignition from a discarded cigarette, vehicle parked over dry grass, sparking brakes from a train, or lightning from a passing thunderstorm into a major wildfire in a matter of several minutes.

The combination of environmental esthetics, recreational opportunities, and proximity to a major metropolitan area make the CCCFPD a desirable location to live and work. However, the district is characterized by several factors that typify a hazardous WUI: development into fire-adapted ecosystems, steep topography, frequent natural and human-caused ignitions, hazardous fuels, prolonged drought, and dry, windy weather conditions. Each identified WUI neighborhood or subdivision represents a distinct area with a unique combination of wildfire fuels, predominant building construction materials, topography, access, available resources, as well as opportunities for fuels mitigation.

The CWPP provides a coordinated assessment of neighborhood wildfire risks and hazards and outlines specific mitigation treatment recommendations designed to make the CCCFPD a safer place to live, work, and play. The CWPP development process can be a significant educational tool for people who are interested in improving the environment in and around their homes. It provides ideas, recommendations, and guidelines for creating a defensible space around the house and ways to reduce structural ignitability through home improvement and maintenance.

1.3 The CWPP Process

The HFRA designed the CWPP to incorporate a flexible process that can accommodate a wide variety of community needs. This CWPP is tailored to meet specific goals as identified by the Core Team, following the standardized steps for developing a CWPP as outlined in "Preparing a Community Wildfire Protection Plan: A Handbook for Wildland-Urban Interface Communities" (Society of American Foresters 2004) and the Colorado State Forest Service Minimum Standards for Community Wildfire Protection Plans (CSFS 2004). Table 1 presents the CWPP development process.

Table 1. CWPP Development Process

Step	Task	Explanation
One	Convene Decision Makers	Form a Core Team made up of representatives from local governments, fire authorities, and the Colorado State Forest Service (CSFS).
Two	Involve Federal Agencies	Engage local representatives of the U.S. Forest Service (USFS) and other land management agencies as appropriate.
Three	Engage Interested Parties	Contact and encourage participation from a broad range of interested organizations and stakeholders.
Four	Establish a Community Base Map	Develop a base map of the District that provides a better understanding of communities, critical infrastructure, and forest/open space at risk.
Five	Develop a Community Risk Assessment	Develop a risk assessment that considers fuel hazards, community and commercial infrastructure, resources, and preparedness capability. Rate the level of risk and incorporate into the base map as appropriate.
Six	Establish Community Priorities and Recommendations	Use the risk assessment and base map to facilitate a collaborative public discussion that prioritizes fuel treatments and non-fuel mitigation practices to reduce fire risk and structural ignitability.
Seven	Develop an Action Plan and Assessment Strategy	Develop a detailed implementation strategy and a monitoring plan that will ensure long-term success.
Eight	Finalize the CWPP	Finalize the District CWPP and communicate the results to interested parties and stakeholders.

The initial step in developing the CCCFPD CWPP is to organize an operating group that serves as the core decision-making team (Table 2). At a minimum, the Core Team consists of representatives from local government, local fire authorities, and the CSFS. In addition, the Core Team should include relevant affected land management agencies and active community and homeowners association (HOA) stakeholders. Collaboration among agencies and with communities is an important CWPP component because it promotes sharing of perspectives, plans, priorities, and other information that is useful to

the planning process. Together these entities guide the development of the CWPP as described in the HFRA and must mutually agree on the plan's final contents.

Table 2. CCCFPD CWPP Core Team Members

Team Member	Organization	Phone Number
Dudley Butler	Coal Creek Canyon Fire Department	303-642-7273
Rocco Snart	Jefferson County Division of Emergency Management	303-271-4900
Allen Gallamore	Colorado State Forest Service	303-279-9757 x 302

As a strategic plan, the real success of any CWPP hinges on effective and long-term implementation of the identified objectives. The CWPP planning and development process should promote efforts to build a stakeholder group that serves as an implementation team and will oversee the execution of prioritized recommendations and maintain the plan as the characteristics of the WUI change over time. Specific projects may be undertaken by individual HOAs, while larger-scale treatments may require collaboration between multiple HOAs, local government, and public land management agencies. Original CWPP Core Team representatives may, but are not required to, assist in the implementation of the CWPP action plan. Continued public meetings are recommended as a means to generate additional support and maintain momentum.

A comprehensive CWPP utilizes relevant geographic information (e.g., Geographic Information System [GIS] data) to develop a community base map. Detailed risk assessment is conducted at the neighborhood or community level to determine relative levels of wildfire risk to better address hazard treatment prioritization. A standardized survey methodology is utilized to create an address-based rating benchmark for comparative future assessments and project evaluations.

CWPP fuel treatment recommendations derived from this analysis are prioritized through an open and collaborative effort with the Core Team and stakeholders. Prioritized treatment recommendations target wildfire hazard reduction in the identified WUI neighborhoods through structural and defensible space improvements, strategic hazardous fuel reduction, ingress/egress upgrades, and enhancements to emergency response capability. An action plan guides treatment implementation for recommended projects over the span of several years.

The finalized CWPP represents a strategic plan with Core Team consensus that provides prioritized wildfire hazard reduction treatment projects, preferred treatment methods, a base map of the WUI, defensible space recommendations, and other information relevant to the scope of the project.

1.4 Policy Framework

This CWPP is not a legal document. There is no legal requirement to implement the recommendations herein. Actions on public lands will be subject to federal, state, and county policies and procedures, such as adherence to the HFRA and National

Environmental Policy Act (NEPA). Action on private land may require compliance with county land use codes, building codes, and local covenants.

There are several federal legislative acts that set policy and provide guidance to the development of the CWPP for the CCCFPD:

- HFRA (2003) – Federal legislation that promotes healthy forest and open space management, hazardous fuels reduction on federal land, community wildfire protection planning, and biomass energy production;
- National Fire Plan and 10-Year Comprehensive Strategy (2001) – Interagency plan that focuses on firefighting coordination, firefighter safety, post-fire rehabilitation, hazardous fuels reduction, community assistance, and accountability; and
- Federal Emergency Management Agency (FEMA) Disaster Mitigation Act (2000) – Provides criteria for state and local multiple-hazard and mitigation planning.

The CSFS is a valuable resource that provides education and guidance to communities and individual landowners concerned with the threat of wildfire, as well as forest resource management in the WUI. The Coal Creek Canyon Fire Department (CCCFD) is another excellent resource for wildfire mitigation guidance within CCCFPD.

The Jefferson County Annual Operating Plan (AOP) outlines all management aspects of wildland fire within the county that includes reimbursement, operational responsibilities, financial responsibilities, and other general areas of interface between the organizations and agencies responsible for wildland fire response.

1.5 CCCFPD CWPP Goals and Objectives

Table 3 provides a brief summary of the primary goals and objectives for the CCCFPD CWPP process.

Table 3. CCCFPD CWPP Goals and Objectives

Goal	Objective
Facilitate and develop a CWPP	▪ Provide oversight for all activities related to the CWPP. ▪ Ensure representation and coordination among agencies and interest groups. ▪ Develop a long-term framework for sustaining CWPP efforts.
Conduct a wildfire risk assessment	▪ Conduct a district-wide wildfire risk assessment. ▪ Identify areas at risk and contributing factors. ▪ Determine the level of risk to structures that wildfires and contributing factors pose.
Develop a mitigation plan	▪ Identify and prioritize hazardous fuel treatment projects. ▪ Identify and prioritize non-fuel mitigation needs. ▪ Identify communities at highest risk and prioritize hazard reduction treatments. ▪ Recommend sustainable initiatives at the HOA level.
Facilitate emergency planning	▪ Develop strategies to strengthen emergency management, response, and evacuation capabilities for wildfire. ▪ Build relationships among county government, fire authorities, and communities.

Goal	Objective
Facilitate public outreach	▪ Develop strategies to increase citizen awareness and action for Firewise practices. ▪ Promote public outreach and cooperation for all fuel reduction projects to solicit community involvement and private landowner cooperation.

2 WILDLAND FIRE MANAGEMENT PRIMER

Wildland fire is defined as any fire burning in wildland fuels and includes prescribed fire, wildland fire use (WFU), and wildfire. Prescribed fires are planned fires ignited by land managers to accomplish specific natural resource improvement objectives. Fires that occur from natural causes, such as lightning, that are then used to achieve management purposes under carefully controlled conditions with minimal suppression costs are known as WFU. Wildfires are unwanted and unplanned fires that result from natural ignition, unauthorized human-caused fire, escaped WFU, or escaped prescribed fire. The CCCFD actively suppresses all wildfire ignitions within the district.

Wildland fires may be further classified as ground, surface, or crown fires. Ground fire refers to burning/smoldering materials beneath the surface including duff, tree or shrub roots, punchy wood, peat, and sawdust that normally support a glowing combustion without flame. Surface fire refers to loose fuels burning on the surface of the ground such as leaves, needles, and small branches, as well as grasses, forbs, low and medium shrubs, tree seedlings, fallen branches, downed timber, and slash. Crown fire is a wildland fire that moves rapidly through the crowns of trees or shrubs.

2.1 Wildland Fire Behavior

Fire behavior is the manner in which a fire reacts to the influences of fuel, weather, and topography. Fire behavior is typically modeled at the flaming front of the fire and described most simply in terms of fireline intensity (flame length) and in rate of forward spread. The implications of observed or expected fire behavior are important components of suppression strategies and tactics, particularly in terms of the difficulty of control and effectiveness of various suppression resources. The Hauling Chart (Table 4) is an excellent tool for measuring the safety and potential effectiveness of various fireline resources given a visual assessment of active flame length. It is so named because it infers the relative intensity of the fire behavior to trigger points where hauling various resources to or away from an incident should be considered.

Table 4. Hauling Chart Interpretations

Flame Length (Feet)	Fireline Intensity (BTU/Ft/Sec)	Interpretation
0-4	0-100	Persons using handtools can generally attack fires at the head or flanks. Handline should hold the fire.
4-8	100-500	Fires are too intense for direct attack on the head by persons using handtools. Handline can not be relied on to hold fire. Equipment such as dozers, engines, and retardant aircraft can be effective.
8-11	500-1,000	Fires may present serious control problems such as torching, crowning, and spotting. Control efforts at the head of the fire will probably be ineffective.
11+	1,000+	Crowning, spotting, and major runs are common, control efforts at the head of the fire are ineffective.

Source: Fireline Handbook 2007

Fire risk is the probability that wildfire will start from natural or human-caused ignitions. Fire hazard is the presence of ignitable fuel coupled with the influences of topography and weather, and is directly related to fire behavior. Fire severity, on the other hand, refers to the immediate effect a fire has on vegetation and soils.

The characteristics of fuels, topography, and weather conditions combine to dictate fire behavior, rate of spread, and intensity. Wildland fuel attributes refer to both dead and live vegetation and include such factors as density, bed depth, continuity, vertical arrangement, and moisture content. Structures with flammable materials are also considered a fuel source.

When fire burns in the forest understory or through grass, it is generally a surface fire. When fire burns through the canopy of vegetation, or overstory, it is considered a crown fire. The vegetation that spans the gap between the forest floor and tree crowns can allow a surface fire to become a crown fire and is referred to as ladder fuel.

For fire to spread, materials such as trees, shrubs, or structures in the flame front must meet the conditions of ignitability. The conditions needed are the presence of oxygen, flammable fuel, and heat. Oxygen and heat are implicitly available in a wildland fire. However, if the potential fuel does not meet the conditions of combustion, it will not ignite. This explains why some trees, vegetation patches, or structures may survive a wildland fire and others in the near vicinity are completely burned.

Potential surface fire behavior may be estimated by classifying vegetation in terms of fire behavior fuel models (FBFMs) and using established mathematical models to predict potential fire behavior under specific climatic conditions. In this analysis, FBFMs were determined through a combination of field evaluations and interpretation of satellite imagery. Climatic conditions were derived from local weather station records.

Weather conditions such as high ambient temperatures, low relative humidity, and windy conditions favor fire ignition and high-intensity fire behavior. Under no-wind conditions fire burns more rapidly and intensely upslope than on level terrain; however, wind tends to be the driving force in fire behavior in the most destructive WUI fires. The “chinook” winds common along the Front Range can rapidly drive wildfire downslope.

2.2 History of Wildfire

Lightning-induced fire is a historic component of Jefferson County ecosystems, and its occurrence is important to maintaining the health of forest and grassland ecosystems. Native Americans used fire as a tool for hunting, improving wildlife habitat, and land clearing. As such, many of the plant species and communities have adapted to recurring fire through phenological, physiological, or anatomical attributes.

European settlers, land use policy, and changing ecosystems have altered fire behavior and fuels accumulation from their historic setting. Euro-American settlers in Jefferson County changed the historic fire regime in several interrelated ways. The nature of vegetation (fuel) changed because of land use practices such as homesteading, livestock grazing, agriculture, water development, and road construction. Livestock grazing reduced the amount of fine fuels such as grasses and forbs, which carried low-intensity

fire across the landscape. Continuous stretches of forest and grassland fuels were broken up by land-clearing activities. The removal of the natural vegetation facilitated the invasion of non-indigenous grasses and forbs, some of which create more flammable fuel beds than their native predecessors.

In addition, more than a century of fire-suppression policy has resulted in large accumulations of surface and canopy fuels in western forests and brushlands. Fuel loads also increased as forests and brushlands encroached into grasslands as a result of fire exclusion. This increase in fuel loading and continuity has created hazardous situations for public safety and fire management, especially when found in proximity to communities. These hazardous conditions will require an array of mitigative tools, including prescribed fire and thinning treatments.

2.3 Prescribed Fire

Prescribed fire may be used as a resource management tool under carefully controlled conditions. This includes pre-treatment of the fuel load and close monitoring of weather and other factors. Prescribed fire ultimately improves wildlife habitat, helps abate invasive vegetation, reduces excess fuel loads, and lowers the risk of future wildfires in the treatment area. These and other fuel management techniques are employed to protect human life, economic values, and ecological values. The use of prescribed fire in the WUI is carefully planned and enacted only under favorable weather conditions, and must meet air quality requirements of the Colorado Department of Public Health and Environment (CDPHE) Air Pollution Control Division (CAPCD). Open burning permits are obtained from Jefferson County Environmental Health Services (www.co.jefferson.co.us/health/health_T111_R38.htm).

Prescribed fire may be conducted either in a defined area, as a broadcast burn, or in localized burn piles. Broadcast burns are used to mimic naturally occurring wildfire but only under specific weather conditions, fuel loads, and expert supervision. Burn piles are utilized to dispose of excess woody material after thinning if other means of disposal are not available or cost-prohibitive.

2.4 Wildland Urban Interface (WUI)

The WUI is the zone where communities and wildland fuel interface and is the central focus of this CWPP. Every fire season catastrophic losses from wildfire plague the WUI. Homes are lost, businesses are destroyed, community infrastructure is damaged, and, most tragically, lives are lost. Precautionary action taken before a wildfire strikes often makes the difference between saving and losing a home. Creating a defensible space around a home is an important component in wildfire hazard reduction. Providing an effective defensible space can be as basic as pruning trees, applying low-flammability landscaping, and cleaning up surface fuels and other fire hazards near a home. These efforts are typically concentrated within 75 feet of a home to increase the chance for structure survival or create an area for firefighters to work in the event of a wildfire (see Section 5.2).

While reducing hazardous fuels around a structure is very important to prevent fire loss, recent studies indicate that, to a great extent, the attributes of the structure itself determine ignitability. Experiments suggest that even the intense radiant heat of a crown fire is unlikely to ignite a structure that is more than 30 feet away as long as there is no direct flame impingement (Cohen and Saveland 1997). Studies of home survivability indicate that homes with noncombustible roofs and a minimum of 30 feet of defensible space had an 85-percent survival rate. Conversely, homes with wood shake roofs and less than 30 feet of defensible space had a 15-percent survival rate (Foote 1996).

2.5 Hazardous Fuels Mitigation

Wildfire behavior and severity are dictated by fuel type, weather conditions, and topography. Because fuel is the only variable of these three that can be practically managed, it is the focus of many mitigation efforts. The objectives of fuels management may include reducing surface fire intensity, reducing the likelihood of crown fire initiation, reducing the likelihood of crown fire propagation, and improving forest health. These objectives may be accomplished by reducing surface fuels, limbing branches to raise canopy base height, thinning trees to decrease crown density, and/or retaining larger fire-resistant trees.

By breaking up vertical and horizontal fuel continuity in a strategic manner, fire suppression resources are afforded better opportunities to control fire rate of spread and contain wildfires before they become catastrophic. In addition to the creation of defensible space, fuelbreaks may be utilized to this end. These are strategically located areas where fuels have been reduced in a prescribed manner, often along roads. Fuelbreaks may be strategically placed with other fuelbreaks or with larger-area treatments. When defensible space, fuelbreaks, and area treatments are coordinated, a community and the adjacent natural resources are afforded an enhanced level of protection from wildfire.

Improperly implemented fuel treatments can have negative impacts in terms of forest health and fire behavior. Aggressively thinning forest stands in wind-prone areas may result in subsequent wind damage to the remaining trees. Thinning can also increase the amount of surface fuels and sun and wind exposure on the forest floor. This may increase surface fire intensity if post-treatment debris disposal and monitoring are not properly conducted. The overall benefits of properly constructed fuelbreaks are, however, well documented.

3 COAL CREEK CANYON FIRE PROTECTION DISTRICT PROFILE

3.1 County and District Setting

Jefferson County was established in 1861 as one of the original 17 counties created by the Colorado Territorial Legislature with a land base of 774 square miles. The county population is currently estimated at 529,401 people with approximately 184,640 people living in the incorporated areas.

Coal Creek Canyon is located in the northwest corner of Jefferson County. Originally a route providing access to mines, the area was first homesteaded in the 1870s. The population grew slowly during the late nineteenth and early twentieth centuries. During the 1950's Colorado Highway 72 was paved, and the population grew more rapidly with the opening of the Rocky Flats facility.

This area is served by the Coal Creek Fire Protection District (CCCFPD) which covers approximately 45 square miles (29,000 acres) with a population of approximately 7,000 residents. The district extends from approximately 5,900 feet at its eastern end along Colorado Highway 93 to just over 9,400 feet on Miramonte Mountain at its western end. While the majority of the district lies within Jefferson County, it also covers the Gross Reservoir area of southern Boulder County and a thin band of Gilpin County's northeast corner (Appendix A, Map 1).

The district is characterized by a steep-sided canyon ascending to rolling forested terrain with canyons to the north and southwest. The vegetation consists of ponderosa pine stands with grass understory or litter understory intermixed with meadows. A mix of ponderosa pine and Douglas-fir can be found north and west facing slopes. A network of predominantly unpaved roads extends off of Colorado Highway 72 which extends up the center of the canyon. There are a wide variety home sizes and styles throughout the canyon.

In addition to spanning across the jurisdiction of three counties, the CCCFPD includes or is adjacent to lands of several agencies. Gross Reservoir and Denver Water Board lands occupy the northern end of the district. Eldorado Canyon and Golden Gate State Parks border the district to the north and the southwest respectively. USFS, Jefferson County Open Space, and Boulder County Open Space lands are also located within and adjacent to the district.

3.2 Climate

The Coal Creek Canyon climate is relatively dry with the majority of precipitation occurring with spring rains and summer monsoons (Table 5). Observations were taken from the Gross Reservoir weather station, located on the northern end of the district at approximately 7,300 feet. The area receives more than 220 days of sunshine per year and an average of 21.30 inches of annual precipitation. Winter high temperatures are typically in the mid 40s (degree Fahrenheit [F]) and summer highs are in the 70s and low

80s. The low precipitation months are typically December, January, and February. Lower elevations within the district may experience warmer and drier conditions. Fire weather conditions are discussed in Section 4.2.

Table 5. Average Monthly Climate Summary for the CCCFPD (1978-2005, Gross Reservior, CO)

Climate Attribute	Month												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average maximum temperature (^{o} F)	43	40	48	52	63	72	81	75	72	59	48	42	58
Average total precipitation (inches)	0.69	0.79	2.31	2.77	3.14	2.26	2.06	2.30	1.71	1.26	1.23	0.80	21.30

Source: High Plains Regional Climate Center (http://hprcc.unl.edu)

3.3 Topography

Topography and elevation play an important role in dictating existing vegetation, fuels, and wildland fire behavior. Topography also often dictates community infrastructure design, further influencing overall hazard and risk factors. The terrain of the Coal Creek Canyon is characterized by a steep-sided canyon ascending westward to rolling forested terrain where the majority of structures are located. This area is surrounded by canyons, south Boulder Creek to the north, Black Gulch to the west, and Beaver Creek to the south. Many homes are exposed to slopes exceeding 45%.

3.4 Wildland Vegetation and Fuels

The vegetation found in the district is typical of the Rocky Mountain Montane ecosystem which occurs between 5,600 and 9,500 feet. Vegetation type and distribution in this zone is controlled primarily by available soil moisture, which is closely related to elevation and slope aspect. Lower elevations in the CCCFPD are characterized by the alluvial outwash plain associated with historic erosional events out of Coal Creek Canyon. This low sloping high plain is dominated by high prairie grasses. Grass and shrubs are found interspersed with open stands of ponderosa pine on lower elevation slopes, as well as south facing slopes at higher elevations.

North-facing slopes of the Montane ecosystem retain more soil moisture and support denser stands of conifer that are less drought resistant. Typically these slopes support a mixture of Douglas-fir and ponderosa pine in lower elevations and lodgepole pine at higher elevations. Willows, mountain alder, water birch, and other water-loving trees may be found in riparian zones along creeks and streams. Blue spruce and Engelmann spruce may also be found in areas of higher moisture.

Existing vegetation is the primary fuel source for wildland fire and has a direct effect on fire behavior. Accurately mapping vegetative ground cover is a critical component of fuel modeling and fire behavior modeling. Understanding the fire behavior characteristics of particular fuel types facilitates effective fuels treatment strategies on a

local, as well as landscape, level. Map 4 (Appendix A) illustrates existing ground cover vegetation represented as FBFMs, based on LANDFIRE, the Landscape Fire and Resource Management Planning Tools Project, with data derived from Landsat multi-spectral satellite imagery. Satellite classification is also field-surveyed, ground-truthed, and photo-documented to verify results and further classify the characteristics of the understory surface fuels, a critical component in determining the FBFMs that are used in modeling potential fire behavior.

Predictive fire modeling is an important component in a variety of strategic and tactical applications including risk and hazard assessments, pre-attack planning, initial attack, extended suppression, prescribed fire planning, and predictive modeling of active wildfires.

BehavePlus Fire Behavior Prediction and Fuel Modeling software was utilized for this assessment. By inputting several user-defined parameters including FBFM, fuel moisture, weather, and slope, fire behavior parameters such as expected rates of spread, associated flame lengths, and fire intensity can be modeled. These are important factors in any tactical or strategic fire management decision. Fire behavior analysis is detailed in Section 4.2.

There are several systems for classifying fuel models. This CWPP utilizes the most commonly used fuel modeling methodology as developed by Hal E. Anderson (1982). Thirteen FBFMs are presented in four fuel groups: grasslands, shrublands, timber litter and understory, and logging slash. Each group comprises three or more fuel models. Of these 13 fuel models, FBFMs 1, 2, 6, 8, 9, and 10 are the most prevalent in the CCCFPD assessment area (Table 6).

Table 6. Fuel Models Common to the CCCFPD
(Fuel models most prevalent in CCCFPD are shaded)

Group	FBFM Number	Description
Grasslands	1	Short grass (1 foot)
	2	Grass with timber/brush overstory
	3	Tall grass (2.5 feet)
Shrublands	4	Mature brush 6 feet)
	5	Young brush
	6	Intermediate or dormant brush
	7	Southern rough
Timber Litter and Understory	8	Closed or short-needle timber litter – light fuel load
	9	Hardwood or long-needle or timber litter
	10	Mature/overstory timber and understory
Logging Slash	11	Light slash; closed timber with down woody fuel
	12	Medium slash (35 tons/acre)
	13	Heavy slash (200 tons/acre)

Source: Anderson 1982

Grasslands, FBFMs 1 and 2

Grass fuels are most common on south-facing slopes and the high plains in the area of Rocky Flats. Grass is found to be intermixed with shrub on some protected north-facing slopes in lower to moderate elevations. Even in areas where Ponderosa pine is prevalent, the surface fuels are often comprised of grasses. The short and mid-height grass species common to this area include blue grama, western wheatgrass, needle-and-thread, and prairie Junegrass. These western perennial grasses are adapted to the relatively frequent disturbance of fire and benefit from fast moving, "cool" fire because it removes excessive dried biomass and adds nutrients to the soil. In the absence of these periodic fires, the accumulation of thatch and woody material and the encroachment of shrub increases surface fuel loads, increasing the probability of high-intensity surface fires.

Historic fire return intervals for these grasslands range from approximately 10 to 35 years, allowing for a rapid departure from the historic fire regime conditions when fire is excluded. Fire exclusion also encourages shrub and noxious grass and weed encroachment. Cheatgrass, also known as downy brome, is an aggressive invasive grass species that is now common throughout the region. Cheatgrass provides forage for livestock but matures and dries out much earlier than native grasses. Due to this early dry-out it can exhibit higher fire intensity than native grasses. Because of its competitive ability, it often becomes the dominant species in overgrazed areas.

Although shrub and timber fires are better known for intense fire behavior, the potential impact of grass fires should not be underestimated. Fire burning in these light, flashy fuels can be resistant to suppression, producing incredibly rapid rates of spread, and flame lengths in excess of 10 feet. They can pose a very real risk to firefighter safety and a serious threat to untreated homes.

Open prairie, grassy slopes, and irrigated meadows and lawns are characterized as FBFM 1, though when well irrigated these fuels may be unavailable to combustion. A grassy understory of ponderosa pine mixed with other herbaceous fuels that would carry a surface fire is defined as FBFM 2.

Shrublands, FBFM 6

Shrubs and shrub stands may be found throughout the district but are most common on protected slopes of the lower and mid-elevation zones and in areas where shaded understory is established. Mountain mahogany is the dominant shrub species in the area and is generally represented by FBFM 6, "intermediate brush". Where shrub stands are less dense, mountain mahogany grows with a grass understory and is best represented by FBFM 2. Riparian zones along creek beds and slope drainages can support other shrub species such as scrub willow, chokecherry, and alder. Areas where conifer is aggressively regenerating may also be classified as shrublands based primarily on density and height of the growth.

It should be noted that shrub vegetation typically constitutes higher-moisture woody plants associated with low to moderate fire intensity. However, prolonged drought (experienced in recent years) lowers the live fuel moisture content in plant stems, resulting in extreme fire intensity under favorable weather conditions.

Timber Litter and Understory, FBFMs 8, 9, and 10

Forest composition in the district is strongly influenced by elevation and slope aspect, which are directly related to the available soil moisture. Ponderosa pine favor drier south-facing aspects while Douglas-fir, lodgepole pine, and Engelmann spruce favor moister and cooler north-facing aspects. Lodgepole pine is more common in elevations above 8,000 feet but species will commonly mix on transitional slope aspects. In some areas fire exclusion has allowed Douglas-fir, an aggressive species, to become disproportionately dominant. Continuous forest canopy, most common at higher elevations and north-facing aspects, often prohibits live surface fuels from taking hold. In some mature and over-mature closed canopy conifer stands the understory is devoid of live surface fuel but thick with woody timber litter from downed trees and ladder fuels.

FBFMs in timber are classified according to the surface fuels that accumulate in the absence of a dominant live understory. FBFM 8 is associated with all short-needle conifer species including Douglas-fir, lodgepole pine, and a variety of spruce; FBFM 9 is characterized by the long needles of ponderosa pine; and FBFM 10 is associated with forest floors that are thick with naturally occurring downed timber in a mature or over-mature stand.

This district is characterized by ponderosa pine in timber stands and woodlands with southern exposure and a mix of denser ponderosa pine and Douglas-fir on northern aspects. Ponderosa pine stands are best represented by FBFM 2 or FBFM 9 depending on presence of grass or needle litter as the surface fuel. The mixed stands are best represented by FBFM 8. A concern in timber stands throughout the district is the encroachment of unchecked conifer regeneration.

3.5 FBFM Classifications of the CCCFPD

This section details the predominant FBFMs observed in the CCCFPD, including their unique characteristics and expected fire behavior. Local photos of fuels are displayed with a narrative for each fuel model as described by Anderson (1982). This section can be used independently as a field reference.

FBFM 1 – Short Grass

Figure 1. FBFM 1

Characteristics: Grassland and savanna vegetation are dominant (Figure 1). Very little shrub or timber overstory is present, generally less than 30 percent of the area. Western perennial and annual grasses such as western wheatgrass, buffalograss, blue grama, and little bluestem that characterize short- to mid-grass prairie are common. Cheatgrass, ryegrasses, and fescues occur at slightly higher elevations. Grass shrub combinations that meet the above criteria are also represented.

Fire Behavior: Fire spread is governed by the fine, very porous, and continuous herbaceous fuels that have cured or are nearly cured. Fires burn as surface fires that move rapidly through the cured grass and associated material.

Fuel Model Values for Estimating Fire Behavior

Total Fuel Load, less than 3-inch dead and live	0.74 ton/acre
Dead Fuel Load, 0 to ¼ inch	0.74 ton/acre
Live Fuel Load, foliage	0.0 ton/acre
Fuel Bed Depth	1.0 foot

FBFM 2 – Grass with Timber/Shrub Overstory

Figure 2. FBFM 2

Characteristics: FBFM 2 defines surface fuels found in open conifer, shrub, or riparian stands (Figure 2). Ground cover generally consists of grasses, needles, and small woody litter. Conifers are typically mature and widely spaced. Limited shrub or regeneration may be present. This model favors mature conifer in the foothill to montane zones. Open shrubland, pine stands, or Rocky Mountain juniper that cover one-third to two-thirds of the area may generally fit this model. Such stands may include clumps of fuels that generate higher fire intensities that may produce firebrands (embers that stay ignited and aloft for great distances).

Fire Behavior: Fire is spread primarily through the fine herbaceous fuels, either curing or dead. These are surface fires where the herbaceous material, in addition to litter and dead-down stem wood from the open shrub or timber overstory, contribute to the fire intensity.

Fuel Model Values for Estimating Fire Behavior

Total Fuel Load, less than 3-inch dead and live	4.0 tons/acre
Dead Fuel Load, 0 to ¼ inch	2.0 tons/acre
Live Fuel Load, foliage	0.5 ton/acre
Fuel Bed Depth	1.0 foot

FBFM 6 – Intermediate or Dormant Brush

Figure 3. FBFM 6

Characteristics: Shrubs in FBFM 6 are older than in FBFM 5, not as tall as in FBFM 4, and do not contain as much fuel as in FBFM 4. Fuel situations to be considered include intermediate stands of oakbrush, mountain mahogany, and juniper shrublands (Figure 3).

Fire Behavior: Fires carry through the shrub layer where the foliage is more flammable than in FBFM 5; however, this requires moderate winds (greater than 8 miles per hour [mph] at midflame height). Fire will drop to the ground at low wind speeds or break in continuous stands.

Fuel Model Values for Estimating Fire Behavior

Total Fuel Load, less than 3-inch dead and live	6.0 tons/acre
Dead Fuel Load, 0 to ¼ inch	1.5 tons/acre
Live Fuel Load, foliage	0.0 ton/acre
Fuel Bed Depth	2.5 feet

FBFM 8 – Closed or Short-Needle Timber Litter – Light Fuel Load

Figure 4. FBFM 8

Characteristics: Closed canopy stands of short-needle conifers, hardwoods, and aspen that have leafed out support fire in the compact litter layer (Figure 4). This layer is mainly needles, leaves, and twigs because little undergrowth is present in the stand. Representative conifer types are lodgepole pine, blue spruce, Engelmann spruce and Douglas-fir. Ponderosa pine can also be included if the understory reflects these characteristics.

Fire Behavior: Fires associated with this model are generally slow-burning, low-intensity ground fires, although a fire may encounter an occasional area of heavy fuels concentration (jackpot) that can cause a flare-up. Only under severe fire weather conditions does this fuel model pose a significant fire hazard, and this is typically due to fire becoming active in the crowns of trees.

Fuel Model Values for Estimating Fire Behavior

Total Fuel Load, less than 3-inch dead and live	5.0 tons/acre
Dead Fuel Load, 0 to ¼ inch	1.5 tons/acre
Live Fuel Load, foliage	0.0 ton/acre
Fuel Bed Depth	0.2 foot

FBFM 9 – Hardwood or Long-Needle or Timber Litter – Moderate Ground Fuel Load

Figure 5. FBFM 9

Characteristics: Closed stands of long-needle pine such as ponderosa pine are characterized by FBFM 9 (Figure 5

Fire Behavior: Fires run through the surface litter faster than in FBFM 8 and have longer flame lengths. Fall fires in hardwoods are predictable; however, high winds will actually cause higher rates of spread than predicted because of spotting caused by rolling or blowing embers and fire brands. Concentrations of dead-down woody material will contribute to possible torching, crowning, and spotting.

Fuel Model Values for Estimating Fire Behavior

Total Fuel Load, less than 3-inch dead and live	3.5 tons/acre
Dead Fuel Load, 0 to ¼ inch	2.9 tons/acre
Live Fuel Load, foliage	0.0 ton/acre
Fuel Bed Depth	0.2 foot

FBFM 10 – Mature/Over Mature Timber and Understory

Figure 6. FBFM 10

Characteristics: Any forest type may be considered FBFM 10 if heavy downed woody material is present. Locally this model is represented by dense stands of over-mature ponderosa pine, lodgepole pine, mixed conifer, and continuous stands of Douglas-fir (Figure 6). Examples include insect or disease-ridden stands, wind-thrown stands, over-mature situations with deadfall, and aged light thinning or partial-cut slash. Dead-down fuels include large quantities of 3-inch or larger limb wood resulting from over maturity or natural events that create a large load of dead material on the forest floor.

Fire Behavior: Fire will burn in the surface and ground fuels with greater intensity than the other timber litter models. Crowning out, spotting, and torching of individual trees is more frequent in this fuel situation, leading to potential fire control difficulties.

Fuel Model Values for Estimating Fire Behavior

Total Fuel Load, less than 3-inch dead and live	12.0 tons/acre
Dead Fuel Load, 0 to ¼ inch	3.0 tons/acre
Live Fuel Load, foliage	2.0 tons/acre
Fuel Bed Depth	1.0 foot

FBFMs present in the district are summarized in Table 7.

Table 7. Fire Behavior Fuel Models of CCCFPD

FBFM	Description
1 Short Grass	**Grass Group** – Fire spread is determined by the fine, very porous, and continuous herbaceous fuels that have cured or are nearly cured. These are surface fires that move rapidly through the cured grass and associated material. Very little shrub or timber is present, generally less than one-third cover of the area. Annual and perennial grasses occur in this model. Fire rate of spread can exceed 3.5 miles per hour (300 chains per hour) with flame lengths over 8 feet.
2 Grass with Timber/Shrub Overstory	**Grass Group** – Fire spread occurs through curing of dead herbaceous fuels. These are surface fires where downed woody debris from the shrub and tree component adds to fire intensity. Open shrublands, pine stands, or oakbrush stands that cover from one- to two-thirds of the area generally fit this model.
6 Intermediate or Dormant Brush	**Shrub Group** – Fire spreads though the shrub layer with flammable foliage but requires moderate winds to maintain the foliage fire. Fire will drop to the ground in low wind situations. Shrubs are mature with heights less than 6 feet. These stands include oakbrush and mountain mahogany less than 6 feet tall. Fire rate of spread can be rapid with flame lengths of 6 to 10 feet.
8 Closed or Short-Needle Timber Litter–Light Fuel Load	**Timber Group** – These fuels produce slow-burning ground fires with low flame lengths. Occasional "jackpots" in heavy fuel concentrations may occur. These fuels pose a fire hazard only under severe weather conditions with high temperatures, low humidity, and high winds. These are mixed conifer stands with little undergrowth. Fire rate of spread is up to 106 feet per hour with flame lengths of 1 foot.
9 Hardwood or Long-Needle or Timber Litter–Moderate Ground Fuel	**Timber Group** – Fires run through the surface litter faster than in FBFM 8 and have longer flame lengths. These are semi-closed to closed canopy stands of long-needle conifers, such as ponderosa pine. The compact litter layer is mainly needles and occasional twigs. Concentrations of dead-down woody material contribute to tree torching, spotting, and crowning. Fire rate of spread is up to 27 chains per hour with flame lengths of 5 feet.
10 Mature/Overmature Timber and Understory	**Timber Group** – Surface fires burn with greater intensity than the other timber litter models. Dead and down surface timber litter is heavier than other timber models and the stands are more prone to hard-to-control fire behavior such as torching, spotting, and crown runs.

Source: Anderson (1982)

3.6 Water Resources

The fire district is supplied by static water sources such as ponds, reservoirs and cisterns. Four reservoirs are dispersed throughout the district and have been identified as potential helicopter dip sites. Five large cisterns are also located throughout the district and four others are planned for the western portion of the district. The eastern portion of the district has over two-million gallons of water storage planned in association with several new developments.

3.7 Fire Protection District

The CCCFPD is served by a volunteer fire department. The department has 40 active members who provide emergency fire, medical, hazardous materials and rescue services, and 20 members of a wildland team who respond only to local wildland fires. In addition

to the district's Fire Chief and Assistant Chief/Wildland Coordinator, the CCCFD maintains four battalion chiefs who oversee operations for each of the district's four stations. Current inventory includes five structural engines, two water tankers, three rescue trucks, one ambulance, two brush trucks, one wildland van, one utility vehicle, one zodiac boat (stationed at Gross Reservoir), one ATV, and one command vehicle.

3.8 Values at Risk

In any hazard and risk assessment, human life and welfare are the most important resources to protect. Homes, businesses, and the resident's desire to preserve and maintain the forested characteristics of the community are all important factors and certainly influence any recommendation; however, the safety and welfare of residents and emergency responders remains the top priority. The WUI has inherent risks including residential and commercial development in areas historically prone to fire, hazardous fuels, and limited access. The CCCFPD is characterized by mixed density residential development within a forested environment intermixed with large tracts of unmanaged and/or inaccessible timber.

Common values at risk for the district include:

- Homes
- Businesses
- Local economy
- Municipal water supply
- Community infrastructure
- Wildlife habitat
- Recreation
- Watershed health
- Water quality
- Air quality
- Forest health
- View shed
- Historic structures
- Tourism

4 WILDFIRE RISK ASSESSMENT

4.1 Approach to the Wildfire Risk Assessment

A comprehensive wildfire risk assessment takes into account a variety of critical factors that reflect predominant WUI characteristics and provide a strong basis for determining a relative hazard and risk level for a given neighborhood. This assessment surveys wildfire hazards and risk, as defined in Section 2, as well as and values-at-risk, which includes infrastructure, structures, improvements, and natural resources that are likely to suffer long-term damage from the direct impacts of a wildfire. Further, WUI hazard rankings provide quantifiable guidance in the determination of mitigation treatment project prioritization.

To better understand the nature and scope of the wildfire hazard that face the CCCFPD, a full spectrum of factors that influence potential fire behavior are evaluated including vegetation and fuels, topography, weather, and historical fire frequency. Community infrastructure is evaluated in terms of emergency response, defensibility, and structural flammability. Analyzing the relationship between expected fire behavior in the wildlands and the placement and design of neighborhoods and subdivisions proximate to those areas is at the core of an effective community wildfire risk assessment. This analysis guides targeted mitigation efforts that can greatly reduce the risk of loss from a wildfire for each homeowner as well as the community as a whole.

The primary assessment area for this CWPP is defined by the boundaries of the CCCFPD. Fourteen individual WUI's within the CCCFPD were identified as areas of critical concern and surveyed in detail using a standardized, nationally recognized methodology.

Vegetation and FBFMs were mapped 1 mile into surrounding regions utilizing LANDFIRE data which was ground verified and photo documented. LANDFIRE, the Landscape Fire and Resource Management Planning Tools Project, is an interagency vegetation, fire, and fuel characteristics mapping project. It is a shared project between the Department of the Interior (DOI) and Forest Service wildland fire management programs and is sponsored by the Wildland Fire Leadership Council. LANDFIRE is actively producing a comprehensive, consistent, scientifically credible suite of spatial data layers for the entire United States and has recently completed areas in central Colorado, including Jefferson County.

As part of the assessment, a concerted effort was made to solicit and include input from the public and local experts in fire and natural resource issues. Community meetings were held to explain the CWPP process and intent, present the findings and recommendations of the CWPP investigations to the public, and solicit input for the final CWPP.

Questionnaires were distributed at the meetings and through direct mailings in a further effort to measure public perception of risk and values-at-risk and to assess public tolerance for various mitigation practices. Appendix E provides a summary of the questionnaire responses.

Project information including maps and reports are posted and available on the Jefferson County Division of Emergency Management web site; http://www.jeffco.us/sheriff/sheriff_T62_R193.htm

4.2 Fire Behavior Analysis

Fire behavior is defined as the manner in which a fire reacts to the influences of fuel, weather, and topography. Two key measures of this behavior are the rate of spread and the intensity. Rate of spread is often expressed in chains per hour. A chain is 66 feet, and one chain per hour closely approximates a spread rate of 1.1 feet per minute. Fireline intensity is represented by flame length at the flaming front although it does not account for continued burning of fuels once the main fire front has passed.

BehavePlus was used to assess potential fire behavior given the identified FBFMs, local topography, and local weather conditions. The predicted fire behavior represents surface fire behavior only. Fire moving through the forest canopy (crowning) and other types of extreme fire behavior are not represented in this analysis.

Topography

Topography and elevation indirectly affect fire behavior through influencing sunlight, predominant vegetation, and the movement of wind. Because heat, and therefore fire, rises, topography also has a very direct influence on fire behavior.

The elevation of the CCCFPD ranges from 5,900 and 9,400 feet elevation along Colorado Highway 72 and is characterized by rolling mountainous terrain amidst steep sided valleys. Homes are concentrated in the higher terrain of the district's central western portion. While this area is more open and less steep than the rest of the district, it is exposed steep canyons on each side. Coal Creek Canyon approaches from the east, Beaver Creek is to the south, Black Gulch is to the west, and South Boulder Creek is to the north of this eight square mile area. The slopes rising from these valleys range from 25% to over 45%.

Fire Weather

Average and severe case weather and fuel moisture conditions were determined using records from two local remote access weather stations (RAWS). The Sugar Loaf RAWS is located in Boulder County at 6758 feet, approximately seven miles north of Coal Creek Canyon. The Pickle Gulch station is located at 9380 feet in Gilpin County, five miles beyond the western edge of the CCCFPD. These two stations capture weather data representative of the lower and upper elevations of the fire district. Sugar Loaf data was analyzed for 1983 through 2007, while Pickle Gulch data was analyzed to its establishment in 1995 (Table 8).

Table 8. Remote Access Weather Stations

Station	Elevation (feet)	Location Relative to Coal Creek Canyon	Years of Data
Sugar Loaf	6,758	7 miles north	1983-2007
Pickle Gulch	9,380	5 miles west	1995-2007

Percentile weather refers to historic occurrences of specified conditions. For example, 90th percentile conditions means that within the weather data examined from the RAWS stations, only 10 percent of the days had more extreme conditions. Fiftieth percentile is approximately average with half the records exceeding recorded conditions and half the records below recorded conditions. Weather was calculated for the typical summer fire season of May through September (Table 9) as defined by local fire occurrence. Mid-flame wind speeds of 8 and 4 mph were used for the modeling of 90th and 50th percentile conditions respectively.

Table 9. Average and Severe Case Fire Weather and Fuel Moisture Conditions for May - August near CCCFPD

Raws Station	Percentile	Max Temp	Relative Humidity	1-Hour Fuel Moisture	10-Hour Fuel Moisture	100-Hour Fuel Moisture	Herbaceous Fuel Moisture	Woody Fuel Moisture
Sugar Loaf 1983-2007	50th	79ºF	25%	6%	7%	10%	46%	108%
	90th	91ºF	11%	3%	4%	6%	29%	74%
Pickle Gulch 1995-2007	50th	71ºF	23%	6%	7%	11%	44%	92%
	90th	80ºF	11%	3%	4%	7%	29%	69%

Additional important fire and weather related resources include:

- Fort Collins Interagency Wildfire Dispatch Center Web index for Fire Intelligence, Fire Weather, Fire Danger/Severity, RAWS – http://www.fs.fed.us/r2/arnf/fire/fire.html
- RAWS index for the Rocky Mountain Geographic Coordinating Area – http://raws.wrh.noaa.gov/cgi-bin/roman/raws_ca_monitor.cgi?state=RMCC&rawsflag=2
- National Fire Weather Page – http://fire.boi.noaa.gov/

Potential Fire Behavior

Two key measures of fire behavior are the rate of spread and the intensity. Rate of spread is expressed in this analysis as chains per hour. Fireline intensity is reflected by flame length at the flaming front.

Fire behavior simulations were conducted for average (50th percentile) and severe (90th percentile) conditions for the critical months of the fire season, May through September (Table 10). The fuel moisture inputs were determined using an average of the two RAWS. Slope steepness was set to 20 percent.

BehavePlus software was used to generally illustrate the potential surface fire behavior given the prevailing fuel types, local topography, and local weather conditions. While any number of variables and assumptions will affect the modeled outputs, there are several significant general principles to focus on:

- Fire Activity (or intensity/rates of spread) increases under 90th percentile conditions (drier fuels, windier conditions) as compared to 50th percentile conditions. These differences are most pronounced in brush and grass fuels.
- This increase in fire activity is approximately two times for flame length and three to four times for rate of spread.
- Fire behavior for most fuel types under 90th percentile conditions exceeds the 4-foot flame lengths generally considered appropriate for direct line construction with hand crews.
- If FBFM 9 converts into the denser FBFM 10, the increases in fireline intensity and flame length are pronounced and conducive to the initiation of crown fire.

Table 10. BehavePlus Predictions of Fire Behavior on 20 Percent Slope for Average and Severe Climatic Conditions

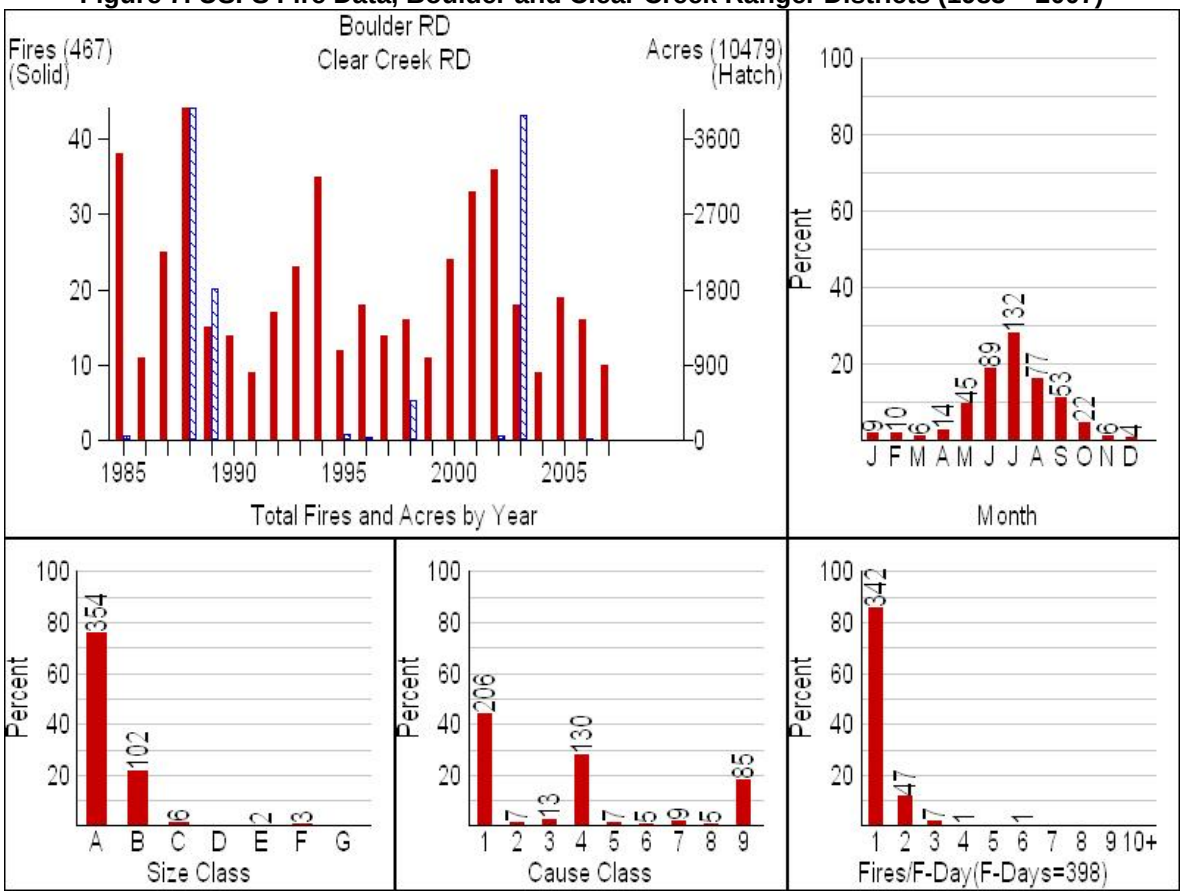
FBFM	Flame Length (feet) Average Conditions[a]	Rate of Spread (chains/hr)[c] Average Conditions	Flame Length, (feet) Severe Conditions[b]	Rate of Spread (chains/hr)[c] Severe Conditions
1 Short Grass	5	101	9	316
2 Grass with Timber/Shrub Overstory	7	46	13	133
6 Intermediate or Dormant Brush	6	36	10	86
8 Closed or Short-needle Timber Litter – Light Fuel Load	1	2	2	5
9 Hardwood or Long-Needle or Timber Litter – Moderate Ground Fuel	3	9	5	26
10 Mature/Overstory Timber and Understory	5	9	9	24

a. Average conditions based on 50th percentile weather and 4 mph midflame windspeed
b. Severe conditions based on 90th percentile weather and 8 mph midflame windspeed
c. Approximately one foot/minute as 1 chain = 66 feet

4.3 Wildfire Occurrence

The vegetation in the assessment area is diverse and typical for the Colorado Front Range. A mix of grass, shrub, and a variety of timber species are found throughout the CCCFPD. All of these vegetation types represent ecosystems that are fire-adapted to some degree. Fire regimes in the area include low, mixed, and high severity with fire return intervals ranging from less than 30 years to over 200 years.

Figure 7. USFS Fire Data, Boulder and Clear Creek Ranger Districts (1983 – 2007)



Fire size class: A<1/4 acre, B= 1/4 to 9 acre, C= 10 to 99 acre, D= 100 to 299 acre, E= 300 to 999 acre, F= 1,000 to 4,999 acre, G> 5,000 acre
Fire cause class: 1=lightning, 2= equipment, 3= smoking, 4= campfire, 5= debris burning, 6= railroad, 7= arson, 8= juveniles, 9= misc
Source: US Forest Service: http://famweb.nwcg.gov/kcfast.

Detailed fire records for CCCFPD were not available, but fire data for the adjoining USFS Clear Creek and Boulder district were analyzed (Figure 7). The typical fire season for CCCFPD is defined as May through September when eighty-five percent of the fires occur, although large fires are now becoming more common throughout the entire year. Forty-four percent of fires on these districts are caused by lightning while escaped campfires account for twenty-eight percent. Despite the large percentage of lightning

caused fires, the largest fires in the area over the last thirty years were human caused. Significant local fires are displayed in Table 11 and a comprehensive regional wildfire history is located in Appendix J.

Table 11. Significant Local and Regional Wildfires

Fire	Month/Year	Approximate Acres Burned	Fire Protection District
Centennial Cone	Jul 2006	22	Golden Gate, Jeffco OS
Ralston Creek	Jun 2006	26	Jeffco, Fairmount, Golden Gate
Rocky Flats	Apr 2006	1,200	4 Counties, multiple FPDs
Plainview	Jan 2006	2,700	Coal Creek
North Table Mountain	Jul 2005	300	Fairmount
Walker Ranch	Sep 2000	1,100	Cherrvale, Coal Creek, BOCO
Blue Mountain	Aug 2002	35	Coal Creek
Hayman	Jun 2002	138,000	4 Counties, multiple FPDs
Schoonover	May 2002	3,000	North Fork, USFS
Snaking	Apr 2002	3,000	Platte Canyon, USFS
Hi Meadow	Jun 2000	10,800	Platte Canyon, /Elk Creek, North Fork
Lininger Mountain	Feb 1999	35	Genesee/Foothills
Buffalo Creek	May 1996	10,400	North Fork, USFS
Elk Creek	May 1991	201	Golden Gate
Mount Falcon	Apr 1989	125	Indian Hills
Coal Creek	Sep 1988	Multiple fires 50 acres	Multiple, along train tracks

Source: Gallamore, 2007 (See Appendix J for a comprehensive wildfire history of the CSFS, Golden District)

4.4 Jefferson County Fire Danger Rating System and Local Weather Information

The Jefferson County Fire Danger Rating System (JFDRS) is based on the National Fire Danger Rating System (NFDRS) implemented in 1978. The JFDRS uses both RAWS and independent weather stations that are monitored with the data available from the Internet. Jefferson County limits the fire danger rating to NFDRS fuel models C (Pine-Grass Savanna) and G (Short-Needle [Heavy Dead]). The RAWS supply all necessary data used for fire danger rating; however, the independent stations require manual inputs to calculate fire danger such as state of the weather and calculation of 1-hour fuel moisture. After the weather data are collected the fire danger is calculated with an NFDRS calculator provided in the Fire Family Plus software. The energy release component (ERC) is then compared to the rating chart developed for Jefferson County, and an adjective fire danger value (extreme, very high, high, moderate, or low) is assigned. The Evergreen Communications Center emails completed forms for the RAWS and independent weather stations to the Jefferson County Sheriff, CSFS, and local fire agencies for distribution. The completed form with various components of the NFDRS is used for responders and an adjective fire danger for the public.

4.5 Wildfire Risk to Communities

CCCFPD assessment and neighborhood hazard and risk surveys were initiated in November, 2007 and completed in May, 2008. Detailed and collaborative analysis of the assessment area resulted in the identification of fourteen individual WUI communities within the assessment area. Each WUI represents a unique response area with identifiable predominant characteristics, resources, and hazards and risks. Based on these criteria, a single WUI may span multiple neighborhoods, or a single neighborhood or HOA may be subdivided in multiple WUIs. Homes, structures, or infrastructure sites not located within a designated WUI are typically best served through individual home and property hazard and risk assessments that are available through the county, CSFS, and the local fire department.

A standardized survey process defined by the National Fire Protection Association (NFPA) was utilized to assess the relative level of wildfire risk and hazard for each neighborhood. Appendix B contains an example of the NFPA Form 1144, *Standard for Protection of Life and Property from Wildfire*. Surveys assess predominant characteristics within individual communities and subdivisions as they relate to structural ignitability, fuels, topography, expected fire behavior, emergency response, and ultimately human safety and welfare. Scores are assigned to each element and then totaled to determine the community's relative level of risk. Low, moderate, high, and extreme hazard ratings may be assigned based on the total community score (Table 12). Detailed observations and survey results are provided in Appendix C.

Table 12. Community Hazard Rating and Contributing Factors

HAZARD RATING	WUI	1144 SURVEY SCORE	CONTRIBUTING FACTORS
EXTREME	Burke	112	▪ Single ingress/egress ▪ Steep terrain ▪ Inaccessibility of Fischer Rd. ▪ Emergency water supply ▪ Density of structures and proximity to slope ▪ Flammability of structures ▪ Defensible space ▪ Above ground utilities
	Wondervu	112	▪ Density of structures ▪ Community accessibility for emergency apparatus ▪ Home addressing and street signage ▪ Emergency water supply ▪ Flammability of structures ▪ Defensible space ▪ Above ground utilities

HAZARD RATING	WUI	1144 SURVEY SCORE	CONTRIBUTING FACTORS
HIGH	Nadm	109	▪ Single ingress/egress ▪ Timber stand density throughout subdivision ▪ Flammability of structures ▪ Defensible space ▪ Topography, road grade, and proximity of structures to slope ▪ Emergency water supply ▪ Above ground utilities
	Chute Road	107	▪ Dual ingress/egress subdivision but most homes located on single ingress/egress secondary road. ▪ Topography and steep slope ▪ Road grade ▪ Chimney access for emergency apparatus ▪ Timber stand density ▪ Flammability of structures ▪ Proximity to railroad ignition source ▪ Above ground utilities
	Lyttle Dowdle	104	▪ Single ingress/egress ▪ Topographic chimney and steep slopes ▪ Road grade ▪ Proximity of homes to slope ▪ Defensible space ▪ Flammability of structures ▪ Timber stand density throughout subdivision ▪ Emergency water supply ▪ Above ground utilities
	Camp Eden	96	▪ Housing density ▪ Timber stand density throughout subdivision ▪ Road infrastructure and accessablity ▪ Topography ▪ Road grade ▪ Defensible space ▪ Flammability of structures ▪ Emergency water supply ▪ Proximity to emergency resources ▪ Above ground utilities
	Coal Creek Heights	96	▪ Steep terrain and proximity of homes to slope ▪ Defensible space ▪ Road grade, tight switchbacks and accessibility ▪ Single ingress/egress for many residents ▪ Flammability of structures ▪ Timber stand density ▪ Emergency water supply ▪ Above ground utilities

HAZARD RATING	WUI	1144 SURVEY SCORE	CONTRIBUTING FACTORS
	Stanton	91	▪ Timber stand density throughout subdivision with areas of dead and down timber ▪ Dual ingress/egress but limited evacuation access ▪ Static emergency water supply. ▪ Flammability of structures ▪ Signage and confusing road network ▪ Above ground utilities
	Crescent Park	85	▪ Single ingess/egress for most homes in the upper portion of subdivision ▪ Topography; ridge top and chimney housing development ▪ Road grade ▪ Proximity to extensive steep and dense timber stand adjacent and upslope from railroad ignition source ▪ Structure density ▪ Flammability of structures ▪ Above ground utilities ▪ Static emergency water supply ▪ Above ground utilities
	Copperdale	82	▪ Structure density ▪ Topography and proximity of structures to slope ▪ Road grade ▪ Timber density ▪ Defensible space ▪ Flammability of structures ▪ Emergency water supply ▪ Above ground utilities
	Miramonte	81	▪ Topography; steep north facing slope ▪ Accessibility; forested approach over 1 mile, private gated ▪ Road grade ▪ Proximity to railroad ignition source ▪ Timber stand density throughout the area ▪ Condition of secondary evacuation route ▪ Flammability of structures ▪ Emergency water supply ▪ Above ground utilities
	Vonnie Claire	80	▪ Flammability of structures ▪ Timber stand density along subdivision margins ▪ Topography ▪ Road grade ▪ Emergency water supply ▪ Above ground utilities

HAZARD RATING	WUI	1144 SURVEY SCORE	CONTRIBUTING FACTORS
MODERATE	Hilltop	68	▪ Flammability of structures ▪ Emergency water supply ▪ Topography and emergency accessibility for the southwest portion ▪ Aging street signage ▪ Above ground utilities
	Blue Mountain	64	▪ Primary access single ingress/egress ▪ Gated secondary emergency access ▪ Static emergency water source ▪ Above ground utilities ▪ Some homes on ridge and steep east facing slope

Note: In addition to the listed factors, rating scores are also influenced by the region's high fire occurrence and potential for severe fire weather.

These comprehensive community assessments provide the basis for effective identification, prioritization, and implementation of specific mitigation and hazard reduction recommendations.

5 WILDFIRE MITIGATION PLAN

5.1 Approach to Mitigation Planning

Wildfire mitigation can be defined as those actions taken to reduce the likelihood of loss due to wildfire. Effective wildfire mitigation can be accomplished through a variety of methods including reducing hazardous fuels, managing vegetation, creating defensible space around individual homes and subdivisions, utilizing fire-resistant building materials, enhancing emergency preparedness and response capabilities, upgrading current infrastructure, and developing programs that foster community awareness and neighborhood activism. Once implemented, these actions will significantly reduce the risk of loss due to wildfire for an individual home, and on a larger implementation scale, for an entire community

The entire Front Range of Colorado is at significant risk of wildfire. Large scale wildfires are an annual occurrence in this region. The CCCFPD encompasses vast tracks of forest and rangeland that have experienced fire exclusion for many decades, resulting in fuel conditions that make them more prone to destructive wildfires. The mitigation recommendations in this CWPP focus largely on the safety and welfare of area's residents and emergency responders. As such, recommended fuel treatments will address hazards and risk directly facing the district's communities and subdivisions rather than the uninhabited forests and rangelands within the district.

Specific mitigation treatment recommendations for the CCCFPD were identified, in part, through detailed community wildfire hazard assessment surveys that evaluated predominant parameters such as vegetation and hazardous fuels, predicted fire behavior, topography, physical infrastructure, access, emergency response resources, home construction flammability, and defensible space characteristics around structures.

The highest-priority recommended actions focus on safety and welfare of the areas residents and emergency responders, and include the implementation of effective defensible space and reducing the likelihood of structural ignition. When properly implemented, these actions alone can make a huge positive impact to minimize fire behavior around a home. This critical mitigation component can be implemented immediately, dependent only on the incentive of the individual home owner.

In some neighborhoods, homes are constructed in sufficient density that coordinated defensible space efforts on adjacent smaller lots would help minimize the threat of loss on a much larger community scale. Priority defensible space zones have been identified throughout the district in these areas.

Securing identified evacuation routes for WUI subdivisions is a critical component of a community's strategic emergency plan. Individual community assessments included in this CWPP identify recommended primary routes that should be capable of supporting two way traffic flow and emergency apparatus access. Shaded fuelbreak zones are designated along forested stretches of these and other primary residential access routes. Road improvements may be suggested in areas that may restrict apparatus access due to

tight switchbacks, dead ends, or narrow single lane. Potential secondary emergency access routes are identified for neighborhoods with limited ingress/egress.

Forest thinning treatment areas have also been identified in strategic locations around populated areas. These treatment zones are strategically located in relation to populated areas based on ignition potential, expected fire behavior, timber density, fuel type, and topography. Other fuel break improvements are suggested for all power transmission line right-of-ways as an additional means of reducing continuous forest canopy cover.

Possible enhancements to existing emergency preparedness have also been assessed. This includes an inventory of existing emergency apparatus, incident response protocol, mutual aid agreements, as well as recommendations for the installation of additional strategic emergency water supplies throughout the district. Preferably these water supplies are large cisterns conveniently positioned above road grade for gravity feed and strategically located at subdivision entrances along main roads.

Recommendations were reviewed by the CCCFPD, county emergency response management, affected public land management agencies, and interested community stakeholders. Project prioritization is based on relative impact to community wildfire hazard and risk reduction, collaborative input, and professional judgment.

5.2 Recommended Actions

Action items include specific fuel reduction recommendations such as fuelbreaks along primary and secondary access roads, forest management programs, defensible space around structures, and homeowner assistance to reduce the combustibility of individual homes. Table 13 lists the recommended actions by category. Other recommended projects address infrastructure characteristics such as community access, signage, evacuation routing, and water resources. Community outreach and educational programs are also recommended. Table 15 summarizes recommendations for each WUI neighborhood.

Table 13. Recommended Actions by Category

Project	Actions
Outreach/Public Education	▪ Encourage stakeholder participation in community meetings. ▪ Distribute Firewise materials. ▪ Assess individual homes.
Defensible Space (Appendix G)	▪ Establish a Firewise fuel zone around homes. ▪ Establish a treated second zone that is thinned, pruned, and cleared of excess surface fuels. ▪ Extend treatment to property boundary to improve natural forest conditions and reduce excess hazardous vegetation. ▪ Where lots are small and housing is dense coordinate efforts between multiple homes to maximize effectiveness. ▪ Employ defensible space practices around identified resources such as cisterns, dip and draft sites, potential safety zones, or observation areas.
Firewise Building Improvements	▪ Replace shake roofs with fire resistant roofing material. ▪ Implement Firewise construction principals for all

Project	Actions
	remodels. ▪ Enclose exposed decks and gables. ▪ Screen vents and chimneys.
Shaded Fuelbreaks (Appendix F)	▪ Treat along primary and secondary evacuation routes. ▪ Improve/expand utility right-of-ways.
Access/Egress Improvements	▪ Improve hazardous primary access routes. ▪ Create/improve dead end turn arounds. ▪ Create/improve secondary evacuation routes where needed. ▪ Improve restricted switchbacks.
Strategic Fuelbreaks (Appendix F)	▪ Provide for fuelbreaks in identified treatment zones. ▪ Conduct removal where possible. ▪ Burn piles where needed. ▪ Coordinate with adjacent defensible space on private lots and treatments on public lands. ▪ Expand to address infestation where needed.
Supporting Actions	▪ Support grant funding acquisition actions. ▪ Involve Jefferson County in evacuation improvements. ▪ Revise county statutes addressing defensible space requirements for home sales. ▪ Coordinate with agency forest management plans.
Fire Department Preparedness	▪ Integrate project GIS ▪ Maintain and distribute map books ▪ Regularly update all water resource maps ▪ Survey potential dip sites and safety zones ▪ Develop and distribute community incident pre-plans ▪ Continue community education and outreach ▪ Continue recruitment, training, and certification ▪ Continue mutual aid strategic planning. ▪ Continue apparatus, facility, and personal protective equipment (PPE) upgrades

Outreach and Public Education

The most effective means to initiate local action is through community education and public outreach. Community education may target a number of goals and objectives including:

- Identify wildfire hazards and risks;
- Introduce the benefits of defensible space and Firewise construction principals;
- Urge homeowners to take action on their own property and influence neighbors, friends, and HOAs;
- Initiate creation of an oversight group to drive CWPP implementation and grant application;
- Increase awareness of current forest conditions and how hands-on management practices can help restore forest health and reduce wildfire risk; and
- Create awareness of the historical role fire has played in the regional ecosystem and forest and rangeland health.

Some parcels within subdivisions may be undeveloped and/or owned by absentee owners. A lack of fuels management on these lots can impact the entire community. An effort

should be made to contact these landowners and determine how to address their concerns and overcome potential obstacles to conducting hazard fuel mitigation on their land.

Action Item: All community meetings should include reminder information concerning the benefits of defensible space, recommended methods to reduce structural ignitability, forest health issues, as well as wildfire probability. Yard slash disposal opportunities should be coordinated on an annual basis. This may be coordinated with HOA spring cleanup activities and may include the coordination of a central disposal site, mobile chipping services, or a hauling service.

As an example, slash collection days could occur in the fall or at other locations to make it easy for all residents to participate. A community, HOA, or neighborhood would hire a contractor by the hour to chip the slash stacked along the main road by homeowners in front of each residence. Each landowner would pay for the time it took to chip his/her slash, but the equipment and scheduling costs would be carried/distributed among all participating landowners.

Defensible Space

Implementation of defensible space around individual homes is an action that can be taken immediately by motivated land and homeowners. It is recommended that defensible space be created following the CSFS guidelines as set forth in *Creating Wildfire Defensible Zones*, Bulletin No. 6.302 (Dennis 2003) (Appendix G), which is consistent with Jefferson County regulations. Effective defensible space in conjunction with non-combustible building materials and clean gutters is the most effective means to protect an individual home from wildfire loss.

Action Item: Creating and improving defensible space around individual homes is the most effective method to reduce hazard fuels and the threat of wildfire within the CCCFPD. It is suggested that the above outreach efforts be used to coordinate and spur implementation and slash disposal at the individual homeowner level. Broad participation on an individual basis ultimately leads to effective hazard reduction at the neighborhood or community level. In neighborhoods where lots are smaller and housing density is high, coordinating efforts between multiple adjacent lots may be necessary to achieve recommended zone dimensions. These areas are identified in the individual assessments as priority defensible space. Many homeowners with the highest need for defensible space are directly adjacent to public community open space properties. Coordinating fuel reduction activities between public, open space, and private lands creates a mutually beneficial solution. Establishing a procedure whereby homeowners who have established defensible space on their property to petition for fuels management on adjacent public lands would facilitate more effective fuels reduction and increase opportunities to enhance forest health.

Effective defensible space consists of a fuel-free zone adjacent to the home, a treated secondary zone that is thinned and cleaned of surface fuels, and, if the parcel is large enough, a transitional third zone that is basically a managed wildland or forest area. These components all work together in a proven and predictable manner. **Zone 1** keeps fire from burning directly to the home; **Zone 2** reduces the adjacent fire intensity and the

likelihood of torching, crown fire, and ember production; and **Zone 3** does the same at a broader scale, keeping the fire intensity lower by maintaining a more historic condition, which in turn reduces the risk of extreme/catastrophic fire behavior.

When this principle of defensible space is combined with fire-resistant construction the risk of structure loss is greatly reduced. Defensible space implemented on adjacent lots has a greater effect on reducing wildfire hazard than on in individual parcel. This is especially relevant where housing is dense and lots are small. Due to safety considerations of responding firefighters, homes and neighborhoods with defensible space are much more likely to be assigned structure defense crews than those without (Figure 8).

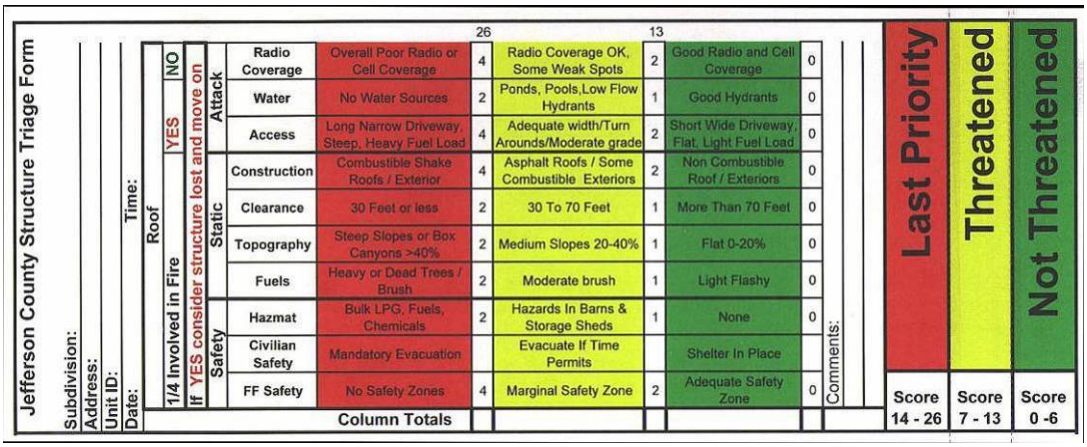


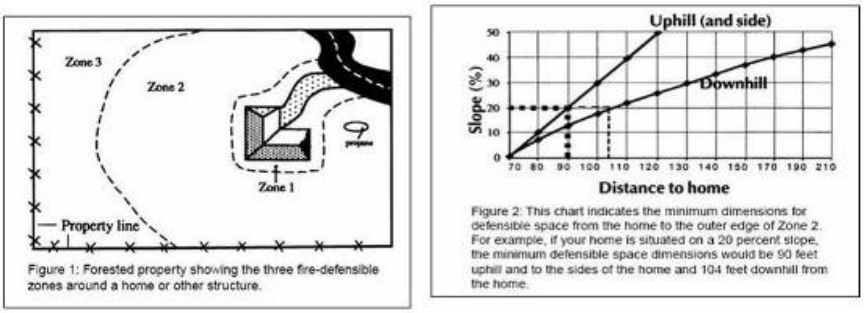
Figure 8. Jefferson County Structure Triage Tag
(for prioritizing structure defense in the event of an advancing wildfire)

Zone 1 (0 to 15 feet from structure): Within 3 to 5 feet of the structure, decorative rock or mowed, irrigated grass is recommended (Figure 10). Well-spaced and pruned, low-flammability plants (Appendix J) are acceptable if the structure has noncombustible siding. In the remainder of Zone 1, trees' lower branches should be pruned 5 to 10 feet above the ground (not to exceed one-third of the tree height). Dead wood, tall grass, and ladder fuels (low limbs, small trees, and shrubs that may carry fire into tree crowns) should be removed from this area. Leaves and overhanging branches should be removed from the roof and gutters. The 15-foot area should be irrigated as appropriate. Woodpiles should be removed and stored in Zone 2, preferably upslope from structures.

Zone 2 (typically from 15 feet out to 60-210 feet from Zone 1): The size of this zone is dependent upon slope. Treatment of surface fuels and ladder fuels is generally the same as for Zone 1. Trees (or small groups of trees) and shrubs should be thinned to provide 10 feet of clearance among crowns. Grasses should be mowed because they dry in late summer.

Zone 3 (beyond Zone 2 to property line): This area outside of Zone 2 should be managed for the appropriate land use objectives, such as forest health, aesthetics, recreation, and wildlife habitat (Figure 9).

Figure 9. Defensible Space Guidelines and Standards (Dennis 2006)



Efforts can be encouraged and coordinated annually through community meetings, planned spring cleanups, and organized disposal efforts. Although most of the work can be accomplished by individual homeowners in a phased approach over time, neighborhood cooperation and support is essential to help those who are unable, or to provide access to critical hazardous areas. Table 14 outlines a manageable phased implementation schedule.

Table 14. Community-Based Defensible Space Project Schedule

Year	Project	Actions
1	Annual spring outreach	▪ Contact and/or organize homeowners.
	Annual spring mitigation (defensible space)	▪ Clean roofs and gutters. ▪ Trim limbs/bushes within 3 to 5 feet of home. ▪ Rake yard. ▪ Help a neighbor. ▪ Organize debris disposal.
2	Annual spring outreach	▪ Contact and/or organize homeowners.
	Annual spring mitigation (defensible space)	▪ Clean up brush along property lines. ▪ Repeat basic yard cleanup. ▪ Organize debris disposal.
3	Annual spring outreach	▪ Contact and/or organize homeowners. ▪ Advise individual homeowners on needed improvements to construction features.
	Annual spring mitigation (defensible space)	▪ If necessary, coordinate defensible space efforts between homeowner groups who have created defensible space and adjacent open space land managers.
4	Annual spring outreach	▪ Contact and/or organize homeowners. ▪ Follow-up on construction feature recommendations.
	Annual spring mitigation (defensible space)	▪ Complete any outstanding projects from previous years. ▪ Begin maintenance phase. ▪ Initiate construction feature improvements.

Structural Flammability

Improving the fire-resistant characteristics of a structure goes hand-in-hand with the development of defensible space. Extensive recommendations can be found in CSFS publications available at http://csfs.colostate.edu/library.htm. The most significant improvement that can be made to many of the homes in the assessment areas is the replacement of wood shake roofing with noncombustible roofing material, as is required for all new and replaced roofs in both Jefferson and Boulder Counties. All homeowners

should keep roofs and gutters clear of leaves and pine needles. Screening of gutters and roof vents is recommended. Embers from a wildfire can become windborne and travel long distances before settling.

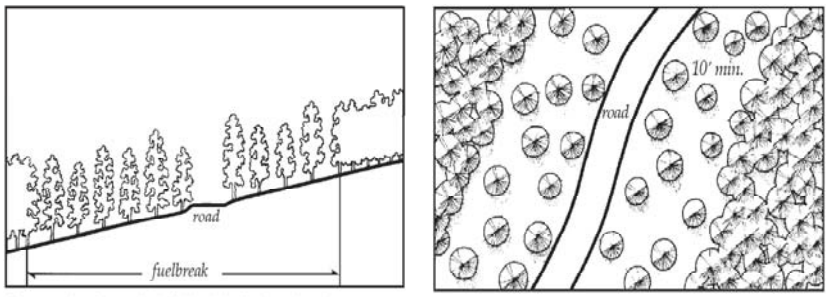
Common structural fuel hazards associated with homes in the WUI include:

- Combustible roofing and siding;
- Combustible decks with exposed undersides;
- Combustible material under decks;
- Open attic vents;
- Combustible fencing; and
- Woody debris in gutters.

Action Item: Provide for community education, outreach, and information distribution through HOAs and other neighborhood associations. Coordinate public education through existing spring cleanup programs. Grassroots action can be as simple and straightforward as coordinating with a local scout troop to distribute applicable CSFS flyers door-to-door.

Shaded Fuelbreaks

Shaded fuelbreaks have been identified along forested evacuation routes and other primary residential access routes. However, all forested access roads should be considered for shaded fuelbreak implementation, where possible. Reducing the forest canopy along access road margins enhances the effectiveness of the physical canopy break the road provides, as well as critical safety factors along likely evacuation and incident access routes. Roads with shaded fuelbreaks create a safer emergency ingress/egress scenario while greatly aiding potential tactical suppression efforts. Fuels treatment along roadways reduces removal costs of by-product as well as project complexity (Figure 10). Visit http://csfs.colostate.edu/library for fuelbreak guidelines (Appendix F).



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

Plan view of fuelbreak showing minimum distance between tree crowns.

Source: Dennis, undated

Figure 10. Shaded Fuelbreak

Action Item: All access roads within the CCCFPD with vegetation or timber encroachment should be considered for shaded fuelbreak treatment and/or seasonal mowing. Project priority should be given to the forested road margins of the primary evacuation routes and other primary residential access routes as identified in the individual community assessments.

Future treatments may be coordinated with property owners along adjoining private land and along public or community right-of-ways. Conifer regeneration and reproduction in previously mitigated areas and road margins should also be addressed. It is recommended that any mitigation projects that involve timber thinning be evaluated, coordinated and monitored by a mitigation specialist and/or certified forester. Appendix F, CSFS Fuelbreak Guidelines for Forested Subdivisions and Communities, has been included as procedural and methodology reference for all thinning projects.

Strategic Fuelbreaks

Thinning recommendations may also target timber stands that pose a specific wildfire threat to neighborhoods but are not directly adjacent to residential access or evacuation routes. These recommended strategic fuelbreaks are identified through remote sensing analysis and field surveys that examine such characteristics as topography, predominant fuel model, forest condition, expected fire behavior, as well as proximity to values at-risk. Strategic fuelbreak recommendations specific to each assessed subdivision are identified in Appendix C and prioritized in Table 15.

Strategic fuelbreaks may be designed with shaded fuelbreak characteristics or as a fuel-free buffer zone for more aggressive fuel reduction. Strategic fuelbreaks along neighborhood margins should mutually support adjacent defensible space efforts. Treatment locations are strategically positioned in forest stands that pose a significant threat to populated areas and are based on ignition potential, expected fire behavior, fuel type and density, and topography. As with shaded fuelbreaks these treatment areas are designed to slow an advancing wildfire by reducing the available fuel load and breaking forest canopy continuity. Stands are thinned, ladder fuels are pruned, and excess surface fuels are removed. Because of the inherent access issues associated with these strategic locations, slash pile burning is often the only feasible option for the removal of timber and slash.

Because treatment areas often span multiple ownership boundaries, planning and coordination with landowners and public agencies is critical.

Action Item: Treatment recommendations for each subdivision should be reviewed relative to ownership and areas where mitigation would be permitted should be identified. Treatment units should be surveyed and delineated and trees marked by CSFS staff or certified/professional forester. Refer to Appendix F, CSFS Fuelbreak Guidelines for Forested Subdivisions and Communities, for recommended thinning methods and procedures. Contract logging companies or certified fire department personnel may be utilized to cut.

Weeds

Integrated weed management will reduce fuel hazards around and within communities and improve the health of grasslands. Fire exclusion practices in meadow and shrub lands have allowed the encroachment of non-native and noxious species that have decreased effective foraging and in some cases have increased wildfire fire potential. In the event of a wildfire, rehabilitation treatment management such as the seeding of native grasses and spreading mulch is beneficial and may be necessary to reestablish a productive natural plant community.

Action Item: An ecological evaluation of the health and species status is recommended for meadow, prairie, and shrub lands within the assessment area. Historically these areas supported the foraging needs of large game and studies to assess the presence of noxious weeds and aggressive non-native species, as well as the condition of shrubs may be useful. Results may indicate the need for small-scale prescribed burning, application of herbicide, or foster modifications to county burned area rehabilitation seeding practices for future wildfire incidents.

Access

Access is an important component of any community's wildfire hazard and risk profile. Community access characteristics dictate the efficiency of emergency evacuation as well as the effectiveness of emergency response. Preferably community road design provides for multiple points of ingress/egress, supports two-way traffic flow, and offers adequate emergency apparatus turnaround radius on dead end roads and cul de sacs.

Each neighborhood or community within the fire district has unique access characteristics. The individual neighborhood assessments provided in Appendix C provide analyses of these characteristics and specific recommendations on ways to improve current conditions. Availability of ingress/egress, characteristics of road surface, road layout and design, treatment of dead ends, road grade, characteristics of switchbacks, and width all factor into access assessment and emergency planning.

Action Item: Existing turn arounds should be evaluated in regards to adequate turning radius for emergency apparatus. Existing dead ends should be identified and mapped and evaluated for turnaround construction. Serious consideration should be given to improving or constructing secondary evacuation routes where single a single access route serves a subdivision. Possible secondary evacuation or emergency access routes are identified in Appendix C.

Emergency Preparedness

CCCFPD maintains a full volunteer staff, four stations, and sufficient apparatus to cover most typical fire, trauma, and medical situations that may arise in the district. Mutual aid agreements are in place to guarantee support from adjacent fire districts as well as resources from three affected counties in the event of a larger scale incident or situations that require additional resources.

Action Item:

- Mutual Aid agreements should be reviewed and amended annually to reflect changing conditions.

- Tactical pre-suppression plans should be developed to provide a framework for tactical operations for initial attack within the district as well as larger scale incidents involving Type III, II or I Incident Management Teams. Community surveys provided through this CWPP may serve as the basis for individual community plans. Plans should be distributed to all agencies that provide mutual aid support.

- Continue the development of emergency water supplies throughout the district with strategic locations that support efficient and safe tactical water operations.

- Conduct surveys of all identified potential safety zones (Appendix C) for applicability supporting emergency operations. Surveys should address access, size, capacity, and maintenance considerations. Approved locations should be mapped and included in any district emergency operations plan.

- Conduct qualified surveys of identified helicopter dip sites (Appendix C) noting potential obstruction hazards and identify, negotiate, and resolve any potential water rights issues. Approved locations should be mapped and included in any district emergency operations plan.

- Conduct surveys of all community and subdivision access routes noting dead ends, restricted turnarounds, security gates, evacuation routes, etc. Results should be mapped and included with updated district mapbooks.

- Maintain district mapping information and coordinate with other surrounding jurisdictions.

- Emergency and evacuation plans should be coordinated with Jefferson County Division of Emergency Management, affected neighboring jurisdictions, and disseminated to residents through neighborhood association meetings or other local events.

Forest Health

Public land managers monitor forest health within public lands, and citizens should be encouraged to do the same on their property. The current mountain pine beetle epidemic has gravely impacted much of Colorado's lodgepole pine forests. Ponderosa pine may also be attacked by the mountain pine beetle, and diligence on the part of the property owner is warranted. Other forest pathogens, such as dwarf mistletoe, are observed at endemic levels in some areas of the CCCFPD.

Action Item: Residents should monitor the health of trees on their property and contact their local CSFS District Forester or a professional arborist with concerns. Further information is available at http://csfs.colostate.edu/iandd.htm.

CCCFPD Mitigation Recommendation Summary

Table 15 provides a summary of the community surveys and outlines a prioritized approach to specific mitigation and related hazard reduction recommendations.

Table 15. Community Mitigation Recommendation Summary

Hazard Rating	WUI	HAZARD REDUCTION RECOMMENDATIONS HIGHER PRIORITY LOWER					
EXTREME	Burke	Improve and maintain defensible space where needed. Coordinate efforts to increase effectiveness & compliment adjacent forest treatment units	Reduce structural ignitability through phased building improvements, new construction, and seasonal maintenance	Improve emergency access improvements on Fischer Rd.	Seasonal road margin maintenance through mowing and conifer reproduction reduction	Timber thinning treatment units identified for stands north of Burke Rd. and along east margin of twin Spruce Rd.	Installation of emergency water supply at Joannie Rd. and Twin Spruce rd.
	Wondervu	Improve and maintain defensible space where needed. Coordinate efforts to increase effectiveness & compliment adjacent forest treatment units	Reduce structural ignitability through phased building improvements, new construction, and seasonal maintenance	Improve emergency access, grade and widen roads, establish turnarounds at dead ends	Seasonal road margin maintenance including mowing and conifer reproduction reduction	Timber thinning treatment units identified for stands around community margins	Install static emergency water supply in the Wondervu Café area
HIGH	Nadm	Improve and maintain defensible space where needed.	Reduce structural ignitability through phased building improvements, new construction, and seasonal maintenance	Develop and maintain shaded fuelbreaks along primary and secondary evacuation routes and primary residential access routes	Timber thinning treatment units identified for stands for stands surrounding the subdivision	Investigate and establish secondary evacuation route to Camp Eden	Install static emergency water supply at Nadm and Twin Spruce Dr.

Hazard Rating	WUI	HAZARD REDUCTION RECOMMENDATIONS HIGHER PRIORITY LOWER					
	Chute Road	Improve and maintain defensible space where needed.	Reduce structural ignitability through phased building improvements, new construction, and seasonal maintenance	Develop and maintain shaded fuelbreaks along forested portions of Gross Dam Rd. and railroad right of way	Timber thinning treatment units identified for stands upslope from railroad along Chute Rd. and Tunnel 19 Rd.	Potential safety zone survey in meadow off Gross Dam Rd. and railroad crossing	
	Lyttle Dowdle	Improve and maintain defensible space where needed. Coordinate efforts to increase effectiveness & compliment adjacent forest treatment units	Reduce structural ignitability through phased building improvements, new construction, and seasonal maintenance	Develop and maintain shaded fuelbreaks along primary evacuation routes and primary residential access routes	Timber thinning treatment units identified for stands for stands surrounding the subdivision	Qualified helicopter dip site survey for pond northwest of subdivision	
	Camp Eden	Improve and maintain defensible space where needed. Coordinate efforts to increase effectiveness & compliment adjacent forest treatment units	Reduce structural ignitability through phased building improvements, new construction, and seasonal maintenance	Develop and maintain shaded fuelbreaks along primary and secondary evacuation routes and primary residential access routes	Survey emergency access restrictions and improve turnarounds where needed	Install static emergency water supply near Camp Eden Rd. and Coal Creel Canyon D	Qualified helicopter dip site survey for lake near Highlander Rd..
	Coal Creek Heights	Improve and maintain defensible space where needed. Coordinate efforts to increase effectiveness & compliment adjacent forest treatment units	Reduce structural ignitability through phased building improvements, new construction, and seasonal maintenance	Develop and maintain shaded fuelbreaks along primary and secondary evacuation routes and primary residential access routes	Timber thinning treatment units identified for stands for several stands surrounding and within the subdivision	Survey emergency access restrictions and improve turnarounds where needed	Investigate and formalize if possible secondary emergency evacuation to the Hilltop subdivision
	Stanton	Improve and maintain defensible space where needed. Coordinate efforts to increase effectiveness & compliment adjacent forest treatment units	Reduce structural ignitability through phased building improvements, new construction, and seasonal maintenance	Develop and maintain shaded fuelbreaks along primary and secondary evacuation routes and primary residential access routes	Timber thinning treatment units identified for stands for several stands west and northwest of the subdivision	Investigate and formalize if possible secondary emergency evacuation to the Hilltop subdivision	Potential safety zone survey in meadows north of subdivisionand meadows south of Gap Rd.

Hazard Rating	WUI	HAZARD REDUCTION RECOMMENDATIONS HIGHER PRIORITY LOWER					
	Crescent Park	Improve and maintain defensible space where needed. Coordinate efforts to increase effectiveness & compliment adjacent forest treatment units	Reduce structural ignitability through phased building improvements, new construction, and seasonal maintenance	Develop and maintain shaded fuelbreaks along upper Spruce Canyon Dr., forested portions of Gross Dam Rd., and forested residential access routes	Timber thinning treatment units identified for stands for stands north and east of Spruce Canyon Dr. and Butte Dr.	Investigate and formalize if possible secondary emergency evacuation from Seaver Dr. to Hollings Dr.	Potential safety zone survey in meadow at Hollings Dr. and Gross Dam Rd.
	Copperdale	Improve and maintain defensible space where needed. Coordinate efforts to increase effectiveness & compliment adjacent forest treatment units	Reduce structural ignitability through phased building improvements, new construction, and seasonal maintenance	Develop and maintain shaded fuelbreaks along primary evacuation routes and primary residential access routes	Timber thinning treatment units identified for stands for stands along subdivision margins and stands between areas of high density homes		
	Miramonte	Improve and maintain defensible space where needed.	Reduce structural ignitability through phased building improvements, new construction, and seasonal maintenance	Develop and maintain shaded fuelbreaks along upper and lower Miramonte Rds. and forested portions of the railroad right of way	Timber thinning treatment units identified for stands for stands adjacent to the subdivision and in the vicinity of the railroad tunnel		
	Vonnie Claire	Improve and maintain defensible space where needed. Coordinate efforts to increase effectiveness & compliment adjacent forest treatment units	Reduce structural ignitability through phased building improvements, new construction, and seasonal maintenance	Develop and maintain shaded fuelbreaks along forested portions of evacuation routes and primary residential access routes	Timber thinning treatment units identified for stands for stands along subdivision margins	Establish emergency access from Vonnie Claire to Crescent Lake Rd.	Potential safety zone survey in meadow central to the subdivision
Moderate	Hilltop	Improve and maintain defensible space where needed. Coordinate efforts to increase effectiveness & compliment adjacent forest treatment units	Reduce structural ignitability through phased building improvements, new construction, and seasonal maintenance	Seasonal road margin maintenance through mowing and conifer reproduction reduction	Develop and maintain shaded fuelbreaks along forested portions of Ranch Elsie Rd. and Hilltop Dr.	Timber thinning treatment units identified for stands on the north and west margins of the subdivision	

Hazard Rating	WUI	HAZARD REDUCTION RECOMMENDATIONS HIGHER PRIORITY LOWER					
	Blue Mountain	Improve and maintain defensible space where needed. Coordinate efforts to increase effectiveness & compliment adjacent forest treatment units	Reduce structural ignitability through phased building improvements, new construction, and seasonal maintenance	Seasonal road margin maintenance through mowing and conifer reproduction reduction	Secondary emergency access/evac preplanning and access improvements	Shaded fuelbreak along ridge on Eastridge Rd	Timber thinning treatment units identified for stands at south end of valley

5.3 Treatment Options

Fuel treatment recommendations for the CCCFPD focus primarily on reducing structural ignitability, developing defensible space around structures, creating shaded fuel breaks along primary access routes and strategic thinning in timber stands that pose a threat to subdivisions. Timber stand thinning and shaded fuelbreaks have also been recommended along forest portions of the railroad that bisects the district to better guard against the constant threat of accidental ignition along that extensive right of way. Power line right of ways are also identified as existing fuels breaks that should be improved to serve as a more effective wildfire buffer. Each of the recommended fuel mitigation projects can be achieved by a variety of methods (Table 16).

Selecting the most appropriate, cost-effective option is an important planning step. This brief synopsis of treatment options and cost estimates is provided to assist in this process. Cost estimates for treatments should be considered as very general guidelines. Timber treatment costs can vary tremendously based on project complexity, but generally run $300 to $1,200 per acre depending upon:

- Type of fuel;
- Diameter of materials;
- Acreage of project;
- Steepness of slope;
- Density of fuels;
- Proximity to structures;
- Access; and
- Transportation costs.

It is imperative that implementers plan for the long-term monitoring and maintenance of all treatments. Post-treatment rehabilitation including seeding with native plants and erosion control may be necessary.

Table 16. Treatment Methods

Treatment	Estimated Cost	Comments
Machine Mowing	$90 - $200 per acre	▪ Appropriate for large, flat grassy areas on relatively flat topography.
Prescribed Fire	$75 - $300 per acre	▪ Can be very cost effective. ▪ Ecologically beneficial. ▪ Can be used as training opportunities for firefighters. ▪ Cost varies with complexity. ▪ Carries risk of escape, which may be unacceptable in some WUI areas. ▪ Unreliable scheduling due to weather and smoke management constraints.
Brush Mastication	$300 - $500 per acre	▪ Brush species (Gamble oak in particular) tend to resprout vigorously after mechanical treatment. ▪ Follow-up treatments with herbicides, fire, grazing, or further mechanical treatments are typically necessary. ▪ Mastication tends to be less expensive than manual treatment and eliminates disposal issues.
Timber Mastication	$300 - $1,200 per acre	▪ Materials up to 10 inches in diameter and slopes up to 30 percent can be treated. ▪ Eliminates disposal issues. ▪ Environmental impacts of residue being left onsite are still under study.
Manual Treatment with Chipping or Pile Burning	$300 - $1,200 per acre	▪ Allows for removal of merchantable materials or firewood in timber. ▪ Requires chipping, hauling, and pile burning of slash.
Feller Buncher	$750 and up per acre	▪ Mechanical treatment on slopes over 30 percent of materials over 10 inches in diameter may require a feller buncher rather than a masticator. ▪ Costs tend to be considerably higher than mastication. ▪ May allow for removal of merchantable material.

5.4 Project Support

This section provides information that will be helpful in planning and preparing for fuels mitigation projects.

Funding and Grants: Grant funding support is often a necessary component of a fuels treatment project and can facilitate recommended mitigation on both private and public lands. In addition to opportunities that may be available through Jefferson County Division of Emergency Management, CSFS (Gallamore, 2008) has summarized the following available resources:

CSFS Eligible Landowner Assistance Programs and contingencies (5/23/07):

- Landowners apply through CSFS District Offices unless noted below;
- Applications approved when funds are available throughout the year;
- Matching expenses or in-kind activities by landowner are generally required; and
- Grant availability is subject to continued funding from Federal and State Government.

1. **WUI Incentives** – Wildland Urban Interface for fuels reduction.

2. **FLEP** – Forest Land Enhancement Program for multiple conservation practices *(applications are usually handled through local Soil & Water Conservation District).*
3. **I & D Prevention and Suppression** – Bark Beetle – Forest Health.
4. **FRFTP** – Front Range Fuels Treatment Partnership for fuels reduction.
5. **STEVENS'** – Stevens' or "Companion" funds for fuels reduction projects on non-federal lands that may be threatened by burning on US Forest Service lands *(these funds may be "no match" in some cases).*

CSFS Assistance Programs – Communities and Agencies and (3/20/08):

- Cooperators, communities, organizations, agencies – apply through CSFS District Offices;
- Applications received and approved during the identified funding windows;
- Matching expenses or in-kind activities by applicants are generally required
- Grant availability is subject to continued funding from Federal and State Government; and
- Applications for activities listed in current CWPPs are normally ranked highest for funding.

1. **WUI Incentives** – Wildland Urban Interface for fuels reduction – *Application period is August, for grants awarded the following May; grants are usually for a one-year period ending September 30th of year following award.*
2. **CWPP Implementation** (CSFS/SFA) - *Application period is January or May, for grants awarded that year; grants usually must be completed by September 30th of the awarded year.*
3. **Colorado Community Forest Restoration** *(HB 07-1130) - Application period is July-August, for grants awarded that year; grants are usually for a two-year period ending June 30th of 2nd year following award; subject to continued funding through Colorado Legislature.*
4. **FRFTP** – Front Range Fuels Treatment Partnership for fuels reduction - *Application period is January or May, for grants awarded that year; grants usually must be completed within one to two years of the award date.*
5. **STEVENS'** – Stevens' or "Companion" funds for fuels reduction projects on non-federal lands that may be threatened by burning on US Forest Service lands *(these funds may be "no match" in some cases) Application period is January or May, for grants awarded that year; grants usually must be completed within one to two years of the award date.*
6. **I & D Prevention and Suppression** – Bark Beetle – Forest Health - *Application period is January or May, for grants awarded that year; grants usually must be completed within one to two years of the award date.*

For additional grants and grant application assistance visit:
Rocky Mountain Wildland Fire Information - Grant Database:
http://www.rockymountainwildlandfire.info/grants.htm
Grant Writing Handbook: http://www.theideabank.com/freeguide.html

Public Land Planning: Public lands within the assessment area include those managed by Jefferson County Open Space, Boulder County Open Space, Denver Water Board, and Colorado Sate Parks. The CWPP development process is designed to facilitate dialog with these agencies and coordinate public and private wildfire and forest management strategies. As the CWPP strategic plan is implemented, dialogue and collaboration should be maintained with these agencies to coordinate strategies and treatments, and make adjustments if necessary.

Regulatory Support: One of the major issues confronting defensible space and hazardous fuels mitigation is the need for ongoing maintenance. Treatment projects in timber or brush fuels have an effective life span of approximately 10 to 15 years before regrowth fuel loads again become hazardous. On the other hand, defensible buffers and fuelbreaks mowed in grasslands are beneficial only through that growing season. For defensible space to be consistently successful some regulatory impetus is recommended. Jefferson County addresses the need for regulatory support of wildfire hazard reduction on forested lands through county zoning regulations. Subsection G addresses defensible space specification and maintenance;

Section 50: W-H Wildfire Overlay District (orig. 1-27-76; am. 7-11-06) provides basic landuse and mitigation guidelines; ***Subsection G. Maintenance Of Defensible Space and Associated Fuel Break Thinning;*** *Defensible space and fuel break thinning work must be completed and maintained to the standards described in the Colorado State University's Cooperative Extension Fact Sheet 6.302. The responsibility for maintaining defensible space and associated fuel break thinning lies with the landowner. Noncompliance with defensible space maintenance standards will be enforced as a Zoning Violation, as specified in the Enforcement and Administrative Exceptions Section of this Zoning Resolution. (orig. 6- 18-02; am. 7-11-06)*

6 EMERGENCY OPERATIONS

6.1 Wildfire Response Capability and Recommendations

The CCCFPD is served by an all-volunteer fire department. The department has 40 active members who provide emergency fire, medical, hazardous materials and rescue services, and 20 members of a wildland team who respond only to local wildland fires. In addition to the district's Fire Chief and Assistant Chief/Wildland Coordinator, the CCCFD maintains four battalion chiefs who oversee operations for each of the district's four stations. Current inventory includes five structural engines, two water tankers, three rescue trucks, one ambulance, two brush trucks, one wildland van, one utility vehicle, one zodiac boat (stationed at Gross Reservoir), one ATV, and one command vehicle.

In addition to the challenges inherent to serving large residential and recreational populations in a rugged high fire hazard area, the CCCFPD is additionally challenged by its unique tri-county location that includes Jefferson, Boulder, and Gilpin Counties. In order to alleviate possible conflicting 911 call dispatching, all 911 calls are forwarded to the Boulder County dispatch center and relayed to fire district personnel through pager activation on the Boulder county fire and medical emergency frequency.

Mutual Aid

The CCCFD is a participant in the Jefferson County Intergovernmental Mutual Aid Agreement (2/10/93), which provides a mutual aid agreement between most, but not all, fire districts in the Jefferson County, and includes the CSFS and USFS. Jefferson County maintains a certified Type 3 Incident Management Team (IMT) for additional overhead support in the event of a large-scale incident. CCCFD also maintains mutual aid agreements with adjacent fire districts in Boulder and Gilpin Counties including Rocky Mountain Fire Authority, and the Timberline Fire Authority, formerly the Colorado Sierra and High County Fire Districts.

Suppression Requirements

For illustration purposes, Table 17 compares initial attack capabilities for an average engine crew as determined from the "Line Production Rates for Initial Action by Engine Crews" charts (NWCG 2004) with predicted fire rates of spread under 50th percentile climatic conditions as determined from the Corral Creek RAWS data. These are generalized figures provided to illustrate that potential spread rates of fires in the district have the capacity to outpace the capabilities of the suppression resources that are typically available to the district.

Table 17. Wildland Fire Production Rates vs. Fire Growth

Initial Attack Fire Line Production Rates Using 3-Person Engine Crew			
FBFM	**Predicted Fireline Production Rates (chains/hr)**	**Fire Acreage and Perimeter (chains) After First Hour**	**Predicted Fire Spread (chains/hr) Under Average Conditions**
1 – Short grass	24	222 acres/183 chains	72
2 – Grass with Timber/Shrub Overstory	15	47 acres/84 chains	33
4 – Mature Brush	8	16 acres/157 chains	61
5 – Young Brush	12	15 acres/47 chains	19
6 – Intermediate or Dormant Brush	12	39 acres/77 chains	30
8 – Closed or Short-Needle Timber Litter – Light Fuel Load	15	0.1 acres/5 chains	2
9 – Hardwood or Long-Needle or Timber Litter – Moderate Ground Fuel	12	2 acres/18 chains	7
10 – Mature/Overstory Timber and Understory	12	2 acres/18 chains	7

1 chain = 66 feet. Source for fire size and rate of spread: BehavePlus Fire Behavior Modeling System

Table 18 is based on the time a crew can prepare a structure for a wildland fire using a Type-1 engine. The accepted standard is 20 minutes for a four-firefighter crew and 30 minutes for a three-firefighter crew.

Table 18. Structural Protection Rates

Structural Protection Rates Per Hour Using Type-1 Engine		
Firefighters	**Rates**	**Total Structures per Hour**
3	30 minutes/structure	2
4	20 minutes/structure	3

Source for production rates: NWCG 2004. *Fireline Handbook*

The aforementioned performance standards included in the plan are designed to address these suppression needs. As with the response targets, these production standards should be trained to and monitored for attainability.

6.2 Emergency Procedures and Evacuation Routes

In the event that the Jefferson County or Boulder County Sheriff orders a community to evacuate because of threatening wildfire, residents should leave in an orderly and timely

manner. The Sheriff would proclaim the preferred evacuation routes and safe destination sites. The need to evacuate may be communicated by telephone, media, and/or direct contact from emergency personnel. However, the need for evacuation can occur without notice when conditions for wildfire are favorable. Homeowners should be prepared in advance to evacuate without formal notice. Human safety is the number one concern in an evacuation.

Before residents leave they should take every precaution to reduce the chance of structure loss as time allows. Actions could include thoroughly irrigating the defensible space, watering down the roof, and removing all debris from rain gutters. Ensure all flammable materials are at least 30 feet from the house, such as woodpiles, leaves, debris, and patio furniture. Windows and doors should be closed but not locked. Other openings should be covered. A ladder should be placed for roof access by firefighters. A fully charged hose that reaches around the house should also be available for firefighter use. Porch lights should be left on to allow firefighters to find homes at night.

Families should have meeting locations in place and phone numbers to call in case family members are separated. Families should take with them important papers, documents, pets, food, water, and other essential items. The exterior of the house should be monitored for smoke for several days after residents return. Embers may lodge in small cracks and crevices and smolder for several hours or days before flaming.

Specific evacuation recommendations are proposed Section 5.2, Subsection – *Access* and in more detail in Appendix C. Approved evacuation plans should outline available evacuation centers and the procedures to activate them. Large animal evacuation centers also need to be identified. Finalized plans should be documented, coordinated with Jefferson County Division of Emergency Management, Boulder County Emergency Services and other affected FPDs, and conveyed to residents as a part of public outreach efforts.

7 CCCFPD CWPP MONITORING AND EVALUATION

7.1 CWPP Adoption

The CCCFPD CWPP is a strategic planning document that is developed and approved by the Core Team. An important component of the development process includes building a stakeholder group that will move the plan forward, implement prioritized recommendations, and maintain the CWPP as the characteristics of the WUI change over time. Organizing and maintaining this team is often the most challenging component of the CWPP process. It is, however, essential in the process of converting the CWPP from a strategic plan into action.

This team will oversee the implementation and maintenance of the CWPP by working with fire authorities, community organizations, private landowners, and public agencies to coordinate and implement hazardous fuels treatment projects management and other mitigation projects. Building partnerships among neighborhood-based organizations, fire protection authorities, local governments, public land management agencies, and private landowners is necessary in identifying and prioritizing measures to reduce wildfire risk. Maintaining this cooperation is a long-term effort that requires the commitment of all partners involved. The CWPP encourages citizens to take an active role in identifying needs, developing strategies, and implementing solutions to address wildfire risk by assisting with the development of local community wildfire plans and participating in county-wide fire prevention activities.

Public meetings are a planned component of the CWPP development process. Community meetings were held to explain the CWPP process and intent, present the findings and recommendations of the CWPP investigations to the public, and solicit input for the final CWPP.

Questionnaires were distributed at the meetings and through direct mailings in a further effort to measure public perception of risk and values-at-risk and to assess public tolerance for various mitigation practices. Questionnaire feedback is found in Appendix E.

CWPP documentation is posted on Jefferson County's Emergency Management website to encourage public review and comment.

The final draft of the CCCFPD CWPP was reviewed by the Core Team, composed of representatives from the CCCFD, Jefferson County Division of Emergency Management, and CSFS.

The CCCFPD CWPP provides the foundation and resources for understanding wildfire risk and presents opportunities to reduce potential losses from wildfire. Individual neighborhoods and private landowners can take action by developing specific fire plans or by participating in district-wide activities for prevention and protection.

The HFRA authority for the CWPP requires adoption of this plan, as does the FEMA Disaster Mitigation Act of 2000. With formal adoption by the Core Team, participating agencies and WUI neighborhoods will be competitive for available hazardous fuels and non-fuels mitigation funding that may assist with plan implementation. Furthermore, adoption of this plan highlights a collaborative planning and development process between the CCCFPD, local government, public agencies, and neighborhood organizations.

7.2 Sustaining Community Wildfire Protection Plan Efforts

A CWPP can serve as the foundation for a safer and healthier WUI through hazard assessment and strategic planning focusing on the threat of wildfire. The mitigation strategies outlined in this plan will greatly reduce that risk, but only if implemented. Converting strategy into action is the key to achieving this important goal.

Communities can be made safer, and this CWPP has outlined realistic measures to achieve that goal. The CWPP process encourages homeowners to take an active role as fuel treatment strategies are developed and prioritized. Ownership of CWPP implementation at that same local level is the most effective means to achieving successful results and sustaining the effort from year to year.

Proactive neighborhoods can seek support and guidance through a variety of local, state, and federal resources identified in this plan including the CSFS, Jefferson County Division of Emergency Management, and CCCFPD.

7.3 Community Wildfire Protection Plan Oversight, Monitoring, and Evaluation

Maintaining the momentum created by this process is critical to successful implementation and ongoing community wildfire hazard reduction. Ownership of this responsibility lies with each neighborhood and HOA identified in the CWPP.

As wildfire hazard reduction efforts are implemented over time and the characteristics of particular WUIs change, neighborhoods may wish to reassess particular areas and update the findings of the original CWPP. Monitoring the progress of project implementation and evaluating the effectiveness of treatments are important components of CWPP oversight and maintenance. The assessment methodology utilized in this plan is a standardized, well-documented hazard and risk survey approach that is designed to provide a benchmark against which future assessments can be compared. Successes, challenges, and new concerns should be noted and subsequently guide any modifications to the CWPP that better accommodate the changing landscape.

Stakeholders will be responsible for CWPP monitoring, evaluation, and modification through regular meetings, and coordination with CCCFPD, neighborhood communities, and HOAs. Monitoring is the collection and analysis of information acquired over time to assist with decision making and accountability and to provide the basis for change. Evaluation includes analysis of the effectiveness of past fuels reduction and non-fuels mitigation projects, as well as recent wildfire suppression efforts. Monitoring and

evaluation measures should progress over time in a way that will determine whether the CWPP goals and objectives are being attained (Table 19).

Table 19. Monitoring and Evaluation Tasks

Objective	Tasks	Timeline
Risk Assessment	▪ Use reliable data that is compatible among partner agencies. ▪ Update the CWPP as new information becomes available. ▪ Continue to asses wildfire risk to communities and private landowners.	Annual Annual Biennial
Fuels Reduction	▪ Identify and prioritize fuels treatment projects on public land through development of a 5-year plan. ▪ Track fuels reduction projects and defensible space projects on private land. ▪ Monitor fuels reduction projects on evacuation routes. ▪ Track grants and other funding sources and make appropriate application.	Annual Biennial Annual Ongoing
Emergency Management	▪ Review suitability and the need for fuels reduction along evacuation routes.	Annual
Public Outreach	▪ Plan and hold Firewise education week. ▪ Provide Firewise pamphlets at public events. ▪ Evaluate techniques used to motivate and educate private landowners.	Annual Annual Annual

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APPENDIX A
PROJECT MAPS

APPENDIX B
NFPA WILDLAND FIRE RISK AND HAZARD SEVERITY ASSESSMENT FORM 1144

WILDLAND FIRE RISK AND HAZARD SEVERITY ASSESSMENT FORM

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

Element	Points	
A. Means of Access		
1. Ingress and egress		
a. Two or more roads in/out	0	_____
b. One road in/out	7	_____
2. Road width		
a. ≥7.3 m (24 ft)	0	_____
b. ≥6.1 m (20 ft) and <7.3 m (24 ft)	2	_____
c. <6.1 m (20 ft)	4	_____
3. All-season road condition		
a. Surfaced road, grade <5%	0	_____
b. Surfaced road, grade >5%	2	_____
c. Non-surfaced road, grade <5%	2	_____
d. Non-surfaced road, grade >5%	5	_____
e. Other than all-season	7	_____
4. Fire Service Access		
a. ≤91.4 m (300 ft) with turnaround	0	_____
b. >91.4 m (300 ft) with turnaround	2	_____
c. <91.4 m (300 ft) with no turnaround	4	_____
d. ≥91.4 m (300 ft) with no turnaround	5	_____
5. Street signs		
a. Present [10.2 cm (4 in.) in size and reflectorized]	0	_____
b. Not present	5	_____
B. Vegetation (Fuel Models)		
1. Characteristics of predominate vegetation within 91.4 m (300 ft)		
a. Light (e.g., grasses, forbs, sawgrasses, and tundra) NFDRS Fuel Models A, C, L, N, S, and T	5	_____
b. Medium (e.g., light brush and small trees) NFDRS Fuel Models D, E, F, H, P, Q, and U	10	_____
c. Heavy (e.g., dense brush, timber, and hardwoods) NFDRS Fuel Models B, G, and O	20	_____
d. Slash (e.g., timber harvesting residue) NFDRS Fuel Models J, K, and L	25	_____
2. Defensible space		
a. More than 30.48 m (100 ft) of vegetation treatment from the structure(s)	1	_____
b. 21.6 m to 30.48 m (71 ft to 100 ft) of vegetation treatment from the structure(s)	3	_____
c. 9.14 m to 21.3 m (30 ft to 70 ft) of vegetation treatment from the structure(s)	10	_____
d. <9.14 m (30 ft) of vegetation treatment from the structure(s)	25	_____
C. Topography Within 91.4 m (300 ft) of Structure(s)		
1. Slope <9%	1	_____
2. Slope 10% to 20%	4	_____
3. Slope 21% to 30%	7	_____
4. Slope 31% to 40%	8	_____
5. Slope >41%	10	_____

(NFPA 1144, 1 of 2)

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Element	Points	
D. Additional Rating Factors (rate all that apply)		
1. Topographical features that adversely affect wildland fire behavior	0–5	_____
2. Areas with a history of higher fire occurrence than surrounding areas due to special situations (e.g., heavy lightning, railroads, escaped debris burning, and arson)	0–5	_____
3. Areas that are periodically exposed to unusually severe fire weather and strong dry winds	0–5	_____
4. Separation of adjacent structures that can contribute to fire spread	0–5	_____
E. Roofing Assembly		
1. Class A roof	0	_____
2. Class B roof	3	_____
3. Class C roof	15	_____
4. Nonrated	25	_____
F. Building Construction		
1. Materials (predominate)		
a. Noncombustible/fire-resistive siding, eaves, and deck (*see Chapter 8*)	0	_____
b. Noncombustible/fire-resistive siding and combustible deck	5	_____
c. Combustible siding and deck	10	_____
2. Building setback relative to slopes of 30% or more		
a. ≥9.14 m (30 ft) to slope	1	_____
b. <9.14 m (30 ft) to slope	5	_____
G. Available Fire Protection		
1. Water source availability		
a. Pressurized water source availability		
1892.7 L/min (500 gpm) hydrants ≤304.8 m (1000 ft) apart	0	_____
946.4 L/min (250 gpm) hydrants ≤304.8 m (1000 ft) apart	1	_____
b. Nonpressurized water source availability (off site)		
≥946.4 L/min (250 gpm) continuous for 2 hours	3	_____
<946.4 L/min (250 gpm) continuous for 2 hours	5	_____
c. Water unavailable	10	_____
2. Organized response resources		
a. Station ≤8 km (5 mi.) from structure	1	_____
b. Station >8 km (5 mi.) from structure	3	_____
3. Fixed fire protection		
a. NFPA 13, 13R, 13D sprinkler system	0	_____
b. None	5	_____
H. Placement of Gas and Electric Utilities		
1. Both underground	0	_____
2. One underground, one aboveground	3	_____
3. Both aboveground	5	_____
I. Totals for Home or Subdivision (Total of all points)		

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

(NFPA 1144, 2 of 2)

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1144 digital field survey form example:

Wildfire Fire Risk and Hazard Severity Field Form NFPA 1144		
Community		**Rating**
Means of Access		
Ingress and Egress		0
	2 or more roads in & out	0
	One road in & out	7
Road Width		0
	> 24 ft	0
	> 20 ft < 24 ft	2
	< 20 ft	4
All-Season Road Condition		0
	Surfaced Road, grade <5%	0
	Surfaced Road, grade >5%	2
	Non-surfaced Road, grade <5%	2
	Non-surfaced Road, grade >5%	5
	Other than all season	7
Fire Service Access		0
	< 300 ft with turnaround	0
	> 300 ft with turnaround	2
	< 300 ft with no turnaround	4
	> 300 ft with no turnaround	5
Street Signs (predominent)		0
	Present - reflective	0
	Not present	5
Vegetation (fuel models)		
Characteristics of predominent veg w/in 300 ft		0
	Light - 1, 2, 3	5
	Medium - 5, 6, 7, 8, 9	10
	Heavy - 4, 10	20
	Slash - 11, 12, 13	25
Defensible Space - vegetation treatment around structure		0
	> 100 ft around structure	1
	> 70 ft < 100 ft around structure	3
	> 30 ft < 70 ft around structure	10
	< 30 ft around structure	25
Topography Within 300 ft of Structures		
Slope		0
	< 9%	1
	10% to 20%	4
	21% to 30%	7
	31% to 40%	8
	> 41%	10
Additional Rating Factors (rate all that apply)		
Additional factors		0
	Topographic feaures that adversely affect fire behavior (0 - 5)	0
	Areas with a history of high fire occurance - ignition potential (0 - 5)	0
	Severe fire weather potential (0 - 5)	0
	Separation of adjacent structures contributing to fire spread (0 - 5)	0
Roofing Assembly		
Roofing		0
	Class A	0
	Class B	3
	Class C	15
	Unrated	25
Building construction		
Materials (predominent)		0
	Non-combustible fire-resistive siding, eaves and deck	0
	Non-combustible siding, eaves and combustible deck	5
	Combustible siding and deck	15
Building set-back relative to slope of 30% or more		0
	> 30 ft to slope	1
	< 30 ft to slope	5
Available Fire Protection		
Water source availability		0
	Hydrants 500 gpm < 1000 ft apart	0
	Hydrants 250 gpm < 1000 ft apart	1
	Non-pressurized water source > 250 gpm for 2 hours	3
	Non-pressurized water source < 250 gpm for 2 hours	5
	Water unavailable	10
Organized response resources		0
	Station < 5 mi from structure	1
	Station > 5 mi from structure	3
Fixed fire protection		0
	NFPA 13, 13R, 13D sprinkler system	0
	None	5
Placement of gas and Electric Utilities		
Utilities		0
	Both underground	0
	One above, one below	3
	Both above ground	5
Totals for home or subdivision		**0**
Hazard Rating Scale		
< 40 LOW		
> 40 MODERATE		
> 70 HIGH		
> 112 EXTREME		

APPENDIX C
COMMUNITY/NEIGHBORHOOD/SUBDIVISION HAZARD AND RISK SURVEY SUMMARIES

Blue Mountain

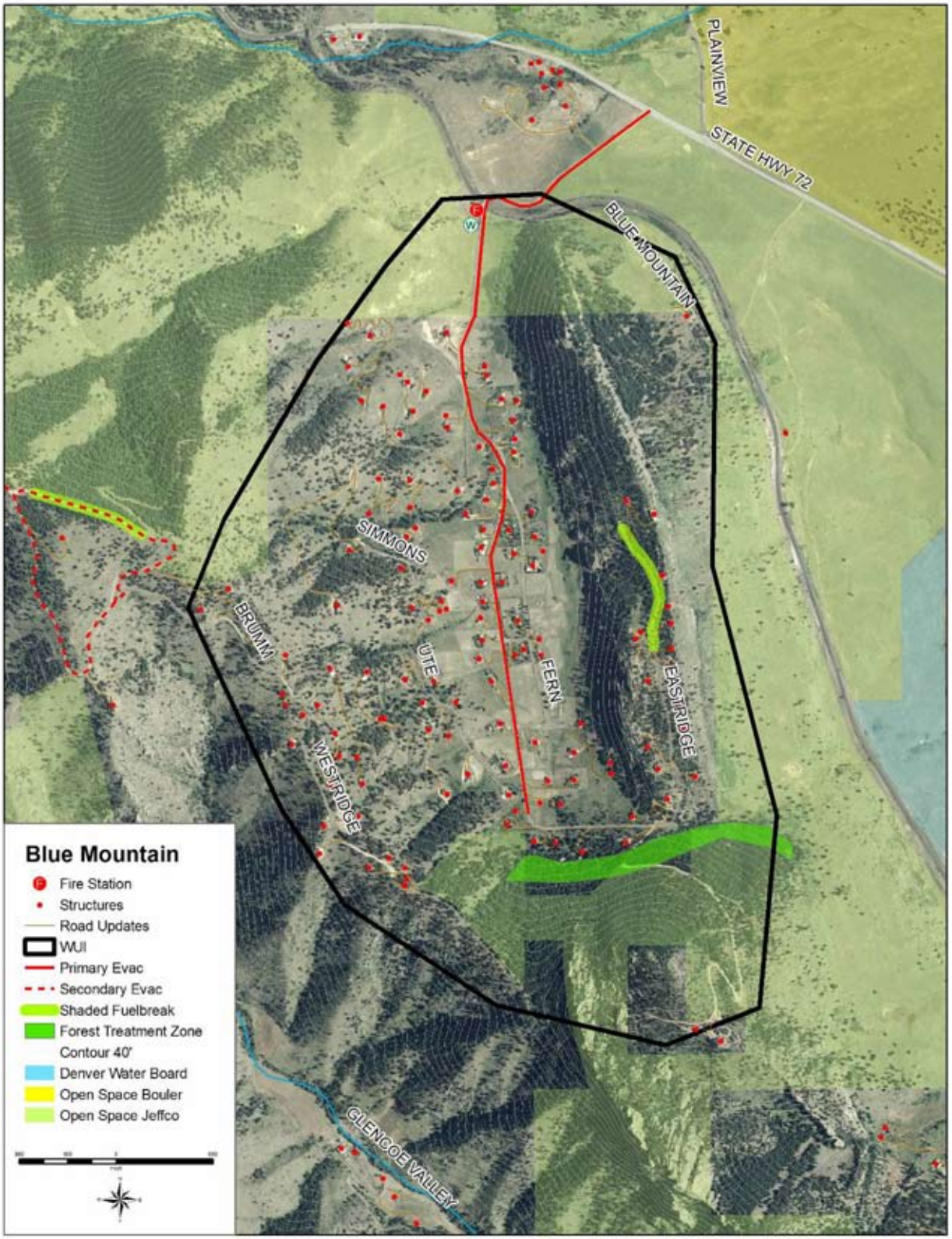
Wildfire Fire Risk and Hazard Severity Form NFPA 1144	
Blue Mountain	
WUI Hazard Rating	moderate
Means of Access	
Ingress and Egress	5
2 or more roads in & out	0
One road in & out	7
Road Width	1
> 24 ft	0
> 20 ft < 24 ft	2
< 20 ft	4
All-Season Road Condition	3
Surfaced Road, grade <5%	0
Surfaced Road, grade >5%	2
Non-surfaced Road, grade <5%	2
Non-surfaced Road, grade >5%	5
Other than all season	7
Fire Service Access	2
< 300 ft with turnaround	0
> 300 ft with turnaround	2
< 300 ft with no turnaround	4
> 300 ft with no turnaround	5
Street Signs (predominent)	0
Present - reflective	0
Not present	5
Vegetation (fire behavior fuel models)	
Characteristics of predominent veg w/in 300 ft	6
Light - 1, 2, 3	5
Medium - 5, 6, 7, 8, 9	10
Heavy - 4, 10	20
Slash - 11, 12, 13	25
Defensible Space - vegetation treatment around structure	2
> 100 ft around structure	1
> 70 ft < 100 ft around structure	3
> 30 ft < 70 ft around structure	10
< 30 ft around structure	25
Topography Within 300 ft of Structures	
Slope	5
< 9%	1
10% to 20%	4
21% to 30%	7
31% to 40%	8
> 41%	10
Additional Rating Factors (rate all that apply)	
Additional factors	10
Topographic feaures that adversely affect fire behavior (0 - 5)	3
Areas with a history of high fire occurance - ignition potential (0 - 5)	3
Severe fire weather potential (0 - 5)	3
Separation of adjacent structures contributing to fire spread (0 - 5)	1
Roofing Assembly	
Roofing	2
Class A	0
Class B	3
Class C	15
Unrated	25
Building construction	
Materials (predominent)	10
Non-combustible fire-resistive siding, eaves and deck	0
Non-combustible siding, eaves and combustible deck	5
Combustible siding and deck	15
Building set-back relative to slope of 30% or more	2
> 30 ft to slope	1
< 30 ft to slope	5
Available Fire Protection	
Water source availability	5
Hydrants 500 gpm < 1000 ft apart	0
Hydrants 250 gpm < 1000 ft apart	1
Non-pressurized water source > 250 gpm for 2 hours	3
Non-pressurized water source < 250 gpm for 2 hours	5
Water unavailable	10
Organized response resources	1
Station < 5 mi from structure	1
Station > 5 mi from structure	3
Fixed fire protection	5
NFPA 13, 13R, 13D sprinkler system	0
None	5
Placement of gas and Electric Utilities	
Utilities	5
Both underground	0
One above, one below	3
Both above ground	5
Totals for home or subdivision	64
Hazard Rating Scale	
< 40 LOW	
> 40 MODERATE	
> 70 HIGH	
> 112 EXTREME	

Description: 125 observed structures; open valley meadow in a box canyon that strikes north; steep bounding slopes to the east, south, and west; dense conifer stands on north and west aspects, open conifer and grass on the east aspect, facing the central valley, which is primarily irrigated meadow and grazing land; primary access is paved and 2 lane; secondary roads are 1 ½ to 2 lane and groomed; potential secondary access through Brumm Rd. is private and gated but provides alternative access to Coal Creek Canyon Drive; 2 long cul de sacs, both have turnarounds; street signage and home addressing standard and reflective; 1 to 5 acre lots most common; defensible space – 8% have < 30', 7% have 30' to 70', 27% have 70' to 100', 59% have > 100'; roofing – 2% wood shake, 81% asphalt, 17% non-combustible; construction – 81% of structures have combustible siding; above ground utilities, subdivision is served by a pressurized water supply and a hydrant is located at the fire station.

Vegetation: Irrigated grassy meadows of FBFM 1 characterize broad valley floor; grassy slopes and open stands of ponderosa pine, FBFM 1 & 2, dominate the east facing slopes along Westridge Dr.; dense stands of ponderosa pine and mixed conifer, FBFM 8 & 9, characterize the north and west facing slopes of Eastridge Dr.

Recommendations:

- Reduce structural ignitability through building upgrades and seasonal maintenance.
- Improve and maintain defensible space where needed and coordinate throughout the neighborhood to accommodate smaller lots and enhance effectiveness of adjacent forest treatments.
- Seasonal road margin maintenance including mowing and conifer reproduction reduction.
- Forest thinning recommended at the south end of the main valley road, along the base of the ridge, breaking continuity of the dense mixed conifer stand adjacent to structures.
- Implement shaded fuel break along forested zone of Eastridge Dr.
- Seek necessary emergency access permissions through Brumm Rd and implement necessary road and shaded fuel break improvements.


PLAINVIEW
STATE HWY 72
BLUE MOUNTAIN
SIMMONS
BRUMM
UTE
FERN
EASTRIDGE
WESTRIDGE
GLENCOE VALLEY
Blue Mountain
Fire Station
Structures
Road Updates
WUI
Primary Evac
Secondary Evac
Shaded Fuelbreak
Forest Treatment Zone
Contour 40'
Denver Water Board
Open Space Boulder
Open Space Jeffco

Burke

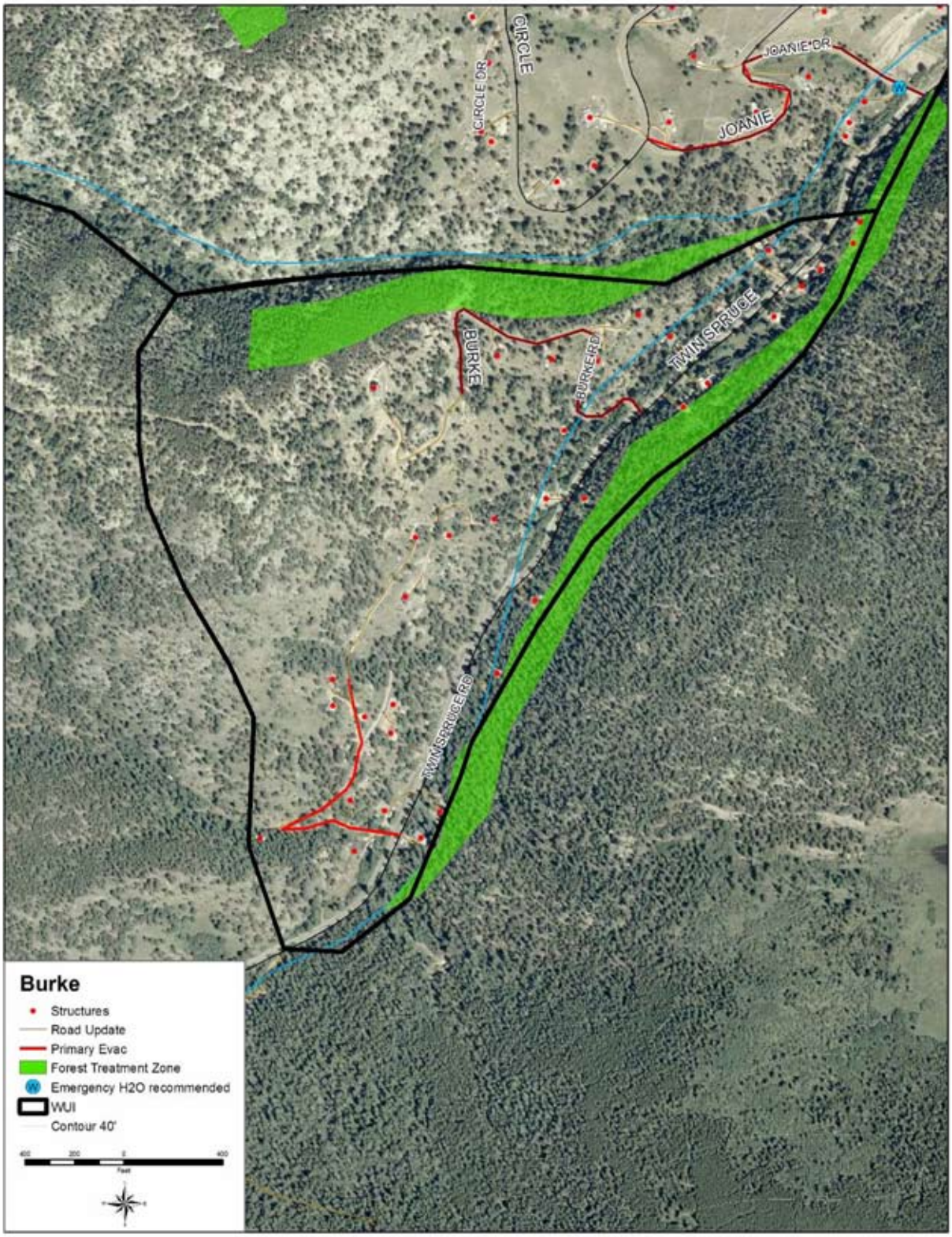
Wildfire Fire Risk and Hazard Severity Form NFPA 1144		
Burke		
	WUI 1 Hazard Rating	EXTREME
Means of Access		
Ingress and Egress		7
	2 or more roads in & out	0
	One road in & out	7
Road Width		4
	> 24 ft	0
	> 20 ft < 24 ft	2
	< 20 ft	4
All-Season Road Condition		6
	Surfaced Road, grade <5%	0
	Surfaced Road, grade >5%	2
	Non-surfaced Road, grade <5%	2
	Non-surfaced Road, grade >5%	5
	Other than all season	7
Fire Service Access		4
	< 300 ft with turnaround	0
	> 300 ft with turnaround	2
	< 300 ft with no turnaround	4
	> 300 ft with no turnaround	5
Street Signs (predominent)		4
	Present - reflective	0
	Not present	5
Vegetation (fire behavior fuel models)		
Characteristics of predominent veg w/in 300 ft		8
	Light - 1, 2, 3	5
	Medium - 5, 6, 7, 8, 9	10
	Heavy - 4, 10	20
	Slash - 11, 12, 13	25
Defensible Space - vegetation treatment around structure		18
	> 100 ft around structure	1
	> 70 ft < 100 ft around structure	3
	> 30 ft < 70 ft around structure	10
	< 30 ft around structure	25
Topography Within 300 ft of Structures		
Slope		7
	< 9%	1
	10% to 20%	4
	21% to 30%	7
	31% to 40%	8
	> 41%	10
Additional Rating Factors (rate all that apply)		
Additional factors		13
	Topographic feaures that adversely affect fire behavior (0 - 5)	5
	Areas with a history of high fire occurance - ignition potential (0 - 5)	3
	Severe fire weather potential (0 - 5)	3
	Separation of adjacent structures contributing to fire spread (0 - 5)	2
Roofing Assembly		
Roofing		3
	Class A	0
	Class B	3
	Class C	15
	Unrated	25
Building construction		
Materials (predominent)		15
	Non-combustible fire-resistive siding, eaves and deck	0
	Non-combustible siding, eaves and combustible deck	5
	Combustible siding and deck	15
Building set-back relative to slope of 30% or more		5
	> 30 ft to slope	1
	< 30 ft to slope	5
Available Fire Protection		
Water source availability		7
	Hydrants 500 gpm < 1000 ft apart	0
	Hydrants 250 gpm < 1000 ft apart	1
	Non-pressurized water source > 250 gpm for 2 hours	3
	Non-pressurized water source < 250 gpm for 2 hours	5
	Water unavailable	10
Organized response resources		1
	Station < 5 mi from structure	1
	Station > 5 mi from structure	3
Fixed fire protection		5
	NFPA 13, 13R, 13D sprinkler system	0
	None	5
Placement of gas and Electric Utilities		
Utilities		5
	Both underground	0
	One above, one below	3
	Both above ground	5
Totals for home or subdivision		112
Hazard Rating Scale		
< 40 LOW		
> 40 MODERATE		
> 70 HIGH		
> 112 EXTREME		

Description: 32 observed structures; Steep southeast facing slope overlooking Twin Spruce Rd.; 2 single ingress/egress roads; Burke Rd. is groomed, 2 lane with turnaround, Fischer Road is single lane, unimproved, dead end with no adequate apparatus access; street signage visible from Twin Spruce Rd., many addresses missing; most homes on Burke Rd. have 1 to 5 acre lots, Fischer Road < ½ acre lots; defensible space – 63% have < 30', 38% have 30' to 70'; roofing – > 95% asphalt; construction – 100% of structures have combustible siding; above ground utilities, no static emergency water supply.

Vegetation: Open ponderosa pine FBFM 9, 2 and meadow FBFM 1 characterize primary southeast slope. Dense stands of mixed conifer are located on north facing slope north of subdivision.

Recommendations:

- Reduce structural ignitability through building upgrades and seasonal maintenance.
- Improve and maintain defensible space where needed and coordinate throughout the neighborhood to increase effectiveness on smaller lots.
- Seasonal road margin maintenance including mowing and conifer reproduction reduction.
- Forest thinning recommended on north slope north of Burke Rd. and behind structures along Twin Spruce Rd.
- Recommended static emergency water supply north of subdivision near Joanie Rd. and Twin Spruce Rd.


CIRCLE
CIRCLE DR
JOANIE DR
JOANIE
BURKE
BURKE RD
TWIN SPRUCE
TWIN SPRUCE RD
Burke
Structures
Road Update
Primary Evac
Forest Treatment Zone
Emergency H2O recommended
WUI
Contour 40'
400
200
0
400
Feet

Camp Eden

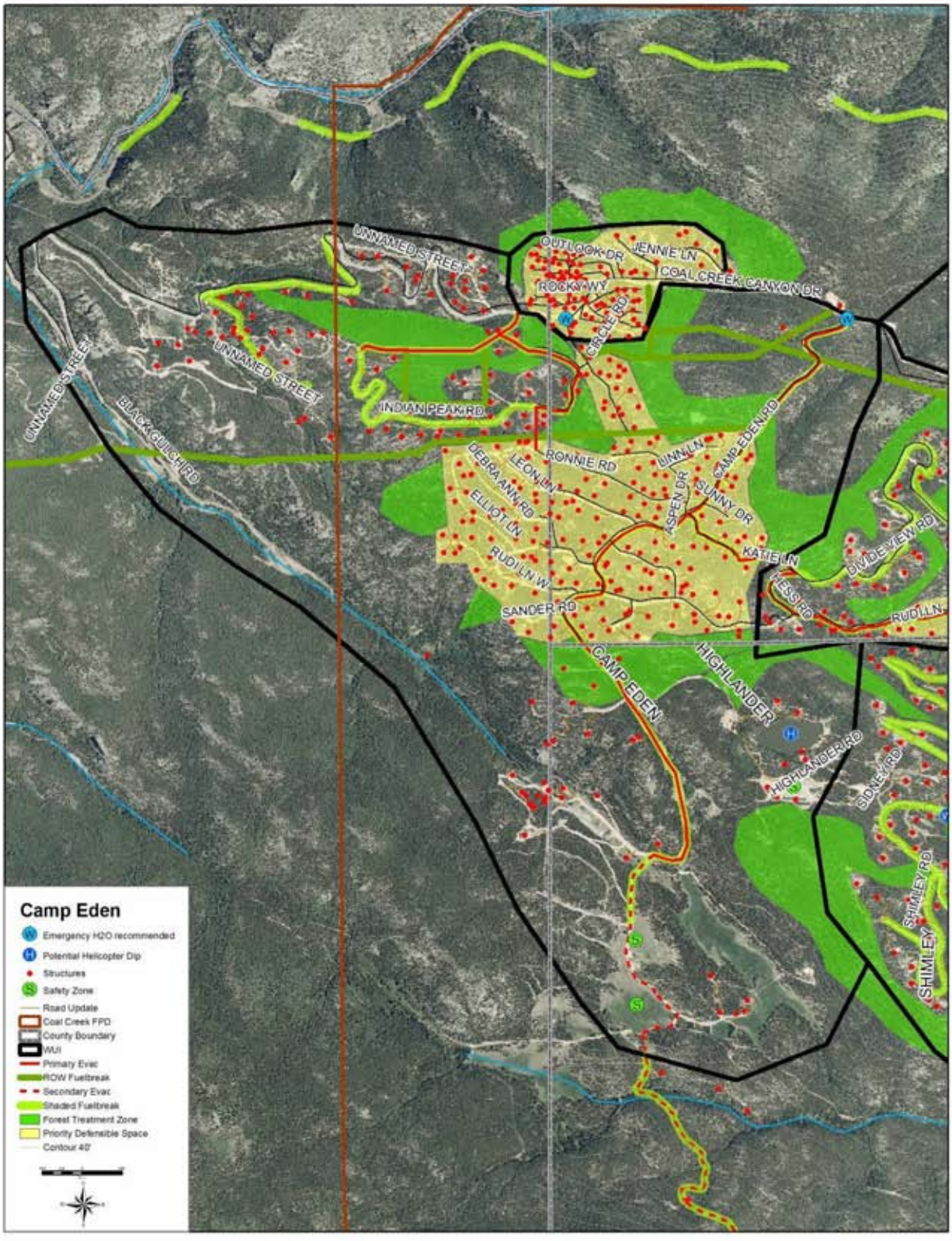
Wildfire Fire Risk and Hazard Severity Form NFPA 1144	
Camp Eden	
WUI Hazard Rating	HIGH
Means of Access	
Ingress and Egress	1
2 or more roads in & out	0
One road in & out	7
Road Width	2
> 24 ft	0
> 20 ft < 24 ft	2
< 20 ft	4
All-Season Road Condition	5
Surfaced Road, grade <5%	0
Surfaced Road, grade >5%	2
Non-surfaced Road, grade <5%	2
Non-surfaced Road, grade >5%	5
Other than all season	7
Fire Service Access	1
< 300 ft with turnaround	0
> 300 ft with turnaround	2
< 300 ft with no turnaround	4
> 300 ft with no turnaround	5
Street Signs (predominent)	4
Present - reflective	0
Not present	5
Vegetation (fire behavior fuel models)	
Characteristics of predominent veg w/in 300 ft	11
Light - 1, 2, 3	5
Medium - 5, 6, 7, 8, 9	10
Heavy - 4, 10	20
Slash - 11, 12, 13	25
Defensible Space - vegetation treatment around structure	17
> 100 ft around structure	1
> 70 ft < 100 ft around structure	3
> 30 ft < 70 ft around structure	10
< 30 ft around structure	25
Topography Within 300 ft of Structures	
Slope	5
< 9%	1
10% to 20%	4
21% to 30%	7
31% to 40%	8
> 41%	10
Additional Rating Factors (rate all that apply)	
Additional factors	14
Topographic feaures that adversely affect fire behavior (0 - 5)	4
Areas with a history of high fire occurance - ignition potential (0 - 5)	3
Severe fire weather potential (0 - 5)	3
Separation of adjacent structures contributing to fire spread (0 - 5)	4
Roofing Assembly	
Roofing	2
Class A	0
Class B	3
Class C	15
Unrated	25
Building construction	
Materials (predominent)	13
Non-combustible fire-resistive siding, eaves and deck	0
Non-combustible siding, eaves and combustible deck	5
Combustible siding and deck	15
Building set-back relative to slope of 30% or more	3
> 30 ft to slope	1
< 30 ft to slope	5
Available Fire Protection	
Water source availability	5
Hydrants 500 gpm < 1000 ft apart	0
Hydrants 250 gpm < 1000 ft apart	1
Non-pressurized water source > 250 gpm for 2 hours	3
Non-pressurized water source < 250 gpm for 2 hours	5
Water unavailable	10
Organized response resources	3
Station < 5 mi from structure	1
Station > 5 mi from structure	3
Fixed fire protection	5
NFPA 13, 13R, 13D sprinkler system	0
None	5
Placement of gas and Electric Utilities	
Utilities	5
Both underground	0
One above, one below	3
Both above ground	5
Totals for home or subdivision	96
Hazard Rating Scale	
< 40 LOW	
> 40 MODERATE	
> 70 HIGH	
> 112 EXTREME	

Description: 165 observed structures; subdivision located on north facing slope directly south of Wondervu and Cola creek Canyon Dr., and bordered on the south by a steep slope dropping into Black Gulch; cartographically Camp Eden falls into 3 counties; multiple established accesses provide adequate ingress/egress; alternative secondary emergency available south on Camp Eden Dr. to Nadm and Twin spruce Dr.; main access paved 2 lane, majority of secondary roads are groomed 1 ½ to 2 lane and range from low to steep grade; turnarounds are established at ends of most cul de sacs; inconsistent street signage is noted with some home addressing missing or difficult to find; housing density is moderate to high with many ¼ to 1 acre lots; defensible space – 25% have < 30', 72% have 30' to 70, 3% have 70' to 100'; roofing – 77% asphalt, 23% non-combustible; construction – 94% of structures have combustible exterior construction; above ground utilities, no static emergency water supply observed.

Vegetation: High elevation and north facing slope support lodgepole pine and mixed conifer in moderate to high density stands (FBFM 8), ponderosa pine and mixed conifer dominate most south facing slopes (FBFM 9 & 8), the area is characterized by a rather continuous canopy cover with shrub and grass (FBFM 1, 2, & 6) in areas where canopy is open or lacking.

Recommendations:

- Reduce structural ignitability through building upgrades and seasonal maintenance.
- Improve and maintain defensible space where needed and coordinated throughout the neighborhood to accommodate smaller lots and enhance effectiveness of adjacent forest treatments. Focus coordination in areas designated as priority defensible space.
- Develop and maintain shaded fuel breaks along primary evacuation routes.
- Forest treatment and thinning zones are identified for most surrounding timber stands.
- Survey and note condition of turnarounds and improve where needed for apparatus access.
- Conduct qualified survey of lake near Highlander Rd. for use as a helicopter dip site.
- Install strategic static emergency water supply, recommend area of Camp Eden Rd. and Coal Creek Canyon Dr.
- Investigate Camp Eden Rd. (south) to Nadm for use as a secondary emergency evacuation route.
- Improve existing powerline ROW.


UNNAMED STREET
OUTLOOK DR
JENNIE LN
COAL CREEK CANYON DR
ROCKY HWY
CIRCLE RD
UNNAMED STREET
UNNAMED STREET
BLACK GULCH RD
INDIAN PEAK RD
RONNIE RD
UNN LN
CAMP EDEN RD
DEBRA ANN RD
LEON LN
ELLIOT LN
ASPEN DR
SUNNY DR
KATIE LN
DIVIDE VIEW RD
RUDI LN W
SANDER RD
JESS RD
RUDI LN
CAMP EDEN
HIGHLANDER
HIGHLANDER RD
SIDNEY RD
SHIMLEY RD
Camp Eden
Emergency H2O recommended
Potential Helicopter Dip
Structures
Safety Zone
Road Update
Coal Creek FPD
County Boundary
WUI
Primary Evac
ROW Fuelbreak
Secondary Evac
Shaded Fuelbreak
Forest Treatment Zone
Priority Defensible Space
Contour 40'

Coal Creek Heights

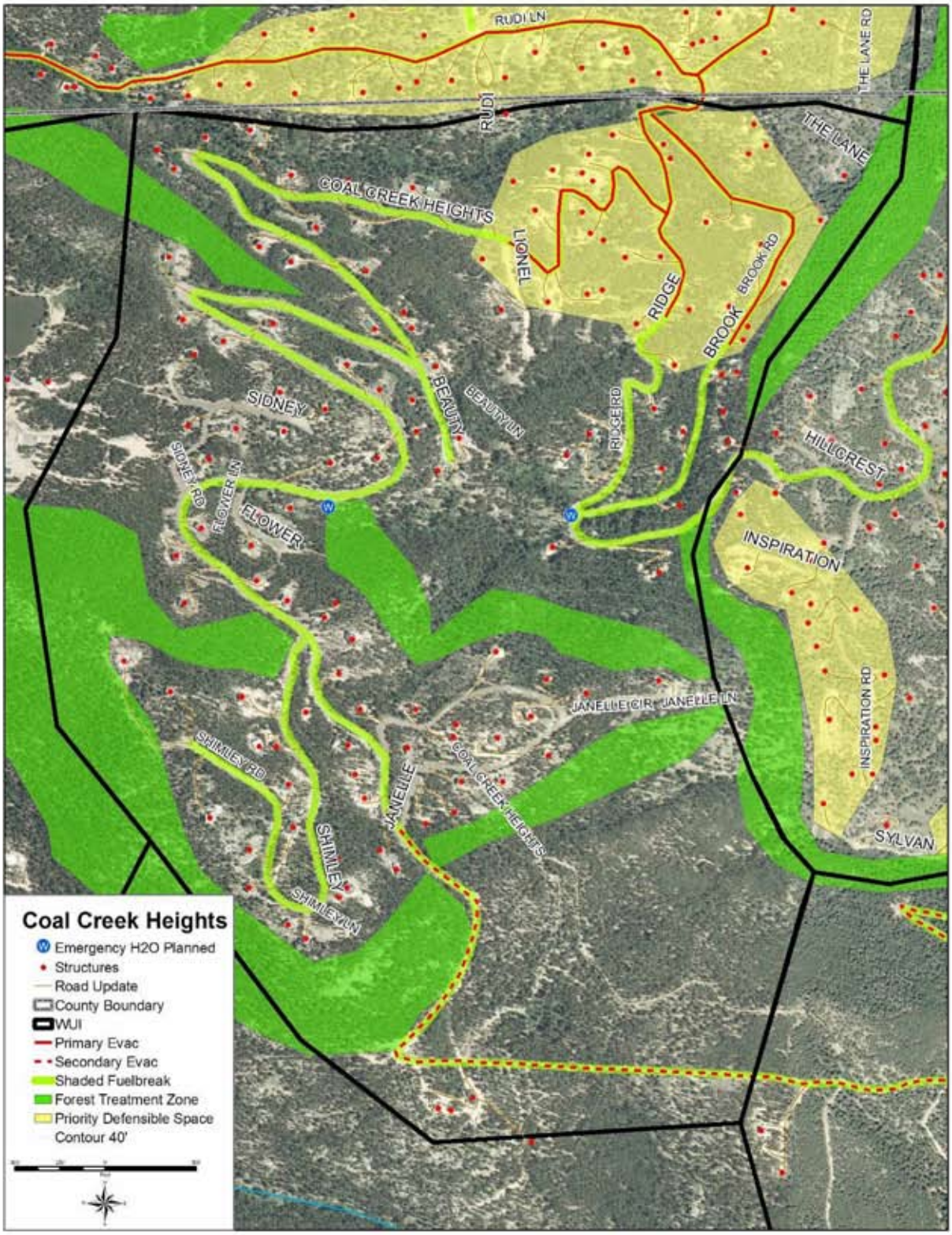
Wildfire Fire Risk and Hazard Severity Form NFPA 1144	
Coal Creek Heights	
WUI Hazard Rating	HIGH
Means of Access	
Ingress and Egress	2
2 or more roads in & out	0
One road in & out	7
Road Width	1
> 24 ft	0
> 20 ft < 24 ft	2
< 20 ft	4
All-Season Road Condition	6
Surfaced Road, grade <5%	0
Surfaced Road, grade >5%	2
Non-surfaced Road, grade <5%	2
Non-surfaced Road, grade >5%	5
Other than all season	7
Fire Service Access	2
< 300 ft with turnaround	0
> 300 ft with turnaround	2
< 300 ft with no turnaround	4
> 300 ft with no turnaround	5
Street Signs (predominent)	3
Present - reflective	0
Not present	5
Vegetation (fire behavior fuel models)	
Characteristics of predominent veg w/in 300 ft	13
Light - 1, 2, 3	5
Medium - 5, 6, 7, 8, 9	10
Heavy - 4, 10	20
Slash - 11, 12, 13	25
Defensible Space - vegetation treatment around structure	14
> 100 ft around structure	1
> 70 ft < 100 ft around structure	3
> 30 ft < 70 ft around structure	10
< 30 ft around structure	25
Topography Within 300 ft of Structures	
Slope	7
< 9%	1
10% to 20%	4
21% to 30%	7
31% to 40%	8
> 41%	10
Additional Rating Factors (rate all that apply)	
Additional factors	14
Topographic feaures that adversely affect fire behavior (0 - 5)	5
Areas with a history of high fire occurance - ignition potential (0 - 5)	3
Severe fire weather potential (0 - 5)	3
Separation of adjacent structures contributing to fire spread (0 - 5)	3
Roofing Assembly	
Roofing	3
Class A	0
Class B	3
Class C	15
Unrated	25
Building construction	
Materials (predominent)	12
Non-combustible fire-resistive siding, eaves and deck	0
Non-combustible siding, eaves and combustible deck	5
Combustible siding and deck	15
Building set-back relative to slope of 30% or more	3
> 30 ft to slope	1
< 30 ft to slope	5
Available Fire Protection	
Water source availability	5
Hydrants 500 gpm < 1000 ft apart	0
Hydrants 250 gpm < 1000 ft apart	1
Non-pressurized water source > 250 gpm for 2 hours	3
Non-pressurized water source < 250 gpm for 2 hours	5
Water unavailable	10
Organized response resources	1
Station < 5 mi from structure	1
Station > 5 mi from structure	3
Fixed fire protection	5
NFPA 13, 13R, 13D sprinkler system	0
None	5
Placement of gas and Electric Utilities	
Utilities	5
Both underground	0
One above, one below	3
Both above ground	5
Totals for home or subdivision	96
Hazard Rating Scale	
< 40 LOW	
> 40 MODERATE	
> 70 HIGH	
> 112 EXTREME	

Description: 117 observed structures; subdivision located on north and northeast facing slope south of Divide View and west of Vonnie Claire WUIs; accesses to neighboring WUIs provide dual ingress/egress but upper portion of subdivision is dependent on secondary emergency access into the Hilltop WUI via Wundertal; all roads are well groomed, 1 ½ to 2 lane with moderate to steep grade with wide switchbacks; standard street signage is present with most home addressing green reflective; housing density is moderate; defensible space – 39% have < 30', 49% have 30' to 70, 12% have 70' to 100'; roofing – 78% asphalt, 20% non-combustible; construction – 87% of structures have combustible exterior construction; above ground utilities, no static emergency water supply observed.

Vegetation: Dense lodgepole pine stands intermixed with mixed conifer are found on north facing slopes(FBFM 8); ponderosa pine and mixed conifer on east and south facing slopes (FBFM 9 & 8), grassy understory where canopy is open (FBFM 2).

Recommendations:

- Reduce structural ignitability through building upgrades and seasonal maintenance.
- Improve and maintain defensible space where needed and coordinated throughout the neighborhood to accommodate smaller lots and enhance effectiveness of adjacent forest treatments. Focus coordination in areas designated as priority defensible space.
- Develop and maintain shaded fuel breaks along primary evacuation routes, main roads, and secondary evacuation routes.
- Strategic forest treatment and thinning zones are recommended for several stands surrounding the subdivision and several stands within the subdivision.
- Survey and note condition of turnarounds switchbacks and improve where needed for apparatus access.
- Install strategic static emergency water supply in planned sites.
- Investigate and formalize secondary emergency evacuation route to the Hilltop subdivision. Improve where necessary.


RUDI LN
THE LANE RD
RUDI
THE LANE
COAL CREEK HEIGHTS
LIONEL
RIDGE
BROOK
BROOK RD
SIDNEY
BEAUTY
BEAUTY LN
RIDGE RD
HILLCREST
SIDNEY RD
FLOWER LN
FLOWER
INSPIRATION
JANELLE CIR
JANELLE LN
INSPIRATION RD
SHIMLEY RD
JANELLE
COAL CREEK HEIGHTS
SHIMLEY
SHIMLEY LN
SYLVAN
Coal Creek Heights
Emergency H2O Planned
Structures
Road Update
County Boundary
WUI
Primary Evac
Secondary Evac
Shaded Fuelbreak
Forest Treatment Zone
Priority Defensible Space
Contour 40'

Chute Road

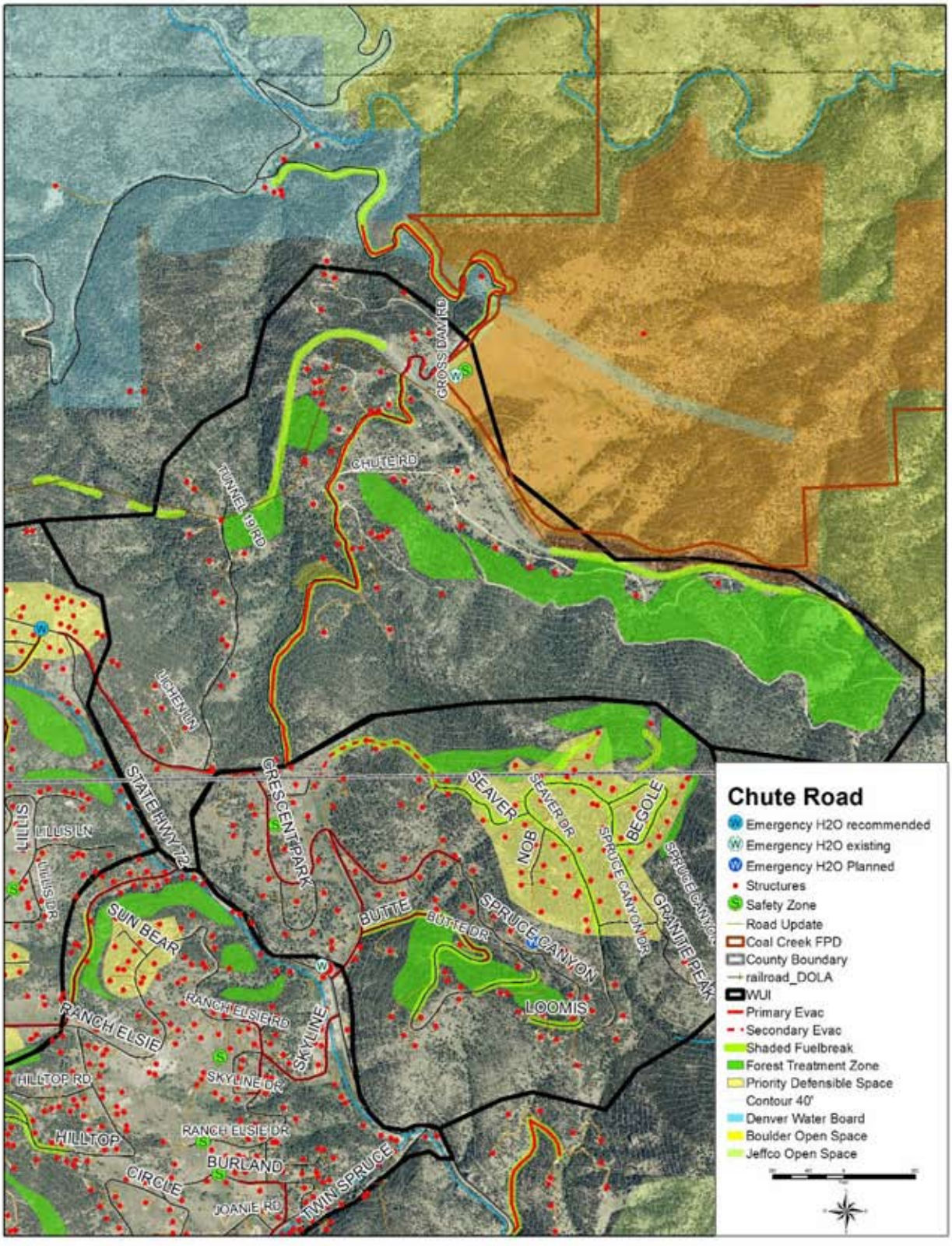
Copperdale		
	WUI Hazard Rating	HIGH
Means of Access		
Ingress and Egress		5
	2 or more roads in & out	0
	One road in & out	7
Road Width		2
	> 24 ft	0
	> 20 ft < 24 ft	2
	< 20 ft	4
All-Season Road Condition		6
	Surfaced Road, grade <5%	0
	Surfaced Road, grade >5%	2
	Non-surfaced Road, grade <5%	2
	Non-surfaced Road, grade >5%	5
	Other than all season	7
Fire Service Access		3
	< 300 ft with turnaround	0
	> 300 ft with turnaround	2
	< 300 ft with no turnaround	4
	> 300 ft with no turnaround	5
Street Signs (predominent)		5
	Present - reflective	0
	Not present	5
Vegetation (fire behavior fuel models)		
Characteristics of predominent veg w/in 300 ft		12
	Light - 1, 2, 3	5
	Medium - 5, 6, 7, 8, 9	10
	Heavy - 4, 10	20
	Slash - 11, 12, 13	25
Defensible Space - vegetation treatment around structure		17
	> 100 ft around structure	1
	> 70 ft < 100 ft around structure	3
	> 30 ft < 70 ft around structure	10
	< 30 ft around structure	25
Topography Within 300 ft of Structures		
Slope		6
	< 9%	1
	10% to 20%	4
	21% to 30%	7
	31% to 40%	8
	> 41%	10
Additional Rating Factors (rate all that apply)		
Additional factors		15
	Topographic feaures that adversely affect fire behavior (0 - 5)	5
	Areas with a history of high fire occurance - ignition potential (0 - 5)	5
	Severe fire weather potential (0 - 5)	3
	Separation of adjacent structures contributing to fire spread (0 - 5)	2
Roofing Assembly		
Roofing		2
	Class A	0
	Class B	3
	Class C	15
	Unrated	25
Building construction		
Materials (predominent)		13
	Non-combustible fire-resistive siding, eaves and deck	0
	Non-combustible siding, eaves and combustible deck	5
	Combustible siding and deck	15
Building set-back relative to slope of 30% or more		3
	> 30 ft to slope	1
	< 30 ft to slope	5
Available Fire Protection		
Water source availability		5
	Hydrants 500 gpm < 1000 ft apart	0
	Hydrants 250 gpm < 1000 ft apart	1
	Non-pressurized water source > 250 gpm for 2 hours	3
	Non-pressurized water source < 250 gpm for 2 hours	5
	Water unavailable	10
Organized response resources		3
	Station < 5 mi from structure	1
	Station > 5 mi from structure	3
Fixed fire protection		5
	NFPA 13, 13R, 13D sprinkler system	0
	None	5
Placement of gas and Electric Utilities		
Utilities		5
	Both underground	0
	One above, one below	3
	Both above ground	5
Totals for home or subdivision		107
Hazard Rating Scale		
< 40 LOW		
> 40 MODERATE		
> 70 HIGH		
> 112 EXTREME		

Description: 44 observed structures; subdivision located on predominantly north facing slope along Gross Dam Rd. which provides dual ingress/egress through the area; homes are scattered upslope from major railway line mostly on dead end secondary roads; turnarounds are present on Lichen Rd. and Tunnel 19 Rd., no turnaround on Juniper Heights Rd.; roads are generally well groomed and 1 ½ to 2 lane; some step grades present; standard street signage is present with most home addressing green reflective; housing density is light; defensible space – 39% have < 30', 39% have 30' to 70, 20% have 70' to 100'; roofing – 59% asphalt, 36% non-combustible, 5% wood shake; construction – 89% of structures have combustible exterior construction; above ground utilities, no static emergency water supply observed.

Vegetation: Dense mixed conifer on steep north facing slopes (FBFM 8 & 9); grassy understory where canopy is open (FBFM 2) and open meadow on flat terrain (FBFM 1), aspen stands noted at the top of Tunnel 19 Rd.

Recommendations:

- Reduce structural ignitability through building upgrades and seasonal maintenance.
- Improve and maintain defensible space where needed.
- Develop and maintain shaded fuel breaks along forested portions of Gross Dam Rd. and forested zones of the railroad ROW to buffer fire spread potential from sparking brakes.
- Associated strategic forest treatment and thinning zones are recommended for stands upslope from railroad ROW along Chute Rd. and Tunnel 19 Rd. area.
- Survey and note condition of turnarounds switchbacks and improve where needed for apparatus access.
- Survey meadow north of railroad on Gross Dam Rd. for potential safety zone.


Chute Road
Emergency H2O recommended
Emergency H2O existing
Emergency H2O Planned
Structures
Safety Zone
Road Update
Coal Creek FPD
County Boundary
railroad_DOLA
WUI
Primary Evac
Secondary Evac
Shaded Fuelbreak
Forest Treatment Zone
Priority Defensible Space
Contour 40'
Denver Water Board
Boulder Open Space
Jeffco Open Space
CROSS DAM RD
CHUTE RD
TUNNEL 19 RD
UCHEE LN
STATE HWY 72
CRESCENT PARK
SEAVER
SEAVER DR
BON
BEGOLE
SPRUCE CANYON DR
SPRUCE CANYON
GRANITE PEAK
BUTTE
BUTTE DR
SUN BEAR
LILLIS
LILLIS LN
LILLIS DR
RANCH ELSIE
RANCH ELSIE RD
SKYLINE
SKYLINE DR
LOOMIS
HILLTOP RD
HILLTOP
RANCH ELSIE DR
BURLAND
CIRCLE
JOANIE RD
TWIN SPRUCE

Crescent Park

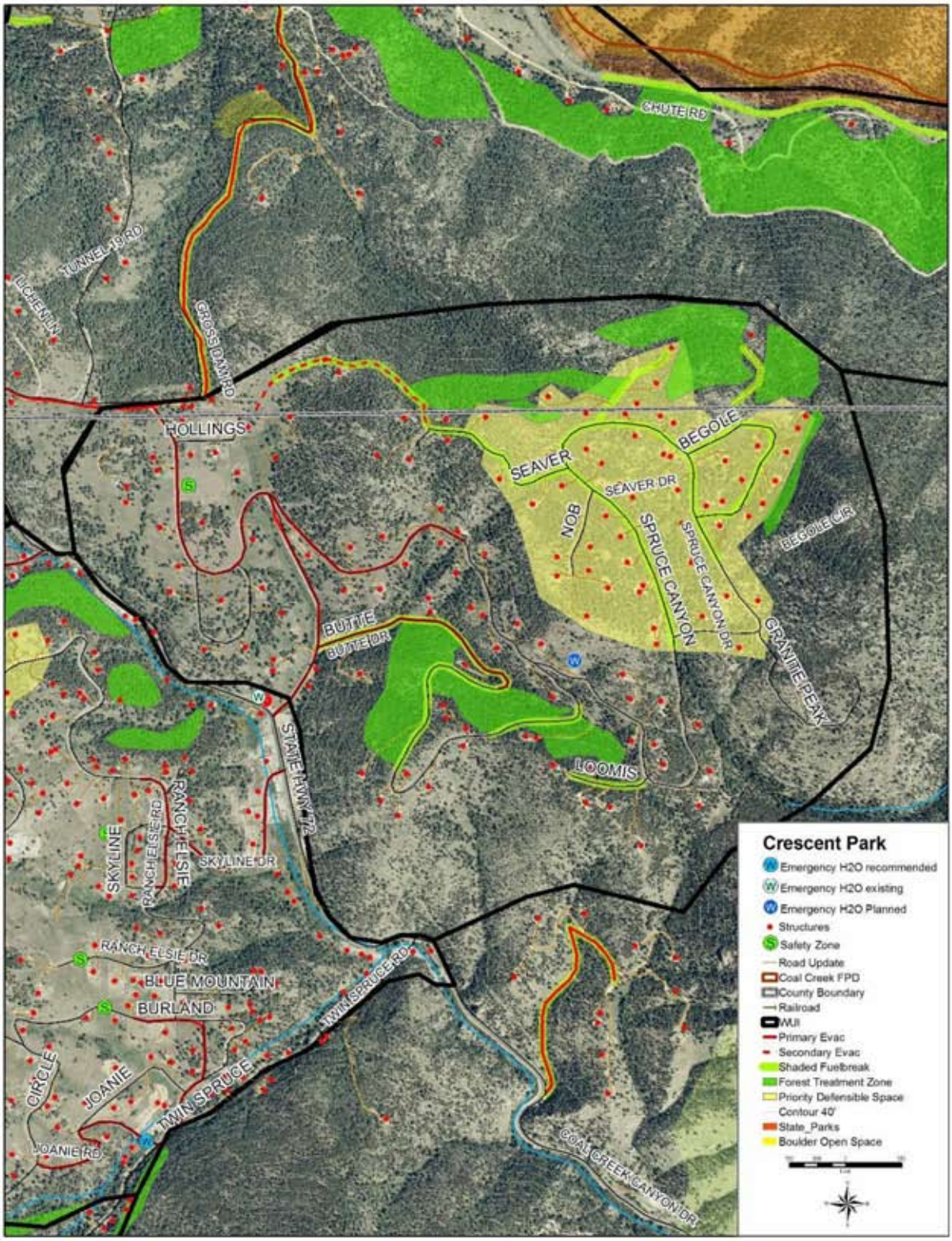
Wildfire Fire Risk and Hazard Severity Form NFPA 1144	
Crescent Park	
WUI Hazard Rating	HIGH
Means of Access	
Ingress and Egress	4
2 or more roads in & out	0
One road in & out	7
Road Width	2
> 24 ft	0
> 20 ft < 24 ft	2
< 20 ft	4
All-Season Road Condition	4
Surfaced Road, grade <5%	0
Surfaced Road, grade >5%	2
Non-surfaced Road, grade <5%	2
Non-surfaced Road, grade >5%	5
Other than all season	7
Fire Service Access	2
< 300 ft with turnaround	0
> 300 ft with turnaround	2
< 300 ft with no turnaround	4
> 300 ft with no turnaround	5
Street Signs (predominent)	1
Present - reflective	0
Not present	5
Vegetation (fire behavior fuel models)	
Characteristics of predominent veg w/in 300 ft	8
Light - 1, 2, 3	5
Medium - 5, 6, 7, 8, 9	10
Heavy - 4, 10	20
Slash - 11, 12, 13	25
Defensible Space - vegetation treatment around structure	14
> 100 ft around structure	1
> 70 ft < 100 ft around structure	3
> 30 ft < 70 ft around structure	10
< 30 ft around structure	25
Topography Within 300 ft of Structures	
Slope	4
< 9%	1
10% to 20%	4
21% to 30%	7
31% to 40%	8
> 41%	10
Additional Rating Factors (rate all that apply)	
Additional factors	13
Topographic feaures that adversely affect fire behavior (0 - 5)	4
Areas with a history of high fire occurance - ignition potential (0 - 5)	3
Severe fire weather potential (0 - 5)	3
Separation of adjacent structures contributing to fire spread (0 - 5)	3
Roofing Assembly	
Roofing	2
Class A	0
Class B	3
Class C	15
Unrated	25
Building construction	
Materials (predominent)	13
Non-combustible fire-resistive siding, eaves and deck	0
Non-combustible siding, eaves and combustible deck	5
Combustible siding and deck	15
Building set-back relative to slope of 30% or more	2
> 30 ft to slope	1
< 30 ft to slope	5
Available Fire Protection	
Water source availability	5
Hydrants 500 gpm < 1000 ft apart	0
Hydrants 250 gpm < 1000 ft apart	1
Non-pressurized water source > 250 gpm for 2 hours	3
Non-pressurized water source < 250 gpm for 2 hours	5
Water unavailable	10
Organized response resources	1
Station < 5 mi from structure	1
Station > 5 mi from structure	3
Fixed fire protection	5
NFPA 13, 13R, 13D sprinkler system	0
None	5
Placement of gas and Electric Utilities	
Utilities	5
Both underground	0
One above, one below	3
Both above ground	5
Totals for home or subdivision	85
Hazard Rating Scale	
< 40 LOW	
> 40 MODERATE	
> 70 HIGH	
> 112 EXTREME	

Description: 105 observed structures; subdivision located on ridge above railroad ROW and Chute Rd., and on slopes and drainages leading southg to Coal Creek Canyon Dr.; technically dual ingress/egress but most homes are limited to single access along Spruce Canyon Dr.; looping road design limits cul de sacs but turnarounds are located at most dead ends; primary road is paved with secondary roads generally groomed with low to moderate grade; standard street signage is present, home addressing is generally present and reflective; housing density is moderate with higher density found along Begole Cir.; defensible space – 29% have < 30', 54% have 30' to 70, 21% have 70' to 100'; roofing – 88% asphalt, 16% non-combustible, 3% wood shake; 95% of structures have combustible exterior construction; above ground utilities, no static emergency water supply observed.

Vegetation: Isolated north and northwest slope stands of dense lodgepole pine and mixed conifer (FBFM 8 & 9); extensive open south facing slopes with grass, shrub and grassy understory in open ponderosa pine stands (FBFM 1, 2, 6); extensive open meadows in flat or low grade slope areas (FBFM 1).

Recommendations:

- Reduce structural ignitability through building upgrades and seasonal maintenance.
- Improve and maintain defensible space where needed and coordinated throughout the neighborhood to accommodate smaller lots and enhance effectiveness of adjacent forest treatments. Focus coordination in areas designated as priority defensible space.
- Develop and maintain shaded fuel breaks along upper Spruce Canyon Dr. and forested access in lower portions of the subdivision. forested portions of Gross Dam Rd.
- Associated strategic forest treatment and thinning zones are recommended for stands adjacent north and east of Spruce Canyon Dr., and Butte Dr.
- Install planned cistern near Loomis and Butte Dr.
- Survey meadow at Hollings and Gross Dam Rd for potential community safety zone.
- Investigate possible secondary evacuation route from Seaver Dr. to Hollings Dr.


&HUTE RD
TUNNEL 19 RD
LUCHERLIN
CROSS DAM RD
HOLLINGS
SEAVER
BEGOLE
SEAVER DR
NOB
SPRUCE CANYON
SPRUCE CANYON DR
BEGOLE CIR
GRANITE PEAK
BUTTE
BUTTE DR
STATE HWY 72
LOOMIS
SKYLINE
RANCH ELSIE RD
SKYLINE DR
RANCH ELSIE DR
BLUE MOUNTAIN
BURLAND
TWIN SPRUCE RD
CIRCLE
JOANIE
TWIN SPRUCE
JOANIE RD
COAL CREEK CANYON DR
Crescent Park
Emergency H2O recommended
Emergency H2O existing
Emergency H2O Planned
Structures
Safety Zone
Road Update
Coal Creek FPD
County Boundary
Railroad
Mill
Primary Evac
Secondary Evac
Shaded Fuelbreak
Forest Treatment Zone
Priority Defensible Space
Contour 40'
State_Parks
Boulder Open Space

Copperdale

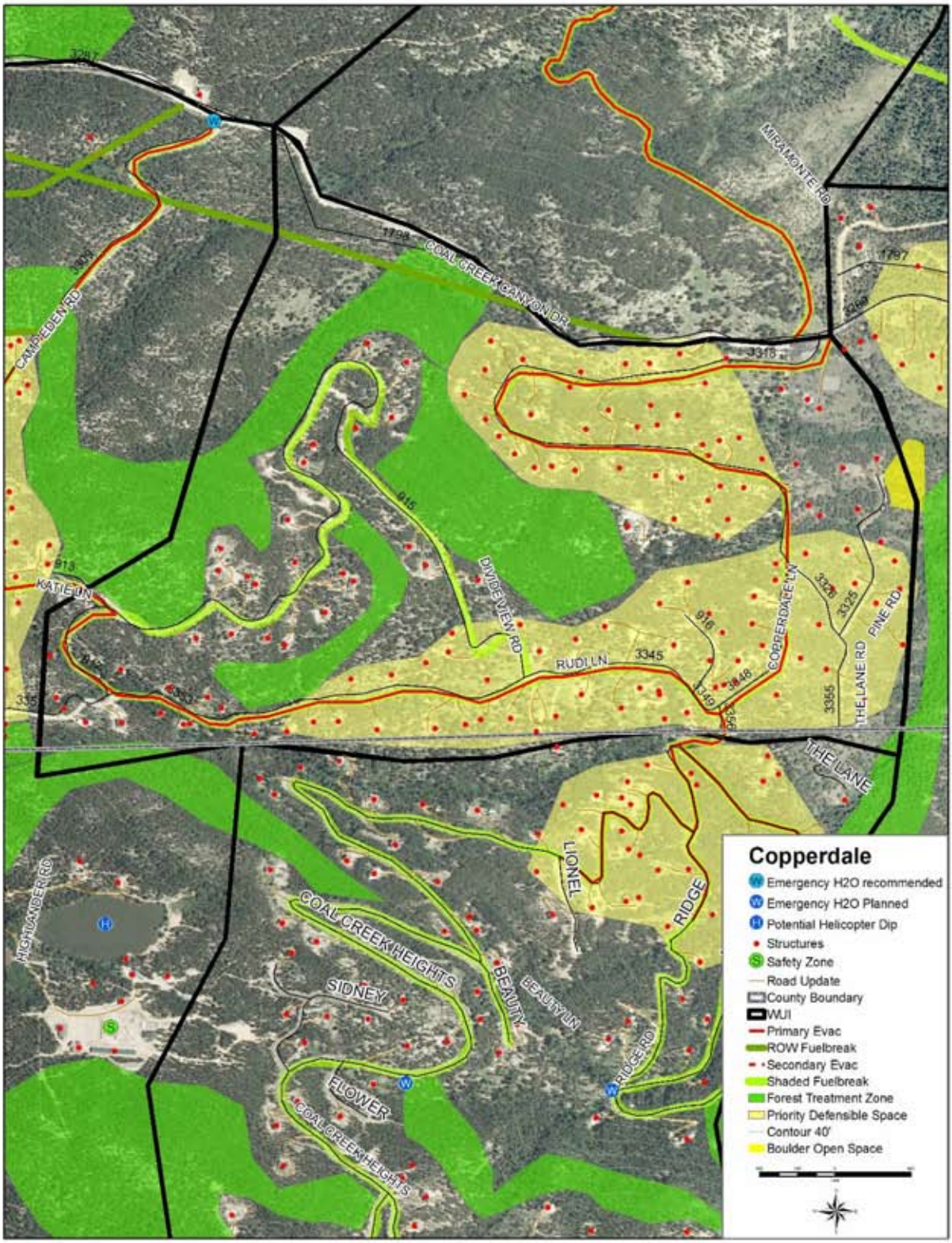
Wildfire Fire Risk and Hazard Severity Form NFPA 1144	
Divide View	
WUI Hazard Rating	HIGH
Means of Access	
Ingress and Egress	1
2 or more roads in & out	0
One road in & out	7
Road Width	2
> 24 ft	0
> 20 ft < 24 ft	2
< 20 ft	4
All-Season Road Condition	3
Surfaced Road, grade <5%	0
Surfaced Road, grade >5%	2
Non-surfaced Road, grade <5%	2
Non-surfaced Road, grade >5%	5
Other than all season	7
Fire Service Access	1
< 300 ft with turnaround	0
> 300 ft with turnaround	2
< 300 ft with no turnaround	4
> 300 ft with no turnaround	5
Street Signs (predominent)	1
Present - reflective	0
Not present	5
Vegetation (fire behavior fuel models)	
Characteristics of predominent veg w/in 300 ft	8
Light - 1, 2, 3	5
Medium - 5, 6, 7, 8, 9	10
Heavy - 4, 10	20
Slash - 11, 12, 13	25
Defensible Space - vegetation treatment around structure	15
> 100 ft around structure	1
> 70 ft < 100 ft around structure	3
> 30 ft < 70 ft around structure	10
< 30 ft around structure	25
Topography Within 300 ft of Structures	
Slope	4
< 9%	1
10% to 20%	4
21% to 30%	7
31% to 40%	8
> 41%	10
Additional Rating Factors (rate all that apply)	
Additional factors	13
Topographic feaures that adversely affect fire behavior (0 - 5)	4
Areas with a history of high fire occurance - ignition potential (0 - 5)	3
Severe fire weather potential (0 - 5)	3
Separation of adjacent structures contributing to fire spread (0 - 5)	3
Roofing Assembly	
Roofing	2
Class A	0
Class B	3
Class C	15
Unrated	25
Building construction	
Materials (predominent)	13
Non-combustible fire-resistive siding, eaves and deck	0
Non-combustible siding, eaves and combustible deck	5
Combustible siding and deck	15
Building set-back relative to slope of 30% or more	3
> 30 ft to slope	1
< 30 ft to slope	5
Available Fire Protection	
Water source availability	5
Hydrants 500 gpm < 1000 ft apart	0
Hydrants 250 gpm < 1000 ft apart	1
Non-pressurized water source > 250 gpm for 2 hours	3
Non-pressurized water source < 250 gpm for 2 hours	5
Water unavailable	10
Organized response resources	1
Station < 5 mi from structure	1
Station > 5 mi from structure	3
Fixed fire protection	5
NFPA 13, 13R, 13D sprinkler system	0
None	5
Placement of gas and Electric Utilities	
Utilities	5
Both underground	0
One above, one below	3
Both above ground	5
Totals for home or subdivision	82
Hazard Rating Scale	
< 40 LOW	
> 40 MODERATE	
> 70 HIGH	
> 112 EXTREME	

Description: 128 observed structures; subdivision located on northeast facing slope on the south side of Coal Creek Canyon Dr.; WUI is surrounded by other subdivisions and multiple accesses are available; lower ½ of main access is paved and 2 lane; 3 cul de sacs are 1 ½ to 2 lane with turnarounds, secondary roads leading to Camp Eden are steep and 1 to 1 ½ lane dirt; standard reflective street signage is present, home addressing is generally present but non standard; housing density is moderate to high; defensible space – 49% have < 30', 38% have 30' to 70, 16% have 70' to 100'; roofing – 82% asphalt, 17% non-combustible; 92% of structures have combustible exterior construction; above ground utilities, no static emergency water supply observed.

Vegetation: Dense stands of lodgepole pine observed throughout assessment area (FBFM 8), mixed stands of Douglas-fir and ponderosa pine elsewhere in the subdivision (FBFM 8 & 9).

Recommendations:

- Reduce structural ignitability through building upgrades and seasonal maintenance.
- Improve and maintain defensible space where needed and coordinated throughout the neighborhood to accommodate smaller lots and enhance effectiveness of adjacent forest treatments. Focus coordination in areas designated as priority defensible space.
- Develop and maintain shaded fuel breaks along identified evacuation routes and primary all access roads.
- Associated strategic forest treatment and thinning zones are recommended for stands along subdivision margins and stands between areas of concentrated housing.
- Improve existing powerline ROW.
- WUI would be served by recommended static emergency water supplies at Coal Creek Canyon Dr and Camp Eden Rd. and Crescent Lake Dr.


MIRAMONTE RD
COAL CREEK CANYON DR
CAMPBELL RD
KATIE LN
DIVIDE VIEW RD
RUDI LN
COPPERDALE LN
PINE RD
THE LANE RD
THE LANE
LIONEL
RIDGE
RIDGE RD
HIGHLANDER RD
COAL CREEK HEIGHTS
SIDNEY
BEAUTY
BEAUTY LN
FLOWER
COAL CREEK HEIGHTS
Copperdale
Emergency H2O recommended
Emergency H2O Planned
Potential Helicopter Dip
Structures
Safety Zone
Road Update
County Boundary
WUI
Primary Evac
ROW Fuelbreak
Secondary Evac
Shaded Fuelbreak
Forest Treatment Zone
Priority Defensible Space
Contour 40'
Boulder Open Space

Hilltop

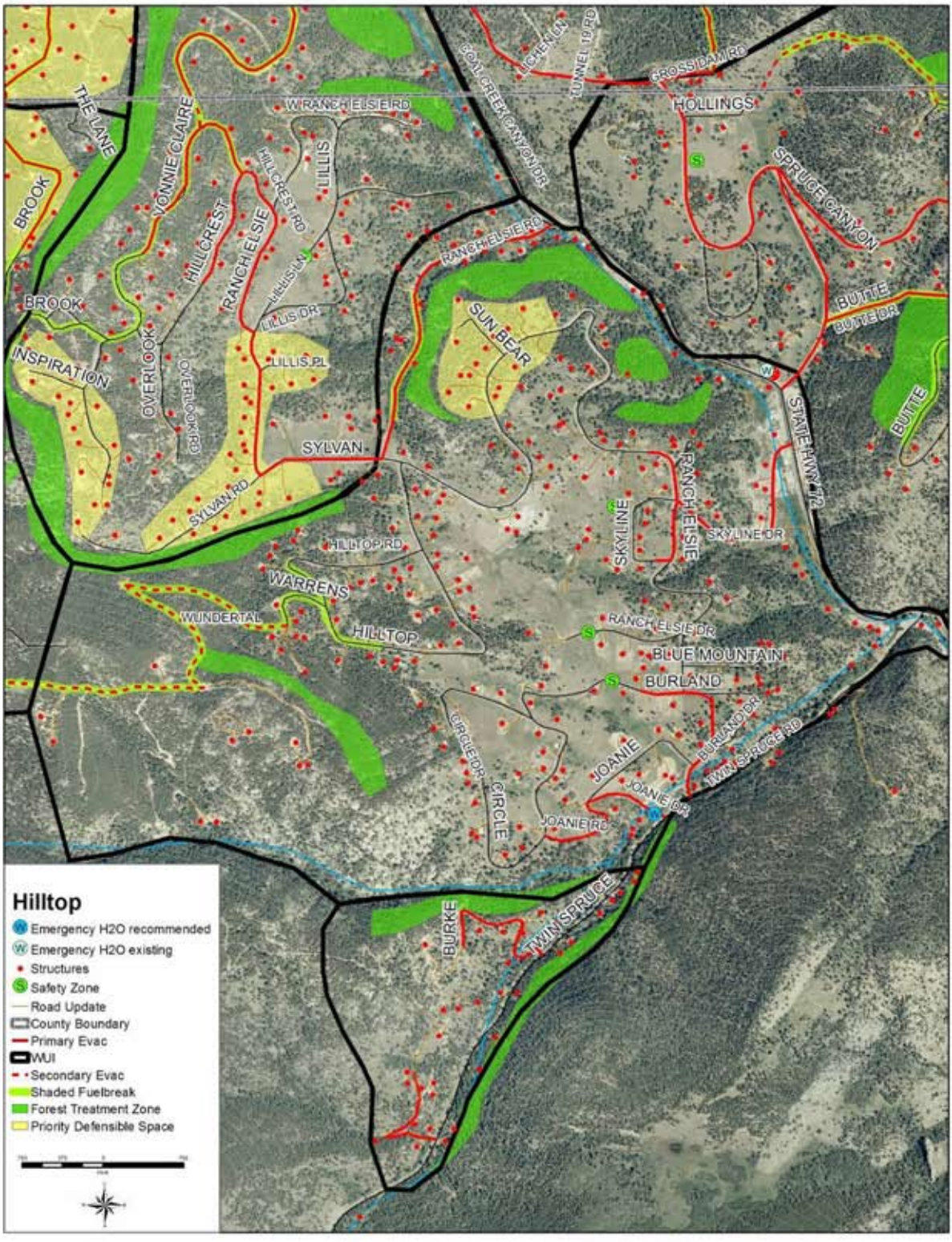
Wildfire Fire Risk and Hazard Severity Form NFPA 1144	
Hilltop	
WUI Hazard Rating	Moderate
Means of Access	
Ingress and Egress	0
2 or more roads in & out	0
One road in & out	7
Road Width	1
> 24 ft	0
> 20 ft < 24 ft	2
< 20 ft	4
All-Season Road Condition	4
Surfaced Road, grade <5%	0
Surfaced Road, grade >5%	2
Non-surfaced Road, grade <5%	2
Non-surfaced Road, grade >5%	5
Other than all season	7
Fire Service Access	2
< 300 ft with turnaround	0
> 300 ft with turnaround	2
< 300 ft with no turnaround	4
> 300 ft with no turnaround	5
Street Signs (predominent)	3
Present - reflective	0
Not present	5
Vegetation (fire behavior fuel models)	
Characteristics of predominent veg w/in 300 ft	6
Light - 1, 2, 3	5
Medium - 5, 6, 7, 8, 9	10
Heavy - 4, 10	20
Slash - 11, 12, 13	25
Defensible Space - vegetation treatment around structure	6
> 100 ft around structure	1
> 70 ft < 100 ft around structure	3
> 30 ft < 70 ft around structure	10
< 30 ft around structure	25
Topography Within 300 ft of Structures	
Slope	3
< 9%	1
10% to 20%	4
21% to 30%	7
31% to 40%	8
> 41%	10
Additional Rating Factors (rate all that apply)	
Additional factors	11
Topographic feaures that adversely affect fire behavior (0 - 5)	2
Areas with a history of high fire occurance - ignition potential (0 - 5)	3
Severe fire weather potential (0 - 5)	3
Separation of adjacent structures contributing to fire spread (0 - 5)	3
Roofing Assembly	
Roofing	2
Class A	0
Class B	3
Class C	15
Unrated	25
Building construction	
Materials (predominent)	15
Non-combustible fire-resistive siding, eaves and deck	0
Non-combustible siding, eaves and combustible deck	5
Combustible siding and deck	15
Building set-back relative to slope of 30% or more	1
> 30 ft to slope	1
< 30 ft to slope	5
Available Fire Protection	
Water source availability	5
Hydrants 500 gpm < 1000 ft apart	0
Hydrants 250 gpm < 1000 ft apart	1
Non-pressurized water source > 250 gpm for 2 hours	3
Non-pressurized water source < 250 gpm for 2 hours	5
Water unavailable	10
Organized response resources	1
Station < 5 mi from structure	1
Station > 5 mi from structure	3
Fixed fire protection	5
NFPA 13, 13R, 13D sprinkler system	0
None	5
Placement of gas and Electric Utilities	
Utilities	3
Both underground	0
One above, one below	3
Both above ground	5
Totals for home or subdivision	**68**
Hazard Rating Scale	
< 40 LOW	
> 40 MODERATE	
> 70 HIGH	
> 112 EXTREME	

Description: 222 observed structures; subdivision characterized by a broad central plateau and an extensive series of central meadows with a forested ridge rising to the south and west; multiple accesses to Twin Spruce Rd., Coal Creek Canyon Dr., and Vonnie Claire subdivision; Ranch Elsie area paved 2 lane, all other roads groomed, 2 lane, low to moderate grade; turnarounds on most cul de sacs; street signage and home addressing inconsistent; housing density moderate to high along access routes ; defensible space – 18% have < 30', 28% have 30' to 70', 29% have 70' to 100', 25% have > 100'; roofing – 90% asphalt, 9% non-combustible; construction – 92% of structures have combustible siding; above ground utilities, cistern located at fire station near Skyline Dr. and Coal Creek Canyon Dr.

Vegetation: Open meadows and grassy understory characterize most of the subdivision (FBFM 1 & 2); isolated dense stands of mixed conifer are found on most north facing slopes (FBFM 8 & 9).

Recommendations:

- Reduce structural ignitability through building upgrades and seasonal maintenance.
- Improve and maintain defensible space where needed.
- Seasonal road margin maintenance including mowing and conifer reproduction reduction.
- Develop and maintain shaded fuelbreaks along forested portions of Ranch Elsie Rd. and Hilltop Dr.
- Forest thinning recommended in stands on the north and west margins of the subdivision.
- Investigate possible secondary evacuation route along Wundertal to Coal Creek Heights.
- Static emergency water supply recommended at Joanie Dr. and Twin Spruce Rd.
- Investigate the use of meadows for community safety zones.


Hilltop
Emergency H2O recommended
Emergency H2O existing
Structures
Safety Zone
Road Update
County Boundary
Primary Evac
WUI
Secondary Evac
Shaded Fuelbreak
Forest Treatment Zone
Priority Defensible Space
THE LANE
BROOK
YONNIE CLAIRE
MILLCREST
MILLCREST RD
LILLIS
LILLIS LN
LILLIS DR
LILLIS PL
RANCH ELSIE
W RANCH ELSIE RD
RANCH ELSIE RD
COAL CREEK CANYON DR
TUNNEL 19 RD
GROSSIDAM RD
HOLLINGS
SPRUCE CANYON
BUTTE
BUTTE DR
SUN BEAR
INSPIRATION
OVERLOOK
OVERLOOK RD
SYLVAN
SYLVAN RD
STATE HWY 72
SKYLINE
SKYLINE DR
HILLTOP RD
WARRENS
WUNDERTAL
HILLTOP
RANCH ELSIE DR
BLUE MOUNTAIN
BURLAND
BURLAND DR
TWIN SPRUCE RD
JOANIE
JOANIE DR
JOANIE RD
CIRCLE DR
CIRCLE
BURKE
TWIN SPRUCE

Lyttle Dowdle

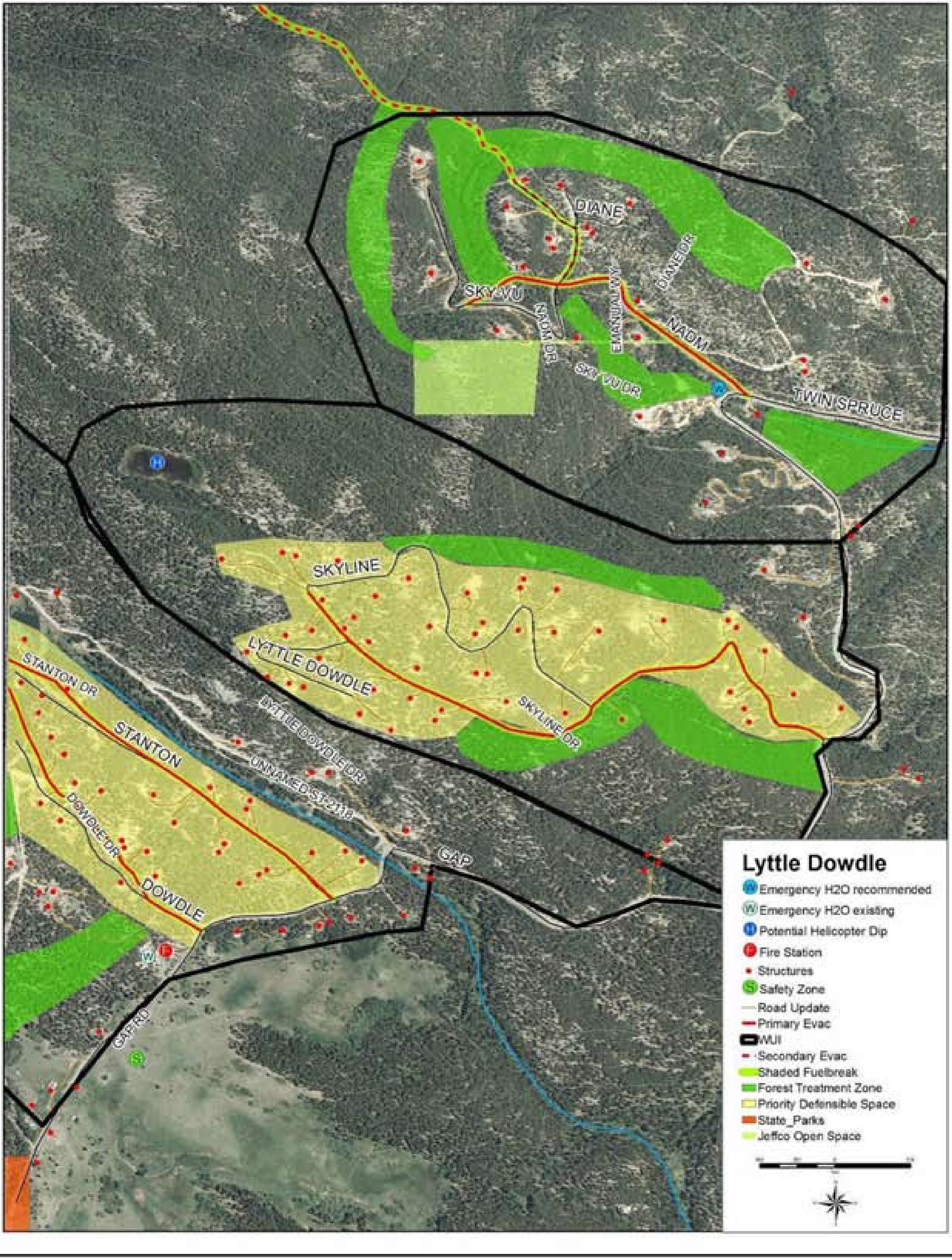
Wildfire Fire Risk and Hazard Severity Form NFPA 1144	
Lyttle Dowdle	
WUI 1 Hazard Rating	HIGH
Means of Access	
Ingress and Egress	7
2 or more roads in & out	0
One road in & out	7
Road Width	2
> 24 ft	0
> 20 ft < 24 ft	2
< 20 ft	4
All-Season Road Condition	5
Surfaced Road, grade <5%	0
Surfaced Road, grade >5%	2
Non-surfaced Road, grade <5%	2
Non-surfaced Road, grade >5%	5
Other than all season	7
Fire Service Access	3
< 300 ft with turnaround	0
> 300 ft with turnaround	2
< 300 ft with no turnaround	4
> 300 ft with no turnaround	5
Street Signs (predominent)	3
Present - reflective	0
Not present	5
Vegetation (fire behavior fuel models)	
Characteristics of predominent veg w/in 300 ft	14
Light - 1, 2, 3	5
Medium - 5, 6, 7, 8, 9	10
Heavy - 4, 10	20
Slash - 11, 12, 13	25
Defensible Space - vegetation treatment around structure	15
> 100 ft around structure	1
> 70 ft < 100 ft around structure	3
> 30 ft < 70 ft around structure	10
< 30 ft around structure	25
Topography Within 300 ft of Structures	
Slope	5
< 9%	1
10% to 20%	4
21% to 30%	7
31% to 40%	8
> 41%	10
Additional Rating Factors (rate all that apply)	
Additional factors	12
Topographic feaures that adversely affect fire behavior (0 - 5)	4
Areas with a history of high fire occurance - ignition potential (0 - 5)	3
Severe fire weather potential (0 - 5)	3
Separation of adjacent structures contributing to fire spread (0 - 5)	2
Roofing Assembly	
Roofing	3
Class A	0
Class B	3
Class C	15
Unrated	25
Building construction	
Materials (predominent)	15
Non-combustible fire-resistive siding, eaves and deck	0
Non-combustible siding, eaves and combustible deck	5
Combustible siding and deck	15
Building set-back relative to slope of 30% or more	2
> 30 ft to slope	1
< 30 ft to slope	5
Available Fire Protection	
Water source availability	5
Hydrants 500 gpm < 1000 ft apart	0
Hydrants 250 gpm < 1000 ft apart	1
Non-pressurized water source > 250 gpm for 2 hours	3
Non-pressurized water source < 250 gpm for 2 hours	5
Water unavailable	10
Organized response resources	3
Station < 5 mi from structure	1
Station > 5 mi from structure	3
Fixed fire protection	5
NFPA 13, 13R, 13D sprinkler system	0
None	5
Placement of gas and Electric Utilities	
Utilities	5
Both underground	0
One above, one below	3
Both above ground	5
Totals for home or subdivision	104
Hazard Rating Scale	
< 40 LOW	
> 40 MODERATE	
> 70 HIGH	
> 112 EXTREME	

Description: 38 observed structures; subdivision located on heavily forested east sloping ridge between Nadm and Stanton WUIs; single ingress/egress; primary access 2 lane groomed, secondary single lane dirt; both moderate to steep grade; standard street signs are present and most homes have installed reflective addressing; 1 cul de sac, 1 turnaround; housing density is moderate to high along access roads; defensible space – 37% have < 30', 53% have 30' to 70, 11% have 70' to 100'; roofing – 95% asphalt; 95% of structures have combustible exterior construction; above ground utilities, no static emergency water supply observed.

Vegetation: Predominantly mixed conifer including ponderosa pine, Douglas-fire, and lodgepole pine (FBFM 8 & 9); some dense stands of lodgepole pine with dead and downed timber (FBFM 8 & 10) .

Recommendations:

- Reduce structural ignitability through building upgrades and seasonal maintenance.
- Improve and maintain defensible space where needed and coordinated throughout the neighborhood to accommodate smaller lots and enhance effectiveness of adjacent forest treatments. Focus coordination in areas designated as priority defensible space.
- Develop and maintain shaded fuel breaks along primary evacuation route.
- Associated strategic forest treatment and thinning zones are recommended for stands adjacent to the subdivision on the north and south margins.
- Emergency static water supply recommended for Nadm and Twin Spruce Dr., and existing static water supply at CCCFPD station on Gap Rd. would serve Lyttle Dowdle WUI.
- Conduct qualified survey of pond northwest of subdivision for use as a helicopter dip site.


DIANE
DIANE DR
SKY VU
NAOMI DR
EMMANUEL WAY
NAOMI
SKY VU DR
TWIN SPRUCE
SKYLINE
LYTTLE DOWDLE
SKYLINE DR
STANTON DR
STANTON
LYTTLE DOWDLE DR
UNNAMED ST 2118
DOWDLE DR
DOWDLE
GAP
GAP RD
Lyttle Dowdle
Emergency H2O recommended
Emergency H2O existing
Potential Helicopter Dip
Fire Station
Structures
Safety Zone
Road Update
Primary Evac
WUI
Secondary Evac
Shaded Fuelbreak
Forest Treatment Zone
Priority Defensible Space
State_Parks
Jeffco Open Space

Miramonte

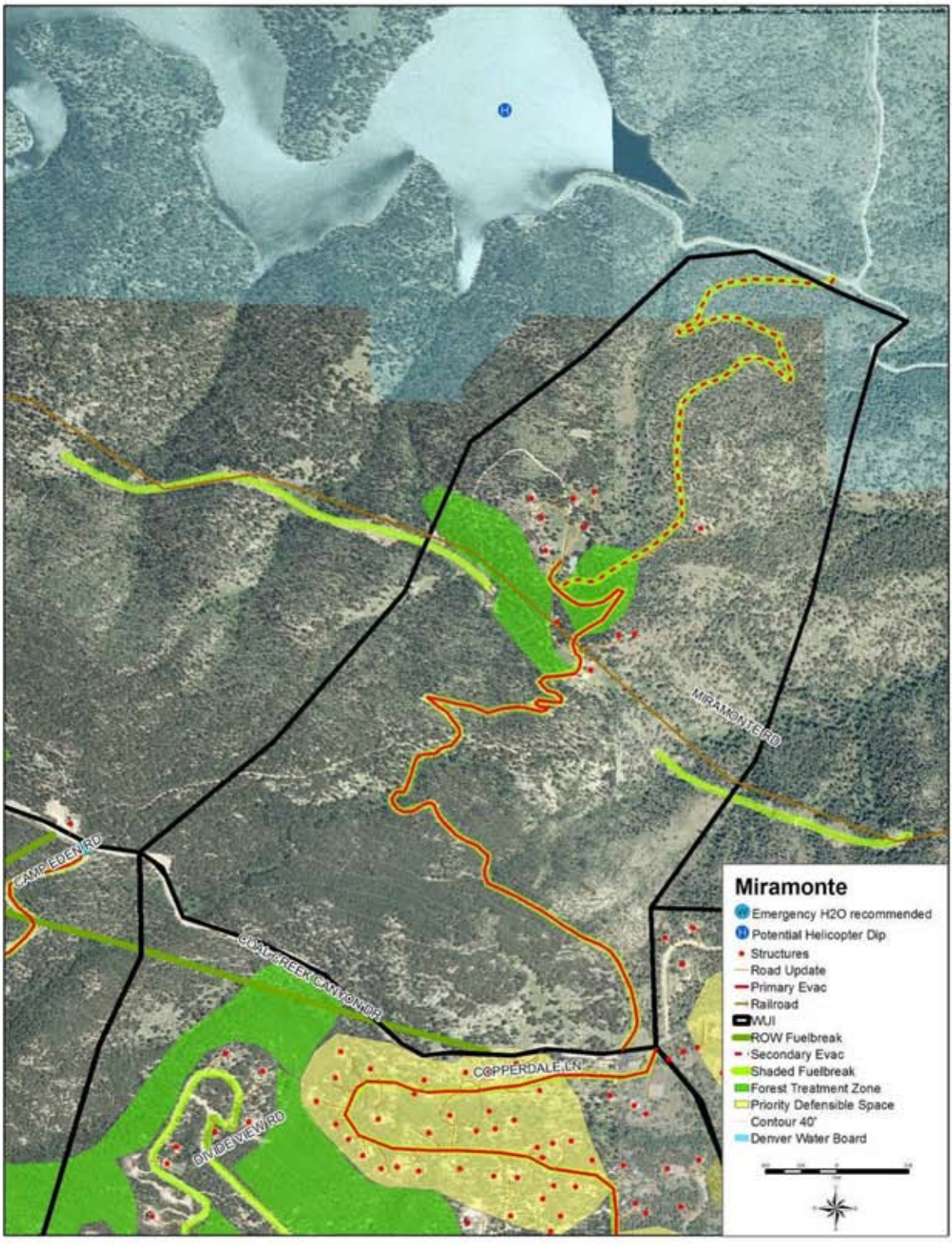
Wildfire Fire Risk and Hazard Severity Form NFPA 1144	
Miramonte	
WUI Hazard Rating	HIGH
Means of Access	
Ingress and Egress	2
2 or more roads in & out	0
One road in & out	7
Road Width	2
> 24 ft	0
> 20 ft < 24 ft	2
< 20 ft	4
All-Season Road Condition	5
Surfaced Road, grade <5%	0
Surfaced Road, grade >5%	2
Non-surfaced Road, grade <5%	2
Non-surfaced Road, grade >5%	5
Other than all season	7
Fire Service Access	3
< 300 ft with turnaround	0
> 300 ft with turnaround	2
< 300 ft with no turnaround	4
> 300 ft with no turnaround	5
Street Signs (predominent)	3
Present - reflective	0
Not present	5
Vegetation (fire behavior fuel models)	
Characteristics of predominent veg w/in 300 ft	9
Light - 1, 2, 3	5
Medium - 5, 6, 7, 8, 9	10
Heavy - 4, 10	20
Slash - 11, 12, 13	25
Defensible Space - vegetation treatment around structure	5
> 100 ft around structure	1
> 70 ft < 100 ft around structure	3
> 30 ft < 70 ft around structure	10
< 30 ft around structure	25
Topography Within 300 ft of Structures	
Slope	3
< 9%	1
10% to 20%	4
21% to 30%	7
31% to 40%	8
> 41%	10
Additional Rating Factors (rate all that apply)	
Additional factors	14
Topographic feaures that adversely affect fire behavior (0 - 5)	4
Areas with a history of high fire occurance - ignition potential (0 - 5)	5
Severe fire weather potential (0 - 5)	3
Separation of adjacent structures contributing to fire spread (0 - 5)	2
Roofing Assembly	
Roofing	3
Class A	0
Class B	3
Class C	15
Unrated	25
Building construction	
Materials (predominent)	13
Non-combustible fire-resistive siding, eaves and deck	0
Non-combustible siding, eaves and combustible deck	5
Combustible siding and deck	15
Building set-back relative to slope of 30% or more	1
> 30 ft to slope	1
< 30 ft to slope	5
Available Fire Protection	
Water source availability	5
Hydrants 500 gpm < 1000 ft apart	0
Hydrants 250 gpm < 1000 ft apart	1
Non-pressurized water source > 250 gpm for 2 hours	3
Non-pressurized water source < 250 gpm for 2 hours	5
Water unavailable	10
Organized response resources	3
Station < 5 mi from structure	1
Station > 5 mi from structure	3
Fixed fire protection	5
NFPA 13, 13R, 13D sprinkler system	0
None	5
Placement of gas and Electric Utilities	
Utilities	5
Both underground	0
One above, one below	3
Both above ground	5
Totals for home or subdivision	81
Hazard Rating Scale	
< 40 LOW	
> 40 MODERATE	
> 70 HIGH	
> 112 EXTREME	

Description: 11 observed structures; gated subdivision located along railroad ROW just south of Gross Reservoir; primary access is off Coal Creek Canyon Dr. and terminates at Miramonte Ranch, secondary access is unimproved and continues north to Gross Dam Rd.; main access is well signed, home addressing is unknown; housing density is light although somewhat clustered around a main living area; defensible space – 18% have < 30', 45% have 30' to 70, 36% have 70' to 100'; roofing – unknown; construction – unknown; above ground utilities, no static emergency water supply noted.

Vegetation: Dense mixed vegetation on steep north slope including lodgepole pine (FBFM 8 & 10), mixed conifer with Douglas-fir and ponderosa pine (FBFM 8 & 9), some aspen and shrub (FBFM 8 & 6), some open meadow and grassy understory (FBFM 1 & 2).

Recommendations:

- Reduce structural ignitability through building upgrades and seasonal maintenance.
- Improve and maintain defensible space where needed.
- Develop and maintain shaded fuel breaks along upper and lower Miramonte Rds. and along forested portions of the local railroad ROW to buffer fire spread potential from sparking brakes.
- Associated strategic forest treatment and thinning zones are recommended for stands adjacent to the subdivision in the vicinity of the railroad tunnel.
- Recommended static water supply at Camp Eden Rd. and Coal Creek Canyon Dr., and existing water supply at CCCFD station would serve WUI.


Miramonte
Emergency H2O recommended
Potential Helicopter Dip
Structures
Road Update
Primary Evac
Railroad
WUI
ROW Fuelbreak
Secondary Evac
Shaded Fuelbreak
Forest Treatment Zone
Priority Defensible Space
Contour 40'
Denver Water Board
MIRAMONTE RD
CAMP EDEN RD
COPPERDALE LN
DIVIDE VIEW RD

Nadm

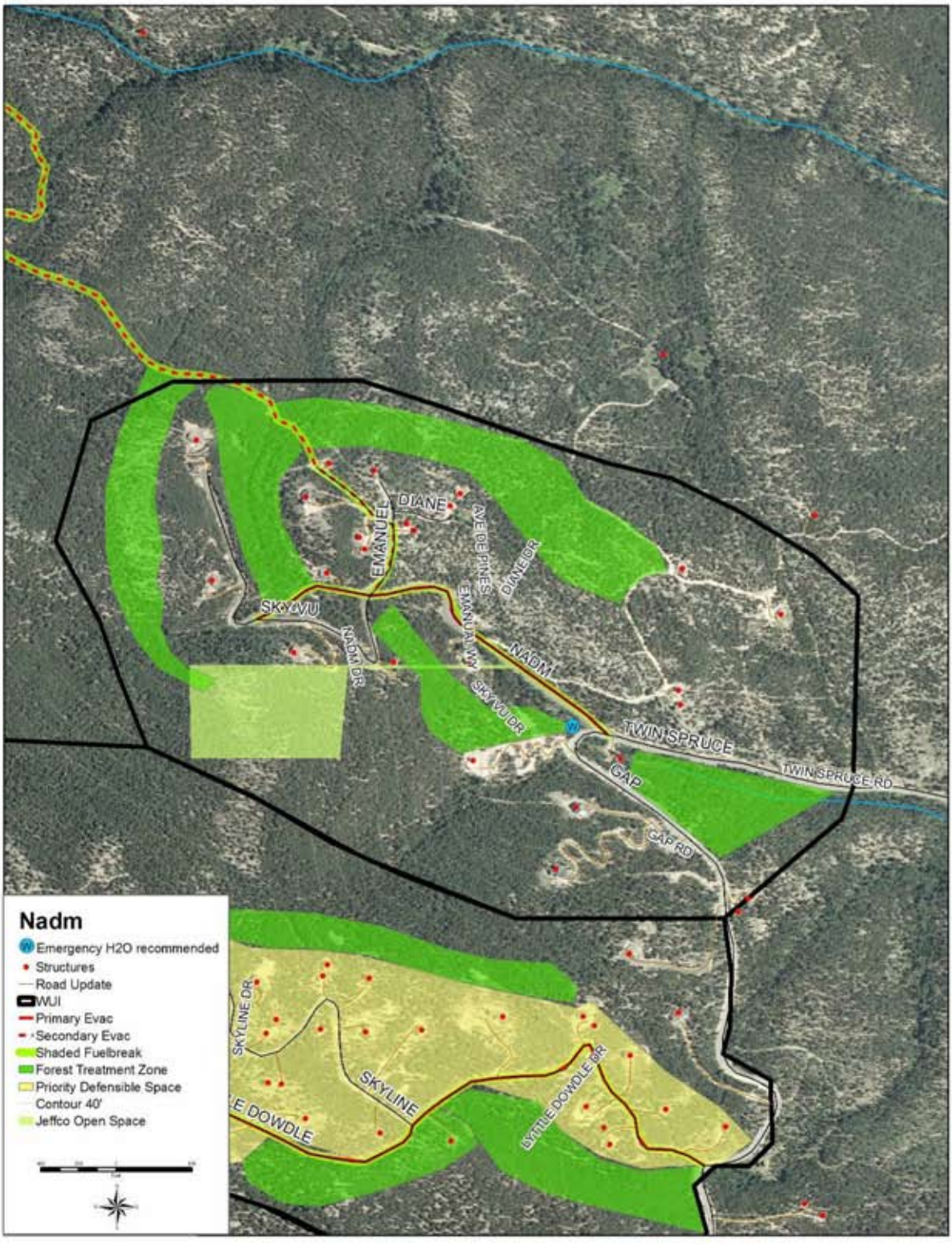
Wildfire Fire Risk and Hazard Severity Form NFPA 1144	
Nadm	
WUI 1 Hazard Rating	HIGH
Means of Access	
Ingress and Egress	7
2 or more roads in & out	0
One road in & out	7
Road Width	3
> 24 ft	0
> 20 ft < 24 ft	2
< 20 ft	4
All-Season Road Condition	5
Surfaced Road, grade <5%	0
Surfaced Road, grade >5%	2
Non-surfaced Road, grade <5%	2
Non-surfaced Road, grade >5%	5
Other than all season	7
Fire Service Access	4
< 300 ft with turnaround	0
> 300 ft with turnaround	2
< 300 ft with no turnaround	4
> 300 ft with no turnaround	5
Street Signs (predominent)	3
Present - reflective	0
Not present	5
Vegetation (fire behavior fuel models)	
Characteristics of predominent veg w/in 300 ft	14
Light - 1, 2, 3	5
Medium - 5, 6, 7, 8, 9	10
Heavy - 4, 10	20
Slash - 11, 12, 13	25
Defensible Space - vegetation treatment around structure	16
> 100 ft around structure	1
> 70 ft < 100 ft around structure	3
> 30 ft < 70 ft around structure	10
< 30 ft around structure	25
Topography Within 300 ft of Structures	
Slope	6
< 9%	1
10% to 20%	4
21% to 30%	7
31% to 40%	8
> 41%	10
Additional Rating Factors (rate all that apply)	
Additional factors	13
Topographic feaures that adversely affect fire behavior (0 - 5)	5
Areas with a history of high fire occurance - ignition potential (0 - 5)	3
Severe fire weather potential (0 - 5)	3
Separation of adjacent structures contributing to fire spread (0 - 5)	2
Roofing Assembly	
Roofing	3
Class A	0
Class B	3
Class C	15
Unrated	25
Building construction	
Materials (predominent)	15
Non-combustible fire-resistive siding, eaves and deck	0
Non-combustible siding, eaves and combustible deck	5
Combustible siding and deck	15
Building set-back relative to slope of 30% or more	2
> 30 ft to slope	1
< 30 ft to slope	5
Available Fire Protection	
Water source availability	5
Hydrants 500 gpm < 1000 ft apart	0
Hydrants 250 gpm < 1000 ft apart	1
Non-pressurized water source > 250 gpm for 2 hours	3
Non-pressurized water source < 250 gpm for 2 hours	5
Water unavailable	10
Organized response resources	3
Station < 5 mi from structure	1
Station > 5 mi from structure	3
Fixed fire protection	5
NFPA 13, 13R, 13D sprinkler system	0
None	5
Placement of gas and Electric Utilities	
Utilities	5
Both underground	0
One above, one below	3
Both above ground	5
Totals for home or subdivision	109
Hazard Rating Scale	
< 40 LOW	
> 40 MODERATE	
> 70 HIGH	
> 112 EXTREME	

Description: 46 observed structures; subdivision located in a short valley striking northwest of Twin Spruce rd. single ingress/egress; primary access 2 lane groomed with a tight looping turnaround, secondary road is 1 to 1 ½ lane dirt with no turnaround; both moderate grade; standard street signs are present, inconsistent home addressing; housing density is low; defensible space – 47% have < 30', 33% have 30' to 70, 20% have 70' to 100'; roofing – 80% asphalt; 93% of structures have combustible exterior construction; above ground utilities, no static emergency water supply observed.

Vegetation: South facing slope medium to high density ponderosa pine (FBFM 9), north facing slope dense lodgepole pine and mixed conifer (FBFM 8 & 10).

Recommendations:

- Reduce structural ignitability through building upgrades and seasonal maintenance.
- Improve and maintain defensible space where needed.
- Develop and maintain shaded fuel breaks along primary and secondary evacuation routes, and other identified primary access routes.
- Associated strategic forest treatment and thinning zones are recommended for stands surrounding to the subdivision.
- Emergency static water supply installation is recommended for Nadm and Twin Spruce Dr.
- Investigate possible secondary evacuation route from Emanuel to Camp Eden.


Nadm
Emergency H2O recommended
Structures
Road Update
WUI
Primary Evac
Secondary Evac
Shaded Fuelbreak
Forest Treatment Zone
Priority Defensible Space
Contour 40'
Jeffco Open Space
EMANUEL
DIANE
AVE DE PINES
DIANE DR
SKYVU
NADM DR
EMANUEL WY
NADM
SKYVU DR
TWIN SPRUCE
TWIN SPRUCE RD
CAP
CAP RD
SKYLINE DR
SKYLINE
LE DOWDLE
LITTLE DOWDLE DR

Stanton

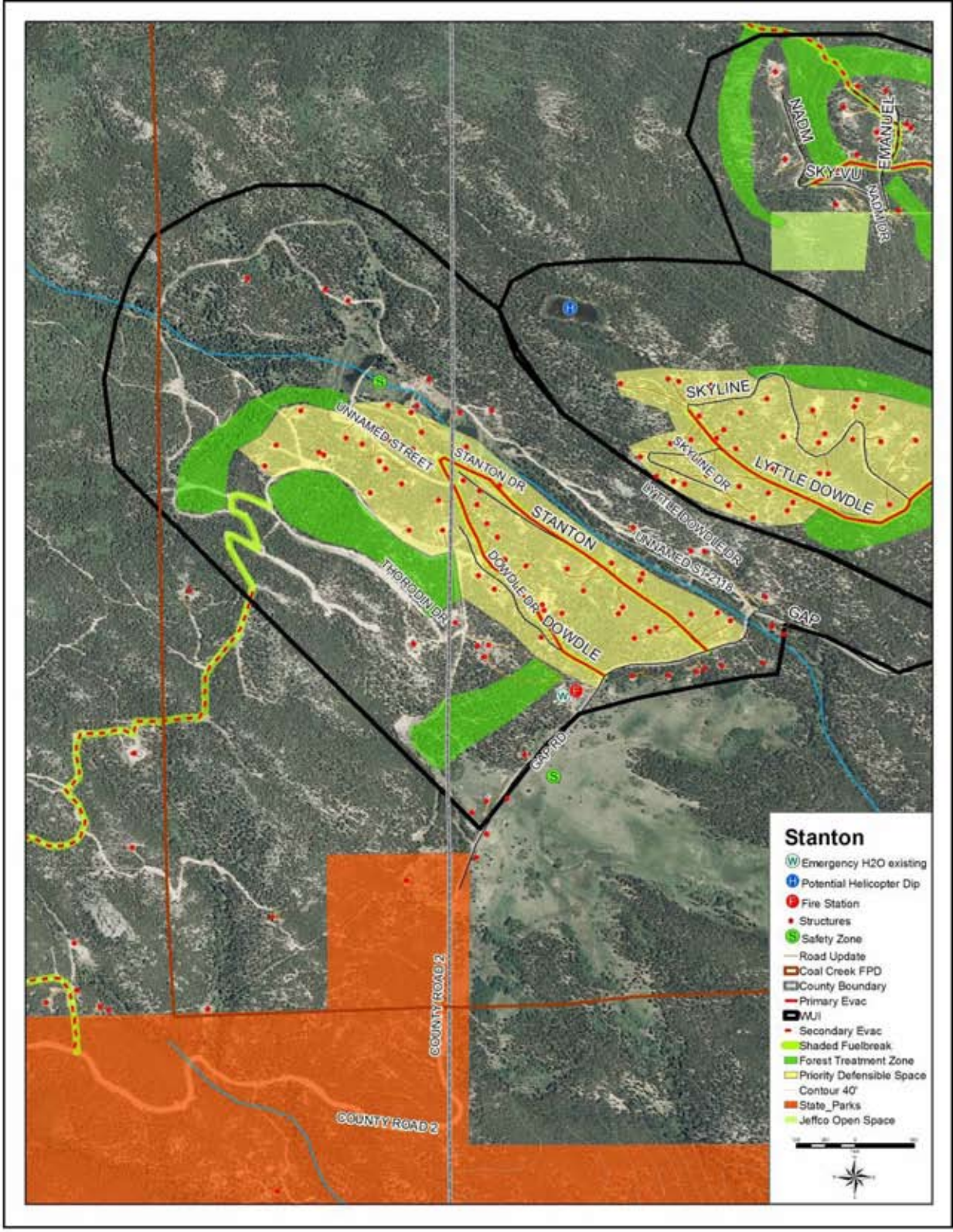
Wildfire Fire Risk and Hazard Severity Form NFPA 1144	
Stanton	
WUI 1 Hazard Rating	HIGH
Means of Access	
Ingress and Egress	2
2 or more roads in & out	0
One road in & out	7
Road Width	2
> 24 ft	0
> 20 ft < 24 ft	2
< 20 ft	4
All-Season Road Condition	5
Surfaced Road, grade <5%	0
Surfaced Road, grade >5%	2
Non-surfaced Road, grade <5%	2
Non-surfaced Road, grade >5%	5
Other than all season	7
Fire Service Access	4
< 300 ft with turnaround	0
> 300 ft with turnaround	2
< 300 ft with no turnaround	4
> 300 ft with no turnaround	5
Street Signs (predominent)	5
Present - reflective	0
Not present	5
Vegetation (fire behavior fuel models)	
Characteristics of predominent veg w/in 300 ft	14
Light - 1, 2, 3	5
Medium - 5, 6, 7, 8, 9	10
Heavy - 4, 10	20
Slash - 11, 12, 13	25
Defensible Space - vegetation treatment around structure	13
> 100 ft around structure	1
> 70 ft < 100 ft around structure	3
> 30 ft < 70 ft around structure	10
< 30 ft around structure	25
Topography Within 300 ft of Structures	
Slope	3
< 9%	1
10% to 20%	4
21% to 30%	7
31% to 40%	8
> 41%	10
Additional Rating Factors (rate all that apply)	
Additional factors	11
Topographic feaures that adversely affect fire behavior (0 - 5)	3
Areas with a history of high fire occurance - ignition potential (0 - 5)	3
Severe fire weather potential (0 - 5)	3
Separation of adjacent structures contributing to fire spread (0 - 5)	2
Roofing Assembly	
Roofing	2
Class A	0
Class B	3
Class C	15
Unrated	25
Building construction	
Materials (predominent)	13
Non-combustible fire-resistive siding, eaves and deck	0
Non-combustible siding, eaves and combustible deck	5
Combustible siding and deck	15
Building set-back relative to slope of 30% or more	1
> 30 ft to slope	1
< 30 ft to slope	5
Available Fire Protection	
Water source availability	5
Hydrants 500 gpm < 1000 ft apart	0
Hydrants 250 gpm < 1000 ft apart	1
Non-pressurized water source > 250 gpm for 2 hours	3
Non-pressurized water source < 250 gpm for 2 hours	5
Water unavailable	10
Organized response resources	1
Station < 5 mi from structure	1
Station > 5 mi from structure	3
Fixed fire protection	5
NFPA 13, 13R, 13D sprinkler system	0
None	5
Placement of gas and Electric Utilities	
Utilities	5
Both underground	0
One above, one below	3
Both above ground	5
Totals for home or subdivision	91
Hazard Rating Scale	
< 40 LOW	
> 40 MODERATE	
> 70 HIGH	
> 112 EXTREME	

Description: 51 observed structures; subdivision located along a drainage striking northwest from Gap/Twin Spruce Rd.; dual ingress/egress but accesses are close in proximity; primary access 2 lane groomed, secondary roads are 2 to 1 ½ lane groomed; low to moderate grade; street signage is inconsistent with a confusing road network, inconsistent home addressing; housing density is moderate along access roads; defensible space – 30% have < 30', 52% have 30' to 70', 17% have 70' to 100'; roofing – 76% asphalt, 24% non-combustible; 85% of structures have combustible exterior construction; above ground utilities, static emergency water supply observed at fire station on Gap Rd.

Vegetation: Some stands of ponderosa pine and Douglas-fir mixed with lodgepole pine (FBFM 8 & 9), extensive stands of lodgepole pine with areas of dead and downed timber (FBFM 8 & 10), extensive meadow complex southeast off Gap rd.

Recommendations:

- Reduce structural ignitability through building upgrades and seasonal maintenance.
- Improve and maintain defensible space where needed and coordinated throughout the neighborhood to accommodate smaller lots and enhance effectiveness of adjacent forest treatments. Focus coordination in areas designated as priority defensible space.
- Develop and maintain shaded fuel breaks along primary and secondary evacuation routes, and other identified primary access routes.
- Associated strategic forest treatment and thinning zones are recommended for stands northwest and west of the subdivision.
- Seasonal road margin maintenance including mowing and conifer reproduction reduction.
- Investigate possible secondary evacuation route from Thorodin Dr. to Gap Rd. inside Golden Gate State Park.
- Investigate the use of meadows north of WUI and south of Gap Rd. for community safety zones.


NADM
EMANUEL
SKYVU
NADMDR
SKYLINE
SKYLINE DR
LYTTLE DOWDLE
LYTTLE DOWDLE DR
UNNAMED STREET
STANTON DR
STANTON
DOWDLE DR
DOWDLE
UNNAMED ST 2318
GAP
GAP RD
THORODIN DR
COUNTY ROAD 2
COUNTY ROAD 2
Stanton
Emergency H2O existing
Potential Helicopter Dip
Fire Station
Structures
Safety Zone
Road Update
Coal Creek FPD
County Boundary
Primary Evac
WUI
Secondary Evac
Shaded Fuelbreak
Forest Treatment Zone
Priority Defensible Space
Contour 40'
State_Parks
Jeffco Open Space

Vonnie Claire

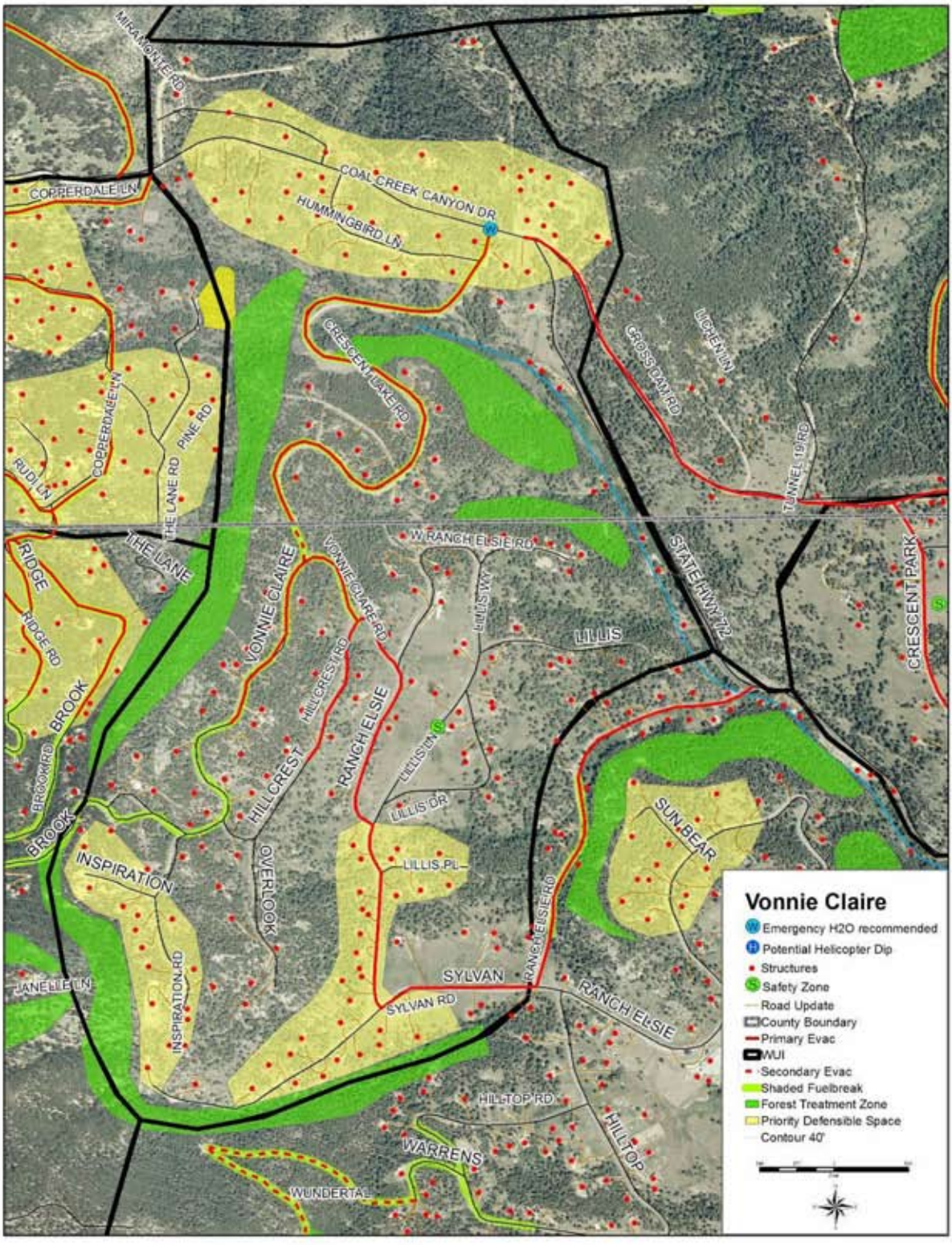
Wildfire Fire Risk and Hazard Severity Form NFPA 1144	
Vonnie Claire	
WUI Hazard Rating	HIGH
Means of Access	
Ingress and Egress	0
2 or more roads in & out	0
One road in & out	7
Road Width	1
> 24 ft	0
> 20 ft < 24 ft	2
< 20 ft	4
All-Season Road Condition	4
Surfaced Road, grade <5%	0
Surfaced Road, grade >5%	2
Non-surfaced Road, grade <5%	2
Non-surfaced Road, grade >5%	5
Other than all season	7
Fire Service Access	2
< 300 ft with turnaround	0
> 300 ft with turnaround	2
< 300 ft with no turnaround	4
> 300 ft with no turnaround	5
Street Signs (predominent)	3
Present - reflective	0
Not present	5
Vegetation (fire behavior fuel models)	
Characteristics of predominent veg w/in 300 ft	8
Light - 1, 2, 3	5
Medium - 5, 6, 7, 8, 9	10
Heavy - 4, 10	20
Slash - 11, 12, 13	25
Defensible Space - vegetation treatment around structure	11
> 100 ft around structure	1
> 70 ft < 100 ft around structure	3
> 30 ft < 70 ft around structure	10
< 30 ft around structure	25
Topography Within 300 ft of Structures	
Slope	3
< 9%	1
10% to 20%	4
21% to 30%	7
31% to 40%	8
> 41%	10
Additional Rating Factors (rate all that apply)	
Additional factors	12
Topographic feaures that adversely affect fire behavior (0 - 5)	3
Areas with a history of high fire occurance - ignition potential (0 - 5)	3
Severe fire weather potential (0 - 5)	3
Separation of adjacent structures contributing to fire spread (0 - 5)	3
Roofing Assembly	
Roofing	2
Class A	0
Class B	3
Class C	15
Unrated	25
Building construction	
Materials (predominent)	15
Non-combustible fire-resistive siding, eaves and deck	0
Non-combustible siding, eaves and combustible deck	5
Combustible siding and deck	15
Building set-back relative to slope of 30% or more	3
> 30 ft to slope	1
< 30 ft to slope	5
Available Fire Protection	
Water source availability	5
Hydrants 500 gpm < 1000 ft apart	0
Hydrants 250 gpm < 1000 ft apart	1
Non-pressurized water source > 250 gpm for 2 hours	3
Non-pressurized water source < 250 gpm for 2 hours	5
Water unavailable	10
Organized response resources	1
Station < 5 mi from structure	1
Station > 5 mi from structure	3
Fixed fire protection	5
NFPA 13, 13R, 13D sprinkler system	0
None	5
Placement of gas and Electric Utilities	
Utilities	5
Both underground	0
One above, one below	3
Both above ground	5
Totals for home or subdivision	**80**
Hazard Rating Scale	
< 40 LOW	
> 40 MODERATE	
> 70 HIGH	
> 112 EXTREME	

Description: 203 observed structures; subdivision characterized by a northeast facing slope and an extensive central meadow; primary access along Ranch Elsie Rd. and the Hilltop WUI, secondary access is available through Coal Creek Heights; Crescent Lake Rd. bisects the assessment area but does not provide through access to the central Vonnie Claire area; primary roads are 2 lane paved or 2 lane groomed, secondary roads are 1 ½ lane and groomed, grade is moderate to steep as they climb the ridge south and west; turnarounds present on most cul de sacs but some are very limited; street signage standard and present, home addressing is inconsistent; housing density moderate to high along access routes ; defensible space – 36% have < 30', 42% have 30' to 70', 12% have 70' to 100', 10% have > 100'; roofing – 86% asphalt, 13% non-combustible; construction – 98% of structures have combustible siding; above ground utilities, no emergency water source observed.

Vegetation: Open meadows and grassy understory characterize the central portion of the subdivision (FBFM 1 & 2); dense stands of ponderosa pine Douglas-fir are found on all margins of the subdivision (FBFM 8 & 9).

Recommendations:

- Reduce structural ignitability through building upgrades and seasonal maintenance.
- Improve and maintain defensible space where needed and coordinated throughout the neighborhood to accommodate smaller lots and enhance effectiveness of adjacent forest treatments. Focus coordination in areas designated as priority defensible space.
- Seasonal road margin maintenance including mowing and conifer reproduction reduction.
- Develop and maintain shaded fuelbreaks along forested portions evacuation routes and primary residential accesses.
- Forest thinning recommended in timber stands along subdivision margins.
- Establish emergency access from Vonnie Claire to Crescent Lake road.
- Static emergency water supply recommended at Crescent Lake Rd. and Coal Creek Canyon Dr..
- Investigate the use of central meadow for community safety zone.


Vonnie Claire
Emergency H2O recommended
Potential Helicopter Dip
Structures
Safety Zone
Road Update
County Boundary
Primary Evac
WUI
Secondary Evac
Shaded Fuelbreak
Forest Treatment Zone
Priority Defensible Space
Contour 40'
MIRAMONTE RD
COPPERDALE LN
COAL CREEK CANYON DR
HUMMINGBIRD LN
CRESCENT LAKE RD
CROSS DAM RD
LICHEN LN
TUNNEL 19 RD
PINE RD
RUDI LN
THE LANE RD
THE LANE
RIDGE
RIDGE RD
BROOK
BROOK RD
VONNIE CLAIRE
VONNIE CLAIRE RD
HILLCREST RD
HILLCREST
W RANCH ELSIE RD
RANCH ELSIE
LILLIS
LILLIS PL
LILLIS DR
STATE HWY 72
CRESCENT PARK
SUN BEAR
INSPIRATION
OVERLOOK
JANELLE LN
INSPIRATION RD
SYLVAN
SYLVAN RD
RANCH ELSIE RD
HILLTOP RD
HILLTOP
WARRENS
WUNDERTAL

Wonderview

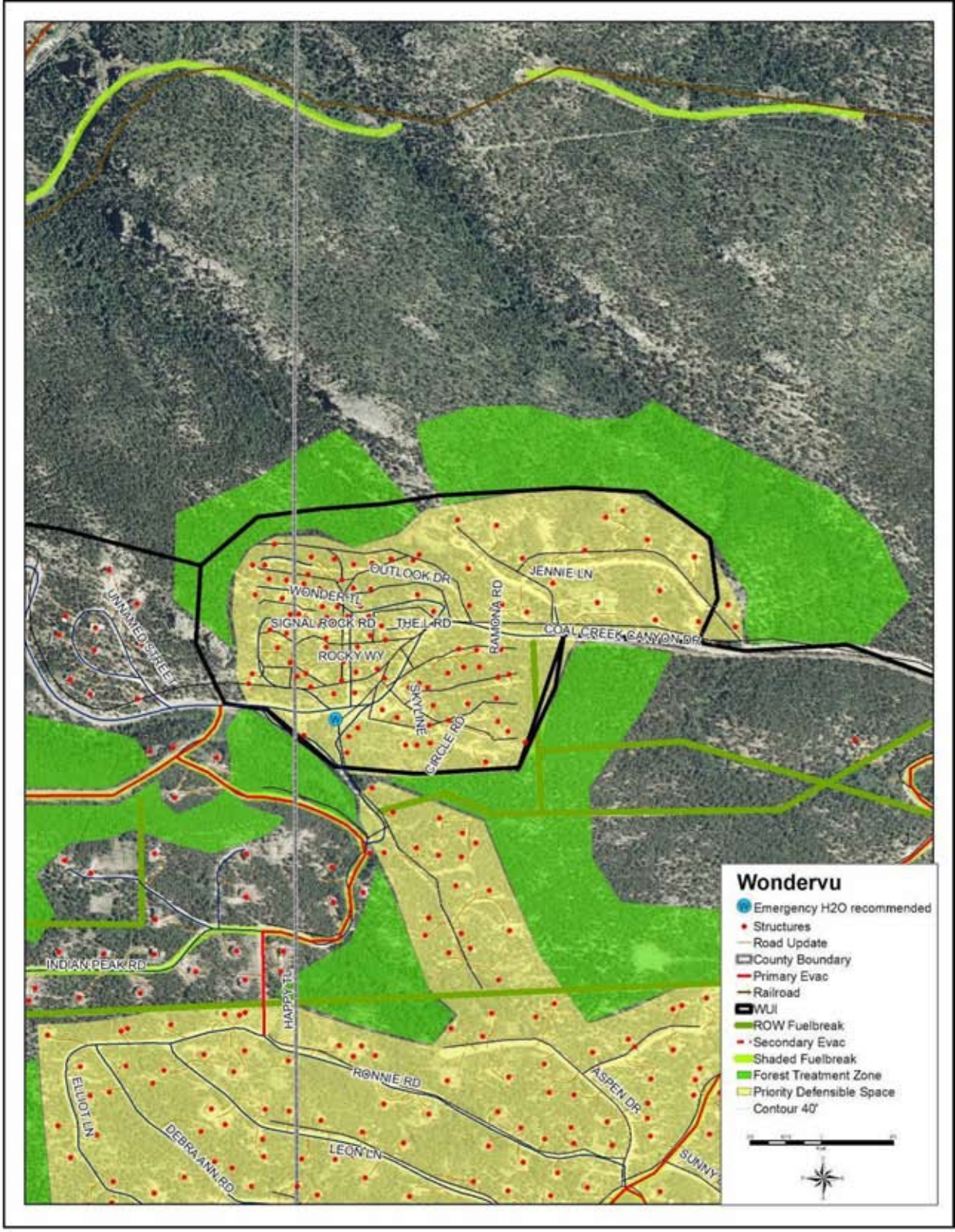
Wildfire Fire Risk and Hazard Severity Form NFPA 1144	
Wondervu	
WUI Hazard Rating	EXTREME
Means of Access	
Ingress and Egress	5
2 or more roads in & out	0
One road in & out	7
Road Width	4
> 24 ft	0
> 20 ft < 24 ft	2
< 20 ft	4
All-Season Road Condition	6
Surfaced Road, grade <5%	0
Surfaced Road, grade >5%	2
Non-surfaced Road, grade <5%	2
Non-surfaced Road, grade >5%	5
Other than all season	7
Fire Service Access	5
< 300 ft with turnaround	0
> 300 ft with turnaround	2
< 300 ft with no turnaround	4
> 300 ft with no turnaround	5
Street Signs (predominent)	5
Present - reflective	0
Not present	5
Vegetation (fire behavior fuel models)	
Characteristics of predominent veg w/in 300 ft	12
Light - 1, 2, 3	5
Medium - 5, 6, 7, 8, 9	10
Heavy - 4, 10	20
Slash - 11, 12, 13	25
Defensible Space - vegetation treatment around structure	20
> 100 ft around structure	1
> 70 ft < 100 ft around structure	3
> 30 ft < 70 ft around structure	10
< 30 ft around structure	25
Topography Within 300 ft of Structures	
Slope	2
< 9%	1
10% to 20%	4
21% to 30%	7
31% to 40%	8
> 41%	10
Additional Rating Factors (rate all that apply)	
Additional factors	14
Topographic feaures that adversely affect fire behavior (0 - 5)	3
Areas with a history of high fire occurance - ignition potential (0 - 5)	3
Severe fire weather potential (0 - 5)	3
Separation of adjacent structures contributing to fire spread (0 - 5)	5
Roofing Assembly	
Roofing	5
Class A	0
Class B	3
Class C	15
Unrated	25
Building construction	
Materials (predominent)	15
Non-combustible fire-resistive siding, eaves and deck	0
Non-combustible siding, eaves and combustible deck	5
Combustible siding and deck	15
Building set-back relative to slope of 30% or more	1
> 30 ft to slope	1
< 30 ft to slope	5
Available Fire Protection	
Water source availability	5
Hydrants 500 gpm < 1000 ft apart	0
Hydrants 250 gpm < 1000 ft apart	1
Non-pressurized water source > 250 gpm for 2 hours	3
Non-pressurized water source < 250 gpm for 2 hours	5
Water unavailable	10
Organized response resources	3
Station < 5 mi from structure	1
Station > 5 mi from structure	3
Fixed fire protection	5
NFPA 13, 13R, 13D sprinkler system	0
None	5
Placement of gas and Electric Utilities	
Utilities	5
Both underground	0
One above, one below	3
Both above ground	5
Totals for home or subdivision	112
Hazard Rating Scale	
< 40 LOW	
> 40 MODERATE	
> 70 HIGH	
> 112 EXTREME	

Description: 110 observed structures; subdivision characterized by high structure density in a densely forested plateau; WUI is bisected by Coal Creek Canyon Dr. which provides dual ingress/egress to the area; secondary roads throughout the community are single lane unimproved dirt; grade is low to flat; roads generally terminate in dead ends within a home cluster; street signage is non-standard and inconsistent, home addressing is inconsistent; housing density is high; defensible space – 72% have < 30', 28% have 30' to 70', roofing – 88% asphalt, 5% non-combustible, 7 % wood shake; construction – 100% of structures have combustible siding; above ground utilities, no emergency water source observed.

Vegetation: Lodgepole pine with some mix Douglas-fir and ponderosa pine characterize the timber in the area (FBFM 8 & 9); high concentration of small homes and some grass and shrub characterize the understory (FBFM 2 & 6).

Recommendations:

- Reduce structural ignitability through building upgrades and seasonal maintenance.
- Improve and maintain defensible space where needed and coordinated throughout the neighborhood to accommodate smaller lots and enhance effectiveness of adjacent forest treatments. Focus coordination in areas designated as priority defensible space.
- Improve emergency access throughout community, grade and widen roads, establish turnarounds at dead ends.
- Seasonal road margin maintenance including mowing and conifer reproduction reduction.
- Forest thinning recommended in timber stands along subdivision margins.
- Improve existing powerline ROW.
- Static emergency water supply recommended near the Wondervu Café.


OUTLOOK DR
WONDER TL
SIGNAL ROCK RD
THE L RD
ROCKY WY
RAMONA RD
JENNIE LN
COAL CREEK CANYON DR
UNNAMED STREET
SKYLINE
CIRCLE RD
INDIAN PEAK RD
HAPPY TL
RONNIE RD
ELLIOT LN
DEBRA ANN RD
LEON LN
ASPEN DR
SUNNY
Wondervu
Emergency H2O recommended
Structures
Road Update
County Boundary
Primary Evac
Railroad
WUI
ROW Fuelbreak
Secondary Evac
Shaded Fuelbreak
Forest Treatment Zone
Priority Defensible Space
Contour 40'

APPENDIX D
COAL CREEK CANYON FIRE PROTECTION DISTRICT QUESTIONNAIRE

Coal Creek Canyon Fire Protection District
Community Wildfire Protection Plan (CWPP)
Questionnaire

Your input on this very important topic will help to create an effective plan. Please provide the following information:

1. What community, neighborhood, or subdivision do you live in or closest to?
   _____

2. How great of a risk do you feel wildfire poses to your community?
   ❑ Extreme Risk ❑ Moderate Risk ❑ Low Risk ❑ No Risk

3. Do you feel your community is currently protected against potential wildfire?
   ❑ Yes. If so, how: _____
   ❑ No. If not, why: _____

4. Do you feel your community is currently prepared to deal with a wildfire?
   ❑ Yes. If so, how: _____
   ❑ No. If not, why: _____

5. Rank the types of areas in your community that you think pose a fire risk to homes or property (1 being the highest risk, 4 the lowest).
   ___Forests ___Shrubs/Scrub ___Meadows/Grasses ___Residential Structures ___Other: _____

6. Do you feel there are areas of extreme wildfire hazard in or near you community?
   ❑ No. ❑ Yes. If so, where: _____

7. Rank what you consider to be the best ways to mitigate or reduce wildfire risks (1 providing the highest benefit and 10 the lowest).
   ___ Reduce vegetation (grasses, trees, etc.) on public land by mechanical treatments (tree thinning, etc.)
   ___ Reduce vegetation on public land by controlled burns.
   ___ Develop shaded fuel breaks along roads and strategic locations.
   ___ Upgrade firefighting equipment.
   ___ Improve fire department volunteer recruitment efforts.
   ___ Increase water availability.
   ___ Encourage private landowners to develop defensible spaces around structures.
   ___ Conduct community outreach and education programs.
   ___ Other_____
   _____
   _____

8. Have actions been taken to reduce the risk of wildfire in your community?
   ❑ Not that I am aware of. ❑ Yes. Please explain: _____

9. Have fire education programs occurred in your community?
   ❑ Not that I am aware of. ❑ Yes. Please describe: _____

10. Are you or someone you know willing to become involved with the implementation of this CWPP?
    ❑ No. ❑ Yes. If so, Please provide contact information:
    Name_____ Email _____
    Address_____ Phone_____

Response Due April 15, 2008

Please email, fax or mail your response to:

Walsh Environmental
CCCFPD CWPP Project Manager
4888 Pearl E. Circle, Suite 108 • Boulder, CO 80301-2475
EMAIL: cwpp@walshenv.com
FAX 303-443-0367
PHONE: 303-443-3282

APPENDIX E
COAL CREEK CANYON FIRE PROTECTION DISTRICT
QUESTIONNAIRE FEEDBACK SUMMARY

Coal Creek Canyon CWPP Questionnaire

1) What community do you live closest to?

Community	Count
Kaulman / Kuhlmann Heights	2
Kulman Heights III	1
Lillis Lane Area	1
Coal Creek Canyon Camp Elder Area	1
Crescent Park	5
30934 Skyline Drive	1
Blue Mountain Estates	5
Gap Road / Lyttle Dowdle Drive	1
Kuhlman Heights No. II	1
Coal Creek Heights Drive	3
Coal Creek Canyon Road	1
Pooles Camelot Subdivision/ Lyttle Dowdle Neighb	1
NADM Acres	1
Georgian Woods	1
Sylvan Heights - Jefferson County	1
Burland Ranch	1
Summit Ranch	1
Lazy Z Estates	1
Stanton Subdivision	2
Hilltop	1

2) How great of a risk do you think wildfire poses to your community?

Extreme	Moderate	Low	None
15	16	1	0

3) Do you think your community is currently protected against potential wildfire?

Yes	No
9	24

If yes, why?

Roads surround and close to Fire Station #1.
Hydrants, fire stations nearby, awareness.
As best it can by CCFD and the increased awareness of homeowners; slowly increasing mitigation efforts.
Two wildfires have been stopped in the last 5 years.
Trained professionals to fight fire (past experiences).
We are very close to the fire station.
Many homeowners cut their grass and vegetation early in summer and some lower in the valley
Many are aware of the danger around us.
community awareness program.
Protected to a certain degree; people are generally good about keeping lots clear; two close fire stations;

If no, why?

Trees are too close to the houses; no grass has been mowed around the houses.
The trees are too thick and too many are diseased.
100 years of growth since the last fire.
High density of trees.
Nothing has been done to prepare.
Minimal fire mitigation by neighbors.
We're lucky.
Next to National Forest and open space.
There is so much forest and inaccessible areas.
Some properties are not well maintained - dense forest not thinned, dead trees not removed,
vacant properties.
Only a few households have been pro active.
Forest Service adjacent land on Winiger Ridge has large stand of dead trees.
Limited equipment, limited firefighters, away from main canyon fire stations.
Some lots still need tree thinning; others, including mine, have tall grasses that should be cut.
Inconsistent efforts by landowners to develop defensible spaces.
Neighbors have not mitigated.

4) Do you think your community is currently prepared to deal with a wildfire?	
Yes	**No**
14	16

If yes, why?

Currently working on it.
Good volunteers and neighbors.
In past, fires have been brought under control such as the Walker Ranch Fire, but not sure about the future.
Hydrants, fire stations nearby, awareness.
There are lots of plans about and slash has been lessened.
Getting better - the two recent fires on East Ridge - Blue Mtn. and Plain View make the folks aware.
Awareness of community/available slurry bombs.
There is a lot of faith in the firefighters; reverse 911.
Fire department has good equipment and well trained volunteers; though the department is sometimes understaffed.
Reverse 911 system and volunteer fire department.
Dedicated firefighters; helps available.
Property of Station 4; need more community involvement and coordination.
Not really sure how we would cope, but seen several fires and evacuated.
Highly competent fire department nearby; shielded fire break; thinning in open space.
Started the process by reducing vegetation, slash pick-up, education, etc.

If no, why?

No good plans are in place and residents are not aware of any plans
Many need to be educated about the risk and how to evacuate the Canyon if needed.
Inadequate water, poor defensible/survivable spaces.
They do not care.
Our subdivision is only accessed by one road. We've been trapped in two times by accidents - a fire would be deadly.
There is still more to be done.
No meetings, no practice against emergencies. Too many homes have no fire mitigation.
Members of the community know nothing.
Nothing has been done to prepare.
No known plan.
Not enough water.
Only one access to get in and out of neighborhood.
Lack of fire hydrants and limited ability to transport water to affected areas.
If it occurs with strong winds and high temperatures, bringing it under control would be very difficult.

5) Rank the types of areas in your community that you think pose a fire risk to homes or porperty (1 highest, 4			
Forest	**Meadows and Grass**	**Shrubs and Bushes**	**Residential Structures**
24 ranked this as #1	7 ranked this as #1	4 ranked this as #1	2 ranked this as #1

If other, describe:

Steep canyon.
Vacant properties, dense forest, dead trees

6) Do you feel there are areas of extreme fire hazard in or near you community?	
Yes	**No**
26	6

If yes, what?

Forests; pine beetles
All around
Much of property surrounding us appears to be owned by out of state owners - property, forest management non-existent.
Steep hillsides facing NW overlooking Gross and Walk Ranch above railroad.
Areas where an excessive amount of fuel has built up with little or no work done to mitigate it.
Crescent Park; all the Canyon.
Everywhere.
The entire Canyon, due to so many beetle killed trees and too many trees.
State Forests have a lot of dead trees.
Any area with dense lodge pole pine.
Hillsides South of Blue Mountain, others…

Many dead, sick, north facing slopes.
The forest to the South of Blue Mountain's valley
Vacant lot behind house.
Adjacent to the railroad tracks.
National Forest.
The open land west - between our house and Hwy 72 has a lot of dead timber and are inaccessible by vehicles.
Large tracts of vacant land, rough terrain, etc.
S. Beaver Creek, private lands, steep canyon.
All around.
Forest Service adjacent land on Winiger Ridge has large stand of dead trees.
Higher elevations with vast abundance of trees.
We are "down-wind" from star Peak and National Forest has lots of fuel.
Land where no actions have been taken to remove ladder fuels and low branches.
Neighbors' yards.

7) Rank what you consider to be the best ways to mitigate or reduce wildfire risk (1 highest, 10 lowest):	
Conduct community outreach	5 ranked this as #1
Develop shaded fuel breaks along roads and strategic locations	4 ranked this as #1
Encourage private landowners to develop defensible space	18 ranked this as #1
Improve fire dept volunteer recruitment	2 ranked this as #1
Increase water availability	9 ranked this as #1
Reduce vegetation on public land by controlled burn	1 ranked this as #1
Reduce vegetation on public land by mechanical treatment	15 ranked this as #1
Upgrade firefighting equipment	1 ranked this as #1
Other	1 ranked this as #1

Other comments

Conduct a house by house assessment and give recommendations to homeowners based on their situation.
Ensure there is approved plans that coordinate use of other firefighting jurisdictions in case of a major wildfire.
Keep slash day at upper fire department and try to have it twice a year
Make it cheaper to register for a controlled burn to remove slash from scrub and branches.
Make sure there are 2 ways in and out of each residential area.
Reduce vegetation on private land through controlled burns.

8) Have actions been taken to reduce the risk of wildfire to your community?	
Yes	**Not that I am aware of**
20	10
If yes, what?	
Some residents have done defensible space cleaning.	
Many of us continue to work on wildfire mitigation, but need more participation for success.	
Tree thinning, slash days (drop off sites).	
Homeowners have done work to increase defensible space areas.	
Education.	
Tree thinning in Golden Gate State Park and new fire station built on Gap Road.	
The Environmental Group organized slash removal days years ago.	
By individual homeowners and wild land and firefighter recruitment.	
Thinning of trees along Gap Road.	
Some people have reduced scrub.	
Slash days.	
Some residents have developed defensible space around structures; tree thinning.	
A few have cleared fuel from around their homes.	
Homeowners are thinning trees and chipping.	
Have been encouraging to cut down trees and clear dead trees and shrubs that are fire hazards.	
Building permits not granted without pruning of low tree branches.	
Community education - but not recently.	
Over the years homeowners have removed limbs and scrub around their homes and installed rock around homes.	
Community education; slash days; articles in local publications.	
Slash collection; homeowners clearing dead trees.	

9) Have fire education programs occurred in your community?	
Yes	**Not that I am aware of**
13	16
If yes, what?	
Fire department has had some.	
Community hall sponsored forestry department talks.	
Flyers from fire department and articles in newsletters.	
Public meetings and mailings.	
Fire mitigation articles in local paper.	
Organized slash removal days.	
Blue Mountain HOA meeting.	
Information updates in local newsletters.	
A few community meetings, publication articles.	
CCVFD	
Fire department visits to our HOA.	
Articles in Mountain Messenger and at HOA meetings.	

APPENDIX F
FUELBREAK GUIDELINES FOR FORESTED SUBDIVISIONS AND COMMUNITIES

Fuelbreak Guidelines for Forested Subdivisions & Communities

By

Frank C. Dennis

Colorado State Forest Service
Knowledge to Go Places

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

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

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

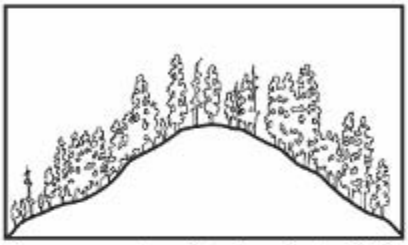
But with development inevitably comes a higher risk of wildfire as well as an ever-increasing potential for loss of life and property. Methods of fire suppression, pre-suppression needs, and homeowner and fire crew safety must all be considered in the planning and review of new developments as well as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

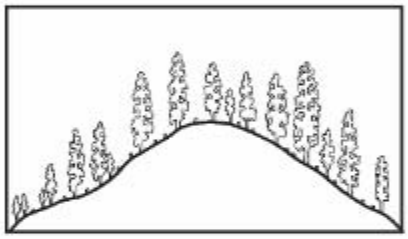
Fuelbreaks should be considered in fire management planning for subdivisions and developments; however, the following are guidelines **only**. They should be customized to local areas by professional foresters experienced in Rocky Mountain wildfire behavior and suppression tactics.

Fuelbreak vs Firebreak

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

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





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

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

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

Fuelbreak Limitations

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

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

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

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

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

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

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

The Need For A Fuelbreak

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

Potential Problem Indicator

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

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

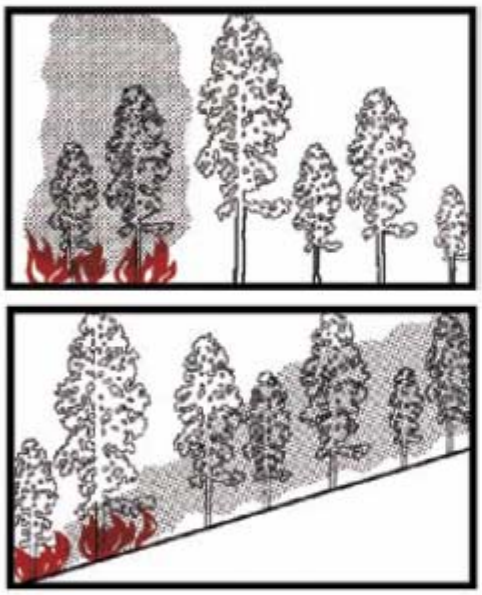
Legend: 5 – Problem may be crucial; 4 – Problem very likely;
3 – Exercise caution; 2 – Problem usually limited;
1 – No rating possible

Wildfire Hazard Maps

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

Slope

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



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

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

Topography

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

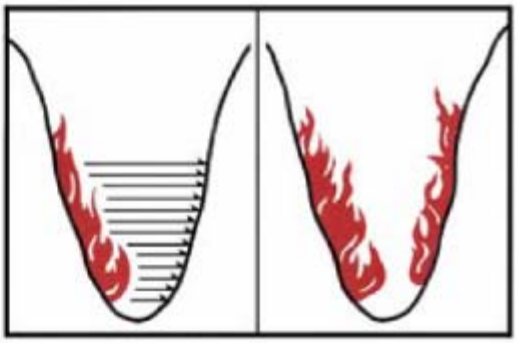
• Chimneys are densely vegetated drainages on slopes greater than 30 percent. Wind, as well as air pre-heated by a fire, tends to funnel up these drainages, rapidly spreading fire upslope.

Chimney.

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

Saddle.

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



Flashover in V-shaped valley.

Crowning Potential

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

Crowning Potential Key

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

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

Ignition Sources

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

Fuelbreak Locations

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

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

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

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

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

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

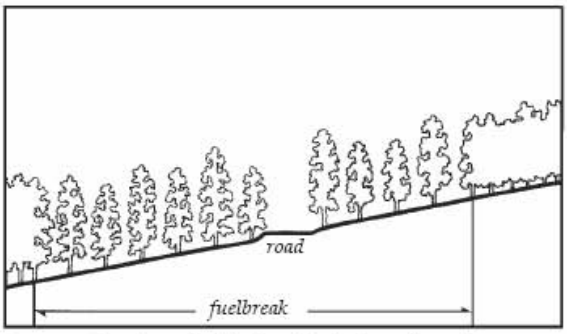
Aesthetics

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

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

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

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



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

Constructing the Fuelbreak

Fuelbreak Width and Slope Adjustments

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

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

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

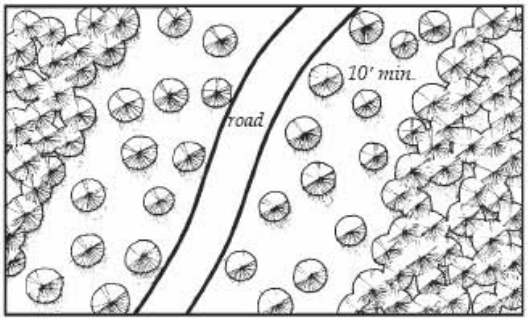
Fuelbreak Width/Slope

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

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

Stand Densities

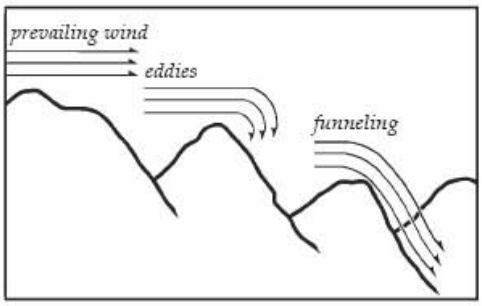
Crown separation is a more critical factor for fuelbreaks than a fixed tree density level. A *minimum* 10-foot spacing between the edges of tree crowns is recommended on level ground. As slope increases, crown spacing should also increase. However, small, isolated groups of trees may be retained for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



Plan view of fuelbreak showing minimum distance between tree crowns.

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

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



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

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

Debris Removal

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

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

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

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

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

Fuelbreak Maintenance

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

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

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

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

Conclusion

An image of well-designed communities for Colorado includes:

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

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

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

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

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

APPENDIX G
CREATING WILDFIRE DEFENSIBLE ZONES

FORESTRY

Creating Wildfire-Defensible Zones no. 6.302

by F.C. Dennis [1]

Quick Facts...

Wildfire will find the weakest links in the defense measures you have taken on your property.

The primary determinants of a home's ability to survive wildfire are its roofing material and the quality of the "defensible space" surrounding it.

Even small steps to protect your home and property will make them more able to withstand fire.

Consider these measures for all areas of your property, not just the immediate vicinity of the house.

Fire is capricious. It can find the weak link in your home's fire protection scheme and gain the upper hand because of a small, overlooked or seemingly inconsequential factor. While you may not be able to accomplish all measures below (and there are no guarantees), each will increase your home's, and possibly your family's, safety and survival during a wildfire.

Start with the easiest and least expensive actions. Begin your work closest to your house and move outward. Keep working on the more difficult items until you have completed your entire project.

Defensible Space

Two factors have emerged as the primary determinants of a home's ability to survive wildfire. These are the home's roofing material and the quality of the "defensible space" surrounding it.

Use fire-resistive materials (Class C or better rating), not wood or shake shingles, to roof homes in or near forests and grasslands. When your roof needs significant repairs or replacement, do so with a fire-resistant roofing material. Check with your county building department. Some counties now restrict wood roofs or require specific classifications of roofing material.

Defensible space is an area around a structure where fuels and vegetation are treated, cleared or reduced to slow the spread of wildfire towards the structure. It also reduces the chance of a structure fire moving from the building to the surrounding forest. Defensible space provides *room for firefighters to do their jobs.* Your house is more likely to withstand a wildfire if grasses, brush, trees and other common forest fuels are managed to reduce a fire's intensity.

The measure of fuel hazard refers to its continuity, both horizontal (across the ground) and vertical (from the ground up into the vegetation crown). Fuels with a high degree of both vertical and horizontal continuity are the most hazardous, particularly when they occur on slopes. Heavier fuels (brush and trees) are more hazardous (i.e. produce a more intense fire) than light fuels such as grass.

Mitigation of wildfire hazards focuses on breaking up the continuity of horizontal and vertical fuels. Additional distance between fuels is required on slopes.

Creating an effective defensible space involves developing a series of management zones in which different treatment techniques are used. See Figure 1 for a general view of the relationships among these management zones. Develop defensible space around each building on your property. Include detached garages, storage buildings, barns and other structures in your plan.

The actual design and development of your defensible space depends on several factors: size and shape of buildings, materials used in their construction, the slope of the ground on which the structures are built, surrounding topography,

Colorado State University Cooperative Extension

Putting Knowledge to Work

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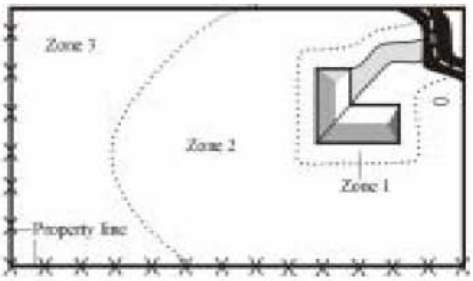

Figure 1: Forested property showing the three fire-defensible zones around a home or other structure.

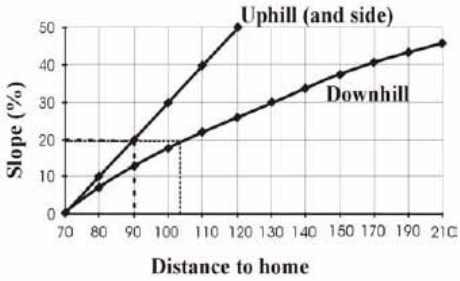

Figure 2: This chart indicates the *minimum recommended* dimensions for defensible space from the home to the outer edge of Zone 2. For example, if your home is situated on a 20 percent slope, the minimum defensible space dimensions would be 90 feet uphill and to the sides of the home and 104 feet downhill from the home.

and sizes and types of vegetation on your property. These factors all affect your design. You may want to request additional guidance from your local Colorado State Forest Service (CSFS) forester or fire department. (See the Special Recommendations section of this fact sheet for shrubs, lodgepole pine, Engelmann spruce, and aspen.)

Defensible Space Management Zones

Zone 1 is the area of maximum modification and treatment. It consists of an area of 15 feet around the structure in which all flammable vegetation is removed. This 15 feet is measured from the outside edge of the home's eaves and any attached structures, such as decks.

Zone 2 is an area of fuel reduction. It is a transitional area between Zones 1 and 3. The size of Zone 2 depends on the slope of the ground where the structure is built. Typically, the defensible space should extend *at least* 75 to 125 feet from the structure. See Figure 2 for the appropriate distance for your home's defensible space. Within this zone, the continuity and arrangement of vegetation is modified. Remove stressed, diseased, dead or dying trees and shrubs. Thin and prune the remaining larger trees and shrubs. Be sure to extend thinning along either side of your driveway all the way to your main access road. These actions help eliminate the continuous fuel surrounding a structure while enhancing homesite safety and the aesthetics of the property.

Zone 3 is an area of traditional forest management and is of no particular size. It extends from the edge of your defensible space to your property boundaries.

Prescriptions

Zone 1

The size of Zone 1 is 15 feet, measured from the edges of the structure. Within this zone, several specific treatments are recommended.

Plant nothing within 3 to 5 feet of the structure, particularly if the building is sided with wood, logs or other flammable materials. Decorative rock, for example, creates an attractive, easily maintained, nonflammable ground cover.

If the house has noncombustible siding, widely spaced foundation plantings of low growing shrubs or other "fire wise" plants are acceptable. Do not plant directly beneath windows or next to foundation vents. Be sure there are no areas of continuous grass adjacent to plantings in this area.

Frequently prune and maintain plants in this zone to ensure vigorous growth and a low growth habit. Remove dead branches, stems and leaves.

Do not store firewood or other combustible materials in this area. Enclose or screen decks with metal screening. Extend the gravel coverage under the decks. Do not use areas under decks for storage.

Ideally, remove all trees from Zone 1 to reduce fire hazards. If you do keep a tree, consider it part of the structure and extend the distance of the entire defensible space accordingly. Isolate the tree from any other surrounding trees. Prune it to at least 10 feet above the ground. Remove any branches that interfere with the roof or are within 10 feet of the chimney. Remove all "ladder fuels" from beneath the tree. Ladder fuels are vegetation with vertical continuity that allows fire to burn from ground level up into the branches and crowns of trees. Ladder fuels are potentially very hazardous but are easy to mitigate. No ladder fuels can be allowed under tree canopies. In all other areas, prune all branches of shrubs or trees up to a height of 10 feet above ground (or 1/2 the height, whichever is the least).

Zone 2

Zone 2 is an area of fuel reduction designed to reduce the intensity of any fire approaching your home. Follow these recommended management steps.

Thin trees and large shrubs so there is at least 10 feet between crowns. Crown separation is measured from the furthest branch of one tree to the nearest branch on the next tree (Figure 3). On steep slopes, allow more space between tree crowns. (See Figure 4 for *minimum recommended* spacing for trees on steep slopes.) Remove all ladder fuels from under these remaining trees. Carefully prune trees to a height of at least 10 feet.

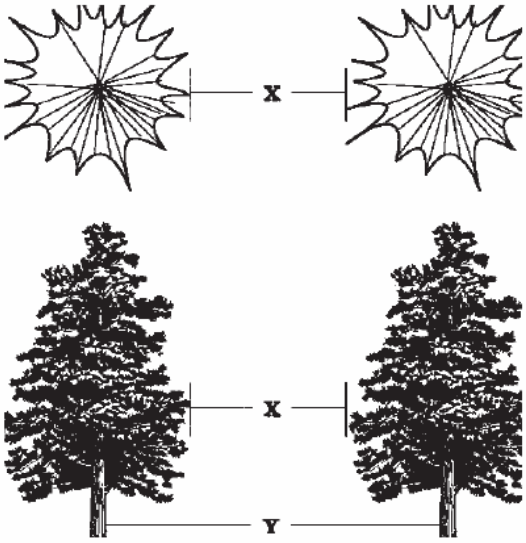

Figure 3: X = crown spacing; Y = stem spacing. Do not measure between stems for crown — measure between the edges of tree crowns.

Small clumps of 2 to 3 trees may be occasionally left in Zone 2. Leave more space between the crowns of these clumps and surrounding trees.

Because Zone 2 forms an aesthetic buffer and provides a transition between zones, it is necessary to blend the requirements for Zones 1 and 3. Thin the portions of Zone 3 adjacent to Zone 2 more heavily than the outer portions.

Isolated shrubs may remain, provided they are not under tree crowns. Prune and maintain these plants periodically to maintain vigorous growth. Remove dead stems from trees and shrubs annually. Where shrubs are the primary fuel in Zone 2, refer to the Special Recommendations section of this fact sheet.

Limit the number of dead trees (snags) retained in this area. Wildlife needs only one or two snags per acre. Be sure any snags left for wildlife cannot fall onto the house or block access roads or driveways.

Mow grasses (or remove them with a weed trimmer) as needed through the growing season to keep them low, a maximum of 6 to 8 inches. This is extremely critical in the fall when grasses dry out and cure or in the spring after the snow is gone but before the plants green up.

Stack firewood and woodpiles uphill or on the same elevation as the structure but at least 30 feet away. Clear and keep away flammable vegetation within 10 feet of these woodpiles. Do not stack wood against your house or on or under your deck, even in winter. Many homes have burned from a woodpile that ignited as the fire passed. Wildfires can burn at almost any time in Colorado.

Locate propane tanks at least 30 feet from any structures, preferably on the same elevation as the house. You don't want the LP container below your house — if it ignites, the fire would tend to burn uphill. On the other hand, if the tank is above your house and it develops a leak, LP gas will flow downhill into your home. Clear and keep away flammable vegetation within 10 feet of these tanks. Do not screen propane tanks with shrubs or vegetation.

Dispose of slash (limbs, branches and other woody debris) from your trees and shrubs through chipping or by piling and burning. Contact your local CSFS office or county sheriff's office for information about burning slash piles. If neither of these alternatives is possible, lop and scatter slash by cutting it into very small pieces and distributing it over the ground. Avoid heavy accumulations

% slope	Tree Crown Spacing	Brush and Shrub Clump Spacing
0 -10 %	10´	2 1/2 x shrub height
11 - 20%	15´	3 x shrub height
21 - 40%	20´	4 x shrub height
> 40%	30´	6 x shrub height

Figure 4: Minimum tree crown and shrub clump spacing.

Grasses

Keep dead, dry or curing grasses mowed to less than 6 inches. Defensible space size where grass is the predominant fuel can be reduced (Figure 5) when applying this practice.

Windthrow

In Colorado, certain locations and tree species, including lodgepole pine and Engelmann spruce, are especially susceptible to damage and uprooting by high winds (windthrow). If you see evidence of this problem in or near your forest, or have these tree species, consider the following adjustments to the defensible space guidelines. It is highly recommended that you contact a professional forester to help design your defensible space.

Adjustments: If your trees or homesite are susceptible to windthrow and the trees have never been thinned, use a stem spacing of diameter plus five instead of the guides listed in the Zone 3 section. Over time (every 3 to 5 years) *gradually* remove additional trees. The time between cutting cycles allows trees to "firm up" by expanding their root systems. Continue this periodic thinning until the desired spacing is reached.

Also consider leaving small clumps of trees and creating small openings on their lee side (opposite of the predominant wind direction). Again, a professional forester can help you design the best situation for your specific homesite and tree species. Remember, with species such as lodgepole pine and Engelmann spruce, the likelihood of a wildfire running through the tree tops or crowns (crowning) is closely related to the overabundance of fuels on the forest floor. Be sure to remove downed logs, branches and *excess* brush and needle buildup.

Maintaining Your Defensible Space

Your home is located in a forest that is dynamic, always changing. Trees and shrubs continue to grow, plants die or are damaged, new plants begin to grow, and plants drop their leaves and needles. Like other parts of your home, defensible space requires maintenance. Use the following checklist each year to determine if additional work or maintenance is necessary.

% slope	D-space size (uphill, downhill, sidehill)
0 - 20 %	30'
21 - 40%	50'
> 40%	70'

Figure 6: Minimum defensible space size for grass fuels.

Defensible Space and FireWise Annual Checklist

- ☐ Trees and shrubs are properly thinned and pruned within the defensible space. Slash from the thinning is disposed of.
- ☐ Roof and gutters are clear of debris.
- ☐ Branches overhanging the roof and chimney are removed.
- ☐ Chimney screens are in place and in good condition.
- ☐ Grass and weeds are mowed to a low height.
- ☐ 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 name and house number are posted and easily visible.
- ☐ There is an easily accessible tool storage area with rakes, hoes, axes and shovels for use in case of fire.
- ☐ You have practiced family fire drills and your fire evacuation plan.
- ☐ Your escape routes, meeting points and other details are known and understood by all family members.
- ☐ Attic, roof, eaves and foundation vents are screened and in good condition.

FIREWISE is a multi-agency program that encourages the development of defensible space and the prevention of catastrophic wildfire.

Stilt foundations and decks are enclosed, screened or walled up.

- ☐ Trash and debris accumulations are removed from the defensible space.
- ☐ A checklist for fire safety needs inside the home also has been completed. This is available from your local fire department.

References

Colorado State Forest Service, Colorado State University, Fort Collins, CO 80523-5060; (970) 491-6303:

- *FireWise Construction — Design and Materials*
- Home Fire Protection in the Wildland Urban Interface
- Wildfire Protection in the Wildland Urban Interface
- *Landowner Guide to Thinning*

Colorado State University Cooperative Extension, 115 General Services Bldg., Fort Collins, CO 80523-4061; (970) 491-6198; E-mail: resourcecenter@ucm.colostate.edu:

- 6.303, *Fire-Resistant Landscaping*
- 6.304, *Forest Home Fire Safety*
- 6.305, *FireWise Plant Materials*
- 6.306, *Grass Seed Mixes to Reduce Wildfire Hazard*
- 7.205, *Pruning Evergreens*
- 7.206, *Pruning Shrubs*
- 7.207, *Pruning Deciduous Trees*

Colorado State Forest Service

This fact sheet was produced in cooperation with the Colorado State Forest Service.

[1]*Wildfire Hazard Mitigation Coordinator, Colorado State Forest Service.*

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APPENDIX H
PRESCRIBED PILE BURNING GUIDELINES

Colorado State FOREST SERVICE

GOLDEN DISTRICT

This handout is designed to be used by forest landowners, land managers, and fire department personnel in planning and conducting safe and effective burning of piled forest debris ("slash") called "pile burns." These guidelines cannot guarantee safety against accidents, unforeseen circumstances, changing burning conditions, or negligent actions of the individuals conducting the prescribed fire. By following the intent of these guidelines and using common sense, the landowner or forest manager can reduce slash accumulations, improve the appearance of their forest land, and reduce wildfire risk on their property. The reader should contact a local office of the Colorado State Forest Service (CSFS) or their local fire authority for updated versions of this publication and current requirements about the use of open fires.

DEFINITIONS:

Slash: The accumulation of vegetative materials such as tops, limbs, branches, brush, and miscellaneous residue resulting from forest management activities such as thinning, pruning, timber harvesting, and wildfire hazard mitigation.

Pile Burning: The treatment of slash by arranging limbs and tops into manageable piles. Piles are burned during safe burning conditions, generally during the winter following cutting.

Chunking-In: The process of moving unburned materials from the outside perimeter into the center of the still burning piles. This is done after the pile has initially burned down and is safe to approach, but before the hot coals in the center have cooled. Chunking-in allows greater consumption of the piled slash.

Mop-up: The final check of the fire to identify and extinguish any still-burning embers or materials. This is accomplished by mixing snow, water, or soil with the burning materials.

MATERIALS TO BE INCLUDED IN PILES:

All limbs, tops, brush, and miscellaneous materials recently cut in the area, no greater than 3 inches in diameter and from 1 to 8 feet in length. Older branches can be used as long as they still have needles/foliage attached or have not started decaying. Materials

greater than 3 inches in diameter do not significantly help a fire spread rapidly, will generally burn longer and require more chunking-in or mopping-up than is cost-effective, produce greater amounts of smoke, and should be used for sawtimber, posts and poles, firewood, or left for wildlife habitat. **Do not place garbage or debris in the piles**.

LOCATION OF PILES:

Piles should be located in forest openings or between remaining trees, in unused logging roads and landings, meadows, and rock outcrops. Piles should be preferably at least 10 feet from the trunk of any overhead trees. In denser stands of trees, piles can be located closer to the trees and even under the overhanging branches, but these piles should be smaller in size and burned when snow or moisture is present in the tree crowns. Piles should NOT be located on active road surfaces, in ditches, near structures or poles, under or around power lines, or on top of logs or stumps that may catch fire and continue smoldering.

CONSTRUCTION OF PILES:

Piles should be constructed by hand whenever possible, but if constructed by machine they should clean of dirt and debris. Piles should be started with a core of kindling-like materials such as needles, small branches, or paper in the bottom of the pile. Pile slash soon after cutting (while still green) and before winter snowfall. Do not include wood products such as firewood and logs. Pile branches and tops with the butt ends towards the outside of the pile, and with the branches overlapping so as to form a series of dense layers piled upon each other. The piles should be compact, packed down during construction, and with no long branches that will not burn from sticking out into the surrounding snow. Piles should be up to 8 feet in diameter, and at least 4 to 6 feet high. These measures prevent snow and moisture from filtering down into the piles and extinguishing the fire before it gets going. If the fuels do not have sufficient needles or fine fuels to carry the fire or kept moisture out (such as oak brush or very old conifer branches), then you should cover the piles with 6 mil plastic to keep them dry until the day of the burn, and then remove it.

PLANNING YOUR BURNING EFFORT:

Individuals should check with the local CSFS office or fire authority for the current requirements on open fires. Generally, you must complete one or more of the following steps before burning slash:

1. Complete and have an approved open burning permit from the local (county) Health Department.
2. Obtain authorization from the legally constituted fire authority for your area. This may be part of the health department's permit process.
3. Land management agencies must complete and have approval of an open burning permit from the Colorado Department of Health - Air Pollution Control Division.

Copies of all permits should be available on-site during the burning operation. Burning activities should also include plans for safety, supplemental water sources, and extra assistance from the local fire authority or the landowner. The individual(s) planning the burning operation should notify the following entities on the day of a burn: the local fire

authority, county sheriff's department, and adjacent landowners who may be affected by smoke. Notification should include the date, times, and exact location of the burn.

Pile burning must be conducted under suitable weather conditions. Periods of snow or light rain, with steady, light winds (for smoke dispersal), and sufficiently snow cover (6-12 inch depths) are ideal. Do not burn during periods of high winds, low humidity or drying conditions, temperature inversions (especially "Red Air Quality" days in metropolitan areas), with a lack of snow cover or these conditions are expected to develop after starting the burn. Persons burning slash piles should have the following: leather gloves; shovels; suitable footwear; masks for covering the mouth and nose; and proper eye protection.

BURNING SLASH PILES:

Piles may be ignited by several means. If the needles and fine fuels within the pile have dried though the summer, ignition can be easily started with matches and a large ball of newspaper placed within the bottom of the pile. If fuels are still partially green, or the pile is wet from rain or melting snow, then a hotter and longer burning source may be necessary. Drip torches (a specially designed gas can used by foresters for igniting fires) or sawdust soaked with diesel fuel can be used to ignite the pile. Flares used for highway emergencies can also be utilized to ignite the piles. **Do not use gasoline for this purpose.**

One test pile should be ignited to see if it burns and at what rate, prior to igniting other piles. If suitable burning conditions exist, then additional piles may be started. Ignite only those piles that can be controlled by the available manpower and resources until they have burned down. You can slow the rate of burning (and possible scorching of adjacent trees) by shoveling snow or spraying water into the pile and cooling the fire down. Depending upon weather conditions, pile size, and moisture content of the fuels, piles should burn down in 30-60 minutes. As a general rule, one person can manage three to six closely situated piles.

After the piles have burned down, chunk-in any unburned slash and wood into the hot coals in the center of the pile. As much as 95 percent of the original slash can be consumed by aggressive chunking-in. Do not start any new piles on fire after 2:00 pm, as they may continue burning into the evening, and will not burn as completely because of lower temperatures and higher relative humidity. Smoke inversions may be a problem for piles still burning after sunset. At all times, piles may need to be actively mopped-up if the weather conditions will not extinguish the fire, or if the fires could escape. If high winds or melting snow increases this risk, then all burning materials must be mopped-up.

ADDITIONAL ASSISTANCE:

If landowners have questions about burning slash, they should contact a local CSFS office (http://csfs.colostate.edu/). CSFS can assist landowners with planning or conducting prescribed fire activities such as pile burning or broadcast (area) burning. Local, state, and fire department authorities may require a burn plan, smoke management plan, and weather monitoring for complex burning operations.

APPENDIX I
GRASS SEED MIXES TO REDUCE WILDFIRE HAZARD

FORESTRY

Grass Seed Mixes to Reduce Wildfire Hazard no. 6.306

by F.C. Dennis[1]

Quick Facts...

Plant "FireWise" grass species to reduce the risk of wildfire damage.

"FireWise" grass mixes may contain only native species or a combination of native and non-native species.

Sow half the seed north to south and the other half east to west.

Rake the seed into the soil.

Mulch erosion-prone areas.

If possible, water often and lightly.

Maintain the area properly.

Colorado State University Cooperative Extension

Putting Knowledge to Work

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During much of the year, grasses ignite easily and burn rapidly. Tall grass will quickly carry fire to your house. Plant "FireWise" grasses in the defensible space around your home. Defensible space is an area around a structure where fuels and vegetation are treated, cleared or reduced to slow the spread of wildfire. See fact sheet 6.302, *Creating Wildfire-Defensible Zones*.

Seed Mixes for Colorado

Grass seed mixes developed for Colorado use native or a combination of native and non-native grass species. While the basic mixes (Tables 1 and 3) work reasonably well on all sites, they were modified for moist sites and/or those with northern exposures (Tables 2 and 4).

Grasses included in these mixes have the following characteristics:

- They are lower growing.
- They need less maintenance.
- Seed is readily available and relatively inexpensive.

Grass seed mixes made up entirely of native seed may take longer to establish — up to three years — than those with a percentage of non-native seed.

Planting

Use either a drop or a cyclone seeder to seed your defensible space.

A drop seeder is more accurate in placing seed, especially if wind is a problem. However, if the ground is rough or rocky, the cyclone seeder will be easier to use.

Seed at the rates shown in the tables below. Divide seed into two equal parts. Sow half of the seed by crossing the area north to south and the other half by crossing east to west.

Rake seed into the soil as soon as possible after sowing to reduce the chances of it blowing or washing out. Soil cover also helps to protect the young seedlings from drying out. When sowing on slopes prone to erosion, cover the seeded area with mulch. Recommended mulches include **clean** straw (straw with no seeds in it), netting or matting of some kind.

If you have water from a central community system or a well permit that allows outside irrigation, water the newly seeded areas frequently and lightly. Water enough to keep the soil moist but not so heavily as to cause soil washing and loss of the grass seed.

Maintenance

Even "FireWise" grasses need proper maintenance. See 6.303, *Fire-Resistant Landscaping*, for tips on proper mowing and other maintenance and landscaping suggestions.

FIREWISE is a multi-agency program that encourages the development of defensible space and the prevention of catastrophic wildfire.

Native Grass "Fire Mixes"

Table 1: All exposures.

Species	Variety	Percent of Mix	Broadcast Rate PLS* Lbs/Acre
Arizona fescue	Redondo	20	9.0 x .20 = 1.80
Western wheatgrass	Barton/Rosana	20	32.0 x .20 = 6.40
Streambank wheatgrass	Sodar	20	22.0 x .20 = 4.40
Indian ricegrass	Nezpar	20	25.0 x .20 = 5.00
Blue grama	Lovington	20	6.0 x .20 = 1.20
	TOTALS	100%	18.80

Table 2: Northerly exposures and/or moist sites.

Species	Variety	Percent of Mix	Broadcast Rate PLS* Lbs/Acre
Arizona fescue	Redondo	25	9.0 x .25 = 2.25
Western wheatgrass	Barton/Rosana	25	32.0 x .25 = 8.00
Streambank wheatgrass	Sodar	25	22.0 x .25 = 5.50
Indian ricegrass	Nezpar	25	25.0 x .25 = 6.25
	TOTALS	100%	22.00

Non-Native/Native Grass "Fire Mixes"

Table 3: All exposures.

Species	Variety	Percent of Mix	Broadcast Rate PLS* Lbs/Acre
Canada bluegrass	Reubens	10	2.0 x .10 = 0.20
Western wheatgrass	Barton/Rosana	20	32.0 x .20 = 6.40
Streambank wheatgrass	Sodar	15	22.0 x .15 = 3.30
Indian ricegrass	Nezpar	15	25.0 x .15 = 3.75
Sheep fescue	Covar	20	8.0 x .20 = 1.60
Blue grama	Lovington	20	6.0 x .20 = 1.20
	TOTALS	100%	16.45

Table 4: Northerly exposures and/or moist sites.

Species	Variety	Percent of Mix	Broadcast Rate PLS* Lbs/Acre
Canada bluegrass	Reubens	15	2.0 x .15 = 0.30
Western wheatgrass	Barton/Rosana	20	32.0 x .20 = 6.40
Streambank wheatgrass	Sodar	20	22.0 x .20 = 4.40
Indian ricegrass	Nezpar	15	25.0 x .15 = 3.75
Sheep fescue	Covar	30	8.0 x .30 = 2.40
	TOTALS	100%	17.25

*Pure Live Seed.

References

For additional information on protecting your homesite, see:

- 6.302, *Creating Wildfire-Defensible Zones*
- 6.303, *Fire-Resistant Landscaping*
- 6.304, *Forest Home Fire Safety*
- 6.305, *FireWise Plant Materials*

Colorado State FOREST SERVICE

This fact sheet was produced in cooperation with the Colorado State Forest Service.

[1]*Wildfire Hazard Mitigation Coordinator, Colorado State Forest Service.*

Colorado State University, U.S. Department of Agriculture and Colorado counties cooperating. Cooperative Extension programs are available to all without discrimination. No endorsement of products mentioned is intended nor is criticism implied of products not mentioned.

APPENDIX J
WILDFIRE HISTORY

Significant Wildfire History
within Wildland Urban Interface
CSFS Golden District and Immediate Vicinity

(Prepared by Allen Gallamore, Colorado State Forest Service, 8/15/07 – subject to revision/correction)

Fire Name	Location	Size	Dates	Additional Information
Owl's Head	Clear Creek County: Mt Evans (future wilderness) area on USFS lands.	Approx: 177 acres	1952	Human-caused wildfire on USFS lands, west of Mt Evans State Wildlife Area.
Devil's Canyon	Clear Creek County: Mt Evans (future wilderness) area on USFS lands.	Approx: 715 acres	June, 1956	Lightning-caused wildfire on USFS lands, near Lincoln Lake.
Rest House	Clear Creek County: Mt Evans (future wilderness) area on USFS lands.	Approx: 1,007 acres	Sept 9 – 21, 1962	Human-caused wildfire at end of "fire season" on USFS lands.
Lincoln	Clear Creek County: Mt Evans (future wilderness) area on USFS lands.	Approx: 740 acres	1968	Lightning-caused wildfire, near Rest House fire location on USFS lands.
Reservoir	Clear Creek County: near Idaho Springs reservoir on USFS lands.	Approx: 400 acres	1978	Human-caused wildfire on USFS lands.
Murphy Gulch	Jefferson County: Inter-Canyon FPD & West Metro (Bancroft) FPD; along foothills west of Ken-Caryl Ranch subdivision	Approx: 3,300 acres	Sept. 10-20, 1978	First EFF fire in Front Range, 1,800 acre run in strong winds on first day. Several structures lost, subdivisions evacuated, interagency resources ordered to supplement local fire departments' resources from multiple counties, until snowstorm on Sept 20th. CSFS takes over under EFF, returns to Jeffco SO control for Sept. 17th-20th.
North Table Mountain	Jefferson County: Fairmount FPD. Top, west and east sides of North Table Mountain.	Approx: 1300 – 2000 acres	Sept. 7 – 9, 1988	Human caused fire off CO 93 crossed mountain to threaten subdivisions on east side of mountain. Over 250 firefighters from 20 fire departments and National Guard respond as well as a helicopter. Structure protection and evacuations in many areas.
Mt. Falcon	Jefferson County: Indian Hills FPD; primarily on Jefferson County OS (Mt. Falcon park)	Approx: 125 acres	April 23 - 24, 1989	Fire within open space property, leading to voluntary fire reimbursement program by county open space agencies to local fire departments to support initial attack. Created impetus for Jefferson County Wildland Committee as a working group of the Jefferson County Fire Council.
Black Tiger	Boulder County private lands west of Boulder, CO in Boulder Canyon	Approx: 2,100 acres	July 9 – 12, 1989	Fire north of Golden District, but is considered a "watershed-event" fire for Colorado and Wildland Urban Interface mitigation. Fire was extensively studied at National level. 44 homes destroyed.
O'Fallon	Jefferson County: Evergreen FPD. DMP parkland east of Kittredge	Approx: 52 acres	March 24 – 25, 1991	Fire within Denver Mountain Parks' open space, leading to 100 firefighters from 5 departments responding. Dry winter conditions, gusty winds, and limited access slowed control efforts.
Elk Creek	Jefferson County: Golden Gate FPD. North of Clear Creek Canyon and east of Centennial Cone, in Michigan Creek and Elk Creek drainages.	Approx: 102 acres	May 13 – 18, 1991	Fire in steep terrain with limited access, leading to use of hand crews formed from 80+ firefighters representing 15 fire departments from several counties. Jefferson County Sheriff's Office' helicopter used to make water drops and county bulldozer cut fire line. Fire managed jointly by FPD and Jefferson County Sheriff's Office's newly formed Incident Management Group (IMG).

Fire Name	Location	Size	Dates	Additional Information
Carpenter Peak / Chatfield	Douglas County: USFS & West Metro (then Roxborough FPD). Two fires, one uphill from Roxborough State Park & one across South Platte River from Jefferson County	Approx: 45 acres & 23 acres	July 9 – 11, 1994	Dry lightning caused fires during larger fire bust throughout Front Range – multiple initial attacks occurring in all locations with limited availability of air resources. Evacuations of Roxborough Park and structure protection occurred, using 300 firefighters and 40 engines from throughout Denver metro area, and National Guard helicopters.
Rooney Rd	Jefferson County: West Metro (Lakewood-Bancroft) FPD; along Dakota Hogback between C-470, I-70, and Alameda Pkwy	Approx: 185 acres	Dec. 19, 1994	High winds and faulty electrical transformer outside "normal" fire season; Rates of Spread, flame lengths and limited access had fire threatening to cross several man-made barriers (roads). Fire departments from throughout Denver Metro area responded, and several structures were threatened – one outbuilding damaged.
Buffalo Creek	Jefferson County: USFS & North Fork FPD	Approx: 10,400 acres	May 18- 25, 1996	High winds and human cause, extreme fire behavior, 10 mile run in 6 hours; 10 homes or outbuildings lost; first "large" fire in Front Range WUI. Cold front on day 2 suppresses fire activity to prevent significant growth. Type 1 IMT (Great Basin) takes over on day 2 from local IMT3 and manages until closeout.
Beartracks	Clear Creek County: USFS lands, within Evergreen FPD and Clear Creek Fire Authority boundaries; immediately southwest of Mt Evans State Wildlife Area	Approx: 485 acres	June 27, 1998 – July 5, 1998	Heavy fuel loading in roadless area and human caused fire leads to heavy initial attack and extended attack by local fire agencies along with air resources; fire poses threat to Upper Bear Creek drainage and numerous homes; Type 2 IMT (Rocky Mountain) takes over from local IMG on day 3 and manages to closeout. At the time of this incident the costs of $2,886/acre were the highest recorded in Colorado.
Whiteside	Park County, Pike National Forest northeast of Grant,CO.	Approx: 100 acres	June 29 – July 3, 1998	Wildfire in roadless area adjacent to Mt Evans Wilderness, at same time as Beartracks fire. Local resources from Platte Canyon FPD assist with initial attack. Type 2 IMT (Oregon) manages till closeout with local USFS district.
Lininger Mountain	Jefferson County: Genesee FPD & Foothills FPD; immediately southeast of Genesee community	Approx: 35 acres	Feb. 26-28, 1999	Dry conditions outside "normal" fire season leads to wildfire threatening several subdivisions during first night, and utilizing local fire resources for several days. Jefferson County Sheriff's Office helicopter makes multiple water drops.
Green Mountain	Jefferson County: West Metro FPD; Green Mountain from C-470 to homes on north and east sides of park	Approx: 200 acres	March 8, 1999	Multiple departments responding to human caused fire in grass fuels with high Rates of Spread, high flame lengths and limited access, outside "normal" fire season; homes, communications sites were threatened.
Hi Meadow	Park County & Jefferson County: Platte Canyon FPD, Elk Creek FPD, North Fork FPD; from Burland Ranchettes on west to CO 126 on east, and south to Buffalo Creek fire and town of Pine	Approx: 10,800 acres	June 12-25, 2000	Human cause fire under initial attack by local FPD, blows up on same day as 10,000 ac Bobcat fire in Larimer County. 52 homes lost & misc. structures; considered "benchmark" WUI fire for Colorado at the time. Type 1 IMT (Rocky Mountain) takes over on day 2 from local IMT3 and manages until closeout.
El Dorado/ Walker Ranch	Boulder County: Cherryvale FPD and Coal Creek FPD; west of El Dorado Canyon State Park, through Walker Ranch park to Gross Reservoir; adjacent to border with Jefferson County.	Approx: 1,100 acres	Sept. 16-22, 2000	Heavy fuel loading in steep terrain leads to heavy initial attack and extended attack by local fire agencies from Boulder, Gilpin, and Jefferson Counties along with air resources; fire poses threat to Gross Reservoir and numerous homes in Boulder and Jefferson County; Type 2 IMT (Rocky Mountain) takes over from zone Type 3 IMT on day 2 and manages to closeout.

Fire Name	Location	Size	Dates	Additional Information
Snaking	Park County: USFS and Platte Canyon FPD; north of US 285 from Platte Canyon HS to Crow Hill.	Approx: 3,000 acres	April 22 – May 2, 2002	High winds and human cause outside "normal" fire season; heavy initial attack and extended attack by local fire agencies from Jefferson and Park Counties along with air resources; fire poses threat to numerous homes. Type 1 IMT (Rocky Mountain) takes over from local type 3 IMT on day 2 and manages until closeout.
Black Mountain	Park County, Jefferson County, Clear Creek County: USFS, Elk Creek FPD and Evergreen FPD; north of Conifer Mountain and south of Brook Forest	Approx: 300 acres	May 5 – 11, 2002	Heavy fuel loading in steep terrain leads to heavy initial attack and extended attack by local fire agencies from Jefferson and Park Counties along with air resources; fire poses threat to multiple subdivisions in Conifer and Evergreen; Type 2 IMT (Rocky Mountain) takes over from local Type 3 IMT on day 2 and manages to closeout.
Schoonover	Douglas County: USFS & North Fork FPD (Trumbull VFD in 2002); immediately south across S. Platte River from Jefferson County, from west of Deckers to near Moonridge.	Approx: 3,000 acres	May 21 – 31, 2002	Lightning cause fire under initial attack by USFS and local FPDs, blows up on 2nd day and makes 3,000 acre/4 mile run in steep terrain. Fire threatens homes, camps businesses, watershed, regional powerline; approx. cabins & misc. structures lost. Type 1 IMT (Rocky Mountain) takes over on day 3 from local IMT3 and manages until closeout.
Hayman	Park, Douglas, Teller, and Jefferson Counties: USFS, multiple FPDs and county sheriffs (North Fork FPD in Jefferson County); from Lake George in Park County to Deckers/CO 126 in Jefferson County to Schoonover fire area and Manitou Exp. Station in Douglas/Teller Counties.	Approx: 138,000 + acres	June 8 to mid-July, 2002	Human cause fire under initial attack and extended attack by USFS and local FPDs under direction of interagency IMT3, blows up on 2nd day for historic 17 mile run and 70,000 acres. Multiple evacuations over two-week period as fire made several additional "runs". Over 150 homes & misc. structures lost; large areas of damage to Cheeseman Reservoir and South Platte Watershed areas; fire is considered of nationally significant WUI fire for Colorado and Rocky Mountain region. Type 1 IMT (Eastern Great Basin) takes over on day 3 from IMT3; fire is eventually managed by series of Type 1 IMTs under an Area Command team, until closeout.
Fountain Gulch	Clear Creek County and Gilpin County: Clear Creek Fire Authority, Central City FD, Clear Creek and Gilpin County Sheriff's Offices. Along county line immediately north of I-70 at the Hidden Valley exit.	Approx: 200 acres	June 29- July 5, 2002	Significant fire activity in steep terrain with poor road access leads to heavy initial attack and extended attack by local fire agencies along with air resources; fire poses threat to I-70 and CO 119 travel corridors, businesses, and distant subdivisions. Interagency handcrews are ordered to replace local fire resources; continued use of air resources; fire is managed by local IMT to closeout.
Blue Mountain	Jefferson County: Coal Creek FPD. Immediately south of CO 72 at mouth of Coal Creek Canyon.	Approx: 35 acres	August 14 - 15, 2002	Railroad caused fire in light fuels spreads rapidly due to continued drought conditions into adjacent timber and subdivision, leading to heavy initial attack and extended attack by local fire agencies along with air resources; fire poses threat to CO 72 and Coal Creek Canyon, businesses, and multiple subdivisions. Fire is managed by local IMT to closeout.
Cherokee Ranch	Douglas County: Littleton FPD, South Metro FPD, Louviers FPD. Between US 85 and Daniels Park Road.	Approx: 1,240 acres	October 29 – 31, 2003	High winds and downed power line outside "normal" fire season; Rates of Spread, flame lengths and limited access had fire threatening to cross several man-made barriers (roads). Fire occurs in "open space" area on same day as 3,500 ac Overland fire in Boulder County. Multiple subdivisions on all sides of fire are threatened as resources from throughout Denver Metro area respond. Fire is managed by local IMT to closeout.

Fire Name	Location	Size	Dates	Additional Information
Waterton Fire	Douglas County: Above the south side of South Platte River across from Jefferson County on USFS lands and adjacent to West Metro FPD.	Approx: 20 – 40 acres	June 28-30, 2005	Lightning-caused fire(s) in steep inaccessible portion of Waterton Canyon, west of Roxborough subdivision & Denver Water's Kessler water treatment plant. Large initial attack response from local fire departments and USFS; access issues requires use of swift water rescue team and boats to cross river. Two "SWIFT" (Department of Corrections) handcrews are used to complete containment and control of the fire burning in heavy gambel oak forests. Fire is managed by Pueblo zone IMT3.
North Table Mtn	Jefferson County: Fairmount FPD. Top, and east, north, west sides of North Table Mountain outside Golden, CO.	Approx: 300 acres	July 22 – 24, 2005	Human cause fire in steep terrain on open space that escapes initial attack. Heavy use of air resources during initial attack & structure protection on day 1. Multiple subdivisions on all sides of fire are threatened as resources from throughout Jefferson County respond. Fire is managed by local IMT3 to closeout.
Plainview	Jefferson County: Coal Creek FPD. Immediately north of CO 72 at mouth of Coal Creek Canyon and east to CO 93, north to approximately Boulder County line.	Approx: 2,700 acres	Jan. 9 – 10, 2006	High winds and human cause outside "normal" fire season. Rates of Spread, flame lengths and limited access had fire threatening to cross several man-made barriers (roads) – 60 mph winds at midnight cause 2 mile fire run in under 5 minutes. Heavy initial attack and extended attack by local fire agencies from Jefferson and Boulder Counties; fire poses threat to numerous homes and businesses. Fire is managed by local IMT3 to closeout.
Rocky Flats	Jefferson, Boulder, Adams, and Broomfield Counties: multiple FPDs. Immediately north of CO 128 onto Rocky Flats NWR and east to Indiana Street.	Approx: 1,200 acres	April 2, 2006	High winds and human cause outside "normal" fire season; Fire occurs in "open space" area of Rocky Flats NWR and adjacent lands. Rates of Spread, flame lengths and limited access had fire threatening to cross several man-made barriers (roads). Heavy initial attack and extended attack by local fire agencies from Jefferson, Boulder, Gilpin, and Adams Counties. Winds prevent use of air resources; multiple subdivisions, businesses, and Rocky Mountain Airport are threatened. Difficulties with communications and fire management across multiple jurisdictional boundaries noted.
Pine Valley	Jefferson County: Elk Creek FPD. Immediately northwest of Town of Pine.	Approx. 102 acres	May 28-30, 2006	High winds and human cause near homes; heavy initial attack and extended attack by local fire agencies from Jefferson and Park Counties along with air resources, local USFS resources, and interagency handcrews. Fire poses threat to numerous homes, while winds limit use of air resources during initial attack. Fire is managed by local IMT3 to closeout.
Ralston Creek	Jefferson County: No-man's lands adjacent to Fairmount FPD and Golden Gate FPD. North end of White Ranch OS park and adjacent uranium mine (private).	Approx: 26 acres	June 17 – 19, 2006	Fire within open space property under initial attack by local FPD, "blows up" and forces resources to retreat to safety zones. Significant fire activity in steep terrain with poor road access leads to heavy use of air resources; fire poses threat to Ralston Reservoir and numerous subdivisions. Interagency handcrews supplement local fire resources and continued use of air resources on day 2; fire is managed by local IMT3 to closeout.
Centennial Cone	Jefferson County: No-man's lands adjacent to Golden Gate FPD. Entirely within Centennial Cone OS park.	Approx: 22 acres	July 21 – 23, 2006	Fire within open space property with significant fire activity in steep terrain with no road access during height of 2006 national fire season leads to limited initial attack; fire poses threat to US 6 in Clear Creek Canyon and distant subdivisions. Limited air resources are utilized to slow fire spread, and an interagency "hotshot" handcrew supplements local fire resources on day 2 for direct attack. Fire is controlled by day 3 as summer monsoons also reduce fire danger.

Fire Name	Location	Size	Dates	Additional Information
Oxyoke	Jefferson County: immediately west of Oxyoke on USFS lands, in South Platte River drainage.	110 acres	July 20-July 23, 2008	Fire, possibly from power line, on USFS Lands and near to private cabins and Denver Water Board land. Rapid growth, crowning and spotting on hot, dry day. Local fire resources assisted with structure protection, road closures, and initial attack; 15 residences evacuated for 3 days. Large use of aircraft helped prevent more spread. PIDC IMT3 managed incident, which had 250 personnel that included 6 handcrews, aircraft, and USFS engines for 3 days.
Green Mountain	Jefferson County: West Metro FPD; Green Mountain Open Space above homes on east side of park and north side of park over to above Jefferson County Fairgrounds	Approx: 388 acres	August 4 -5, 2008	Multiple departments and agencies responded to lighting caused fire in grass fuels with high Rates of Spread, flame lengths 4-8 feet, steep slopes, and limited access; homes (1 slightly damaged) and communications sites were threatened. Use of a Single Engine Air Tanker, Air Attack plane, and a type 3 helicopter (USFS-Monument helitack) supported efforts into the early evening. Multiple media helicopters interfere with air operations until a Temporary Flight Restriction (TFR) is placed over the fire. Difficulties with communications occur between departments and agencies using different 800 mhz and VHF radio systems.

Other smaller wildfires within the WUI that posed high potential for significant impacts to adjacent communities, and had large initial attack response by local fire departments, include:

- Coal Creek fire, September 1988: 14 separate fires over 42 acres from train in Coal Creek Canyon area, resulting in response from multiple fire agencies and Single Engine Air Tanker, and CO National Guard Huey – dip site Ralston Reservoir.
- Beaver Brook, 7/20/98-7/21/98: 25-acre fire immediately downhill from Mt. Vernon Country Club in Clear Creek Canyon, resulting in air resources and structural protection.
- Red Rocks fire, 3/9/00: 10-acre grass and brush fire with high winds immediately southwest of Red Rocks amphitheatre, resulting in response from multiple fire agencies in Jefferson County.
- Bald Mountain fire, 5/6/00: 5-acre fire in Genesee park, immediately west of Mt. Vernon Country Club.
- Silver Bullet fire, 6/15/00: approximately 20-acre fire on South Table Mountain immediately above Coors Plant in Golden, requiring air tanker use to assist local fire departments. Fire occurred during same time that Hi Meadow fire was making significant run in southern Jefferson County.
- Mt Galbraith fire, 8/11/00: 2 acres in three dry lightning fires on top of Mt. Galbraith above City of Golden, threatening subdivisions in town.
- US 6 fire, 4/6/02: 50-acre grass and brush fire west of US 6 and south of 19th street in City of Golden, threatening multiple subdivisions.

- North Spring Gulch fire, 6/6 - 6/7/02: 20-acre fire northwest of Idaho Springs in Clear Creek County requiring significant air tanker use to assist local fire departments.
- Leyden fire, 1/18/05: 300-acre grass fire northwest of Arvada runs 5 miles in 25-30 mph winds, causing minor damage to numerous homes being protected by 60+ firefighters and multiple engines from Arvada, Evergreen, Rocky Flats, and Golden Fire departments.

APPENDIX K
WEB REFERENCE GLOSSARY

Resource	Web Site
Jefferson County Emergency Operating Plan	http://www.co.jefferson.co.us/ca/chap06016.htm#P6_19
Jefferson County Policies and Procedures	http://www.co.jefferson.co.us/ca/ca_T148_R2.htm
Jefferson County CWPP project site	http://www.co.jefferson.co.us/emerg/index.htm
Jefferson County Environmental Health Services	www.co.jefferson.co.us/health/health_T111_R38.htm
Colorado State Forest Service Library	http://csfs.colostate.edu/library.htm
Rocky Mountain Geographic Science Center – Wildfire Support	http://wildfire.cr.usgs.gov
Firewise National Firewise Community Program	http://www. Firewise.org.
Searchable Grants Database	http://www.rockymountainwildlandfire.info/
Jefferson County Department of Emergency Management	http://jeffco.us/sheriff/sheriff_T62_R191.htm
Coal Creek Fire & Rescue	http://www.coalcreekcanyonfd.org
Landfire Geospatial Data	http://www.landfire.gov/products_overview.php
Colorado State Forest Service	http://csfs.colostate.edu
National Fire Weather	http://fire.boi.noaa.gov
RAWS Station index for the Rocky Mountain Geographic Coordinating Area	http://raws.wrh.noaa.gov/cgi-bin/roman/raws_ca_monitor.cgi?state=RMCC&rawsflag=2
Fort Collins Interagency Wildfire Dispatch Center Web Index	http://www.fs.fed.us/r2/arnf/fire/fire.html
Colorado Forest Industries Directory	http://www.colostate.edu/programs/cowood/New_site/Publications/Articles/Colorado%20Forest%20Industry%20Directory.pdf
Current Weather Summary for Rocky Mountain Geographic Coordinating Area	http://raws.wrh.noaa.gov/cgi-bin/roman/raws_ca_monitor.cgi?state=RMCC&rawsflag=2
U.S. Forest Service, Kansas City Fire Access Software	http://famweb.nwcg.gov/kcfast
Fire Regime Condition Class	www.frcc.gov
National Climate Data Center	www.ncdc.noaa.gov

APPENDIX L
LIST OF PREPARERS

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