Garfield County
Community Wildfire Protection Plan

November 2012

Prepared for:

Garfield County
Office of Emergency Management

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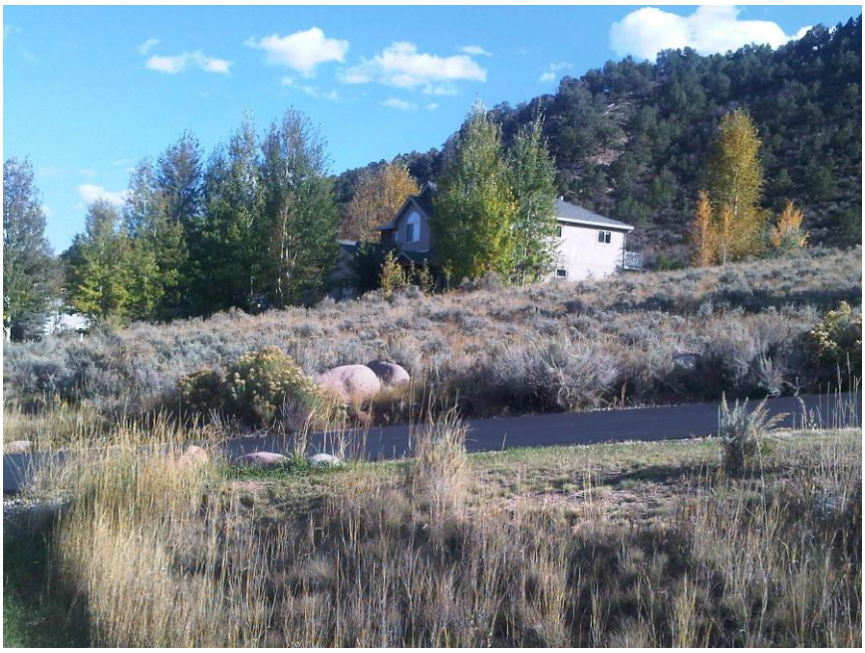

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CWPP Certification

The Garfield County Community Wildfire Protection Plan (CWPP) was developed in accordance with 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 (2009). This plan:

- Was collaboratively developed through planning meetings with representatives from the fire protection districts, federal agencies, state agencies, county agencies, communities, and other organizations invited to participate;
- Identifies and prioritizes areas for vegetation-fuels reduction treatments to reduce the wildfire threat to human welfare, and economic and ecological values at risk in the county;
- Recommends measures to reduce the ignitability of structures; and
- Provides recommendations on ways to improve wildfire response capabilities for the fire protection districts.

The following entities mutually agree with the contents of this Community Wildfire Protection Plan:

Garfield County Office of Emergency Management	Date
Colorado State Forest Service, Grand Junction District	Date
Garfield County Fire Protection Districts Representative	Date

Executive Summary

The Healthy Forests Restoration Act (HFRA) of 2003 provides the impetus for wildfire risk assessment and planning at the county and community level. HFRA refers to this level of planning as a Community Wildfire Protection Plan (CWPP). The CWPP provides a means for Garfield County to evaluate its current situation with regard to wildfire risks and hazards, and devise ways to protect human welfare and important economic and ecological values. This CWPP addresses wildfire risks, fuel hazards, structure flammability, vegetation-fuel treatments, and ways to improve fire protection response capabilities. Representatives from the fire protection districts, federal agencies, state agencies, county agencies, communities, and other organizations were invited to participate in the collaborative planning effort to develop the CWPP.

The Garfield County CWPP is countywide, with emphasis on the protection of human welfare, communities, and other economic and ecological values. Catastrophic wildfire fires have occurred throughout the County and the threat of wildfire continues. Wildfire risks to human welfare and economic and ecological values are more serious today than in the past because homes and other infrastructures are located in close proximity to forest and rangeland vegetation-fuels.

This CWPP is a strategic plan that delineates the wildland urban interface (WUI) areas within each fire protection district (FPD), identifies wildfire threats within these areas, and prioritizes mitigation actions that are designed to reduce wildfire hazards and risks. The accumulation of hazardous fuels may set the stage for catastrophic wildfire occurrence. There are varieties of vegetation-fuels around communities, ranches, structures, and on public lands that create problems for fire protection. A coordinated effort among all fire authorities and private landowners is needed to manage hazardous fuels and reduce the risks of wildfire.

Implementing and sustaining the CWPP is crucial to success. This is the responsibility of the planning team. Building partnerships among community-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 countywide fire prevention activities.

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List of Abbreviations and Acronyms

AOP	Annual Operating Plan
Avg.	Average
BLM	Bureau of Land Management
BTU	British Thermal Unit
CAPCD	Colorado Air Pollution Control Division
CDPHE	Colorado Department of Public Health and Environment
CPW	Colorado Parks and Wildlife
CSFS	Colorado State Forest Service
CCWWPP	Critical Community Watershed Wildfire Protection Plan
CWPP	Community Wildfire Protection Plan
DFPC	Division of Fire Prevention and Control
DOC	Department of Corrections
DOI	Department of the Interior
EFF	Emergency Fire Fund
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
F	Fahrenheit
FBFM	Fire Behavior Fuel Model
FD	Fire Department
FEMA	Federal Emergency Management Agency
FMP	Fire Management Plan
FPD	Fire Protection District
FRCC	Fire Regime Condition Class
Ft	Foot
GARCO	Garfield County
GIS	Geographic Information System
HFRA	Healthy Forests Restoration Act
HOA	Homeowners Association
HPP	Habitat Partnership Program
I-70	Interstate 70
IC	Incident Commander
ICS	Incident Command System
ISO	Insurance Services Office
IMT	Incident Management Team
In	Inch
MACG	Multi-Agency Coordinating Group
Max	Maximum
Min	Minimum
NCIFMU	Northern Colorado Interagency Fire Management Unit
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NHMP	Natural Hazard Mitigation Plan

List of Abbreviations and Acronyms, con't.

NIMS	National Incident Management System
NRCS	Natural Resources Conservation Service
NWCG	National Wildfire Coordinating Group
O&G	Oil and Gas
pdf	portable document format
SEAT	Single Engine Air Tanker
Sec.	Second
SO	Sheriff's Office
SWAPP	Source Water Assessment and Protection Program
SWPA	Source Water Protection Area
SWPP	Source Water Protection Plan
Temp.	Temperature
US DOI	U.S. Department of Agriculture
UCRIFMU	Upper Colorado River Interagency Fire Management Unit
USFS	United States Forest Service
WERF	Wildfire Emergency Response Fund
WFII	Wildfire Intensity Index
WRP	Wildfire Response Plan
WFSI	Wildfire Susceptibility Index
WUI	Wildland-Urban Interface

1 Introduction

1.1 The Purpose

The Garfield County Community Wildfire Protection Plan (CWPP) is a strategic plan that identifies specific wildland fire risks facing communities and neighborhoods and provides prioritized mitigation recommendations designed to reduce those risks. The CWPP is a component of the Garfield County Natural Hazards Mitigation Plan (NHMP). The CWPP and the NHMP each require similar risk, vulnerability, and mitigation plan information. At the same time, the two plans have different scopes of influence. The NHMP addresses all possible hazards while the CWPP is focused on wildfire and it provides the County with access to different financial resources for risk reduction. To reduce administrative overlap and assure that the best and most current available data are available in both plans, the two planning processes must be coordinated.

The NHMP calls for participation in the ongoing development of an updated CWPP, and assures that future updates to the NHMP and the CWPP are coordinated to reflect the best available data and a comprehensive set of risk reduction actions. The NHMP specifically calls for these wildfire mitigation action items:

- Develop Firewise programs in vulnerable communities.
- Develop or update a CWPP.
- Identify areas with heavy fuel loads and implement fuels reduction projects if possible, explain what specific areas would be considered.
- Conduct public education programs to encourage and train property owners to manage fuel loads on their own properties and use fire-resistant building materials.
- Encourage use of fire resistant materials for all new developments in identified hazard risk areas.
- Retrofit critical facilities, hospitals, nursing homes, etc. in the wildland-urban interface (WUI) with fire resistant roofs, siding and/or windows.
- Address ingress/egress access issues in vulnerable subdivisions.
- Support existing cross training efforts that coordinate industry and fire district response to fires affecting the oil and gas fields.

- Continue to update the database of the location of industry assets for use by fire responders (industry or fire protection district personnel) in real time. Transfer data for use in Emergency Responders vehicles.
- Increase coordination among mitigation planning efforts and actions with the soon-to-be-developed County-wide CWPP. Coordinate future updates of the mitigation plan with the CWPP updates.
- Ensure that all areas of Garfield County are served by a fire protection district.

The need for a CWPP is crucial because families and businesses are locating more and more into the unincorporated areas of the county. Demographic trends have shifted in Garfield County as families and infrastructure have moved into rangeland and forest settings away from traditional urban and suburban communities. Homes and infrastructure are being built in close proximity to wildland vegetation-fuels and terrain that could be conducive to catastrophic wildfire. Recent large-scale wildfires in the County have resulted in the devastating loss of structures, businesses, and human lives.

A CWPP will empower the County to take advantage of wildland fire and hazardous fuel management opportunities through collaborative planning with the Bureau of Land Management (BLM), U.S. Forest Service (USFS), and Colorado Division of Fire Prevention and Control (DFPC) to reduce the risks of wildfire. On July 1, 2012, the DFPC assumed the responsibilities for wildland fire prevention and protection as provide by House Bill 12-1283. Prior to July 1, 2012, it was the obligation of the Colorado State Forest Service (CSFS) to provide wildland fire prevention and protection. As a result, there are numerous references to CSFS in this CWPP because they participated on the planning team and several CSFS documents are referenced that pertain to wildland fire protection and control.

A CWPP provides prioritized access to state and federal grant funding to support identified vegetation-fuel management projects and other mitigation actions to reduce the risks of wildfire throughout the county. The development of CWPPs is authorized and defined in Title I of the Healthy Forests Restoration Act (HFRA) passed by Congress on November 21, 2003 and signed into law by President George W. Bush on December 3, 2003. The HFRA places renewed emphasis on community planning by extending a variety of benefits to counties and communities with a wildfire protection plan in place. Critical among these benefits is the option of establishing a localized definition and boundary for the WUI and the opportunity to help shape fuels treatment priorities on federal and non-federal lands.

The CWPP, as described in the HFRA, brings together diverse local interests to discuss their mutual concerns for public safety, community sustainability, and natural resources. It offers a positive, solution-oriented environment in which to address challenges such as local firefighting capability, the need for defensible space around homes and subdivisions, and where and how to prioritize vegetation-fuel management on both federal and non-federal lands.

The implementation of effective wildfire mitigation is a dynamic process. The characteristics of forests and interface communities are constantly changing. Flexibility is designed into the CWPP implementation process to accommodate this changing landscape. Regular plan maintenance and annual updates can document these changes and highlight progress.

1.2 The Need

Wildfire is a naturally occurring and important component of the oak brush, sagebrush, mountain brush, and mixed coniferous forest vegetation types that dominate much of Garfield County, Colorado. These vegetation types are "fire-dependent" ecosystems that have evolved over thousands of years to be resilient to wildfire occurrence, and in the case of many plant species, dependent on wildfire to maintain stand health and trigger reproduction. Even though fires naturally occur and are important for ecosystem function, they present considerable risks to human welfare and economic values.

Since the early 20th century rangeland and forest management practices across the western United States were designed around a simple protocol, "Prevent Wildfires." While originally intended to protect human settlement and forest and rangeland resources, the practice of fire exclusion proved to be short-sighted. Vegetation-fuels have accumulated to hazardous levels because of the growth of weedy species such as cheatgrass and overstocked shrub and forest stands.

Garfield County's record-setting growth has precipitated a significant population shift into rangeland and forested regions that are at a high risk for catastrophic wildfire. With the County's population rapidly increasing, there are more structures, residents, and supporting infrastructure in fire-prone areas than ever before, directly impacting human welfare and compromising the safety of firefighters and emergency responders that serve the County.

In 2008, CSFS sponsored a study to assess the risk of wildfire in many of the forested counties including Garfield. The resulting map was an assessment of wildfire susceptibility index (WFSI), which predicts the probability of wildfire occurrence and the potential rate of spread once a fire occurs (Figure 1). Approximately, 28 percent of the County is classified with a moderate to very high WFSI. The wildfire risk areas were identified through a spatial analysis using Geographical Information System (GIS) spatial analysis technology based on terrain, climate, vegetation-fuels, and wildfire history. Areas with moderate to very high risk mainly occur in the Roaring Fork Valley and a few towns that occur along the Interstate 70 (I-70) corridor, which are major population areas in the County.

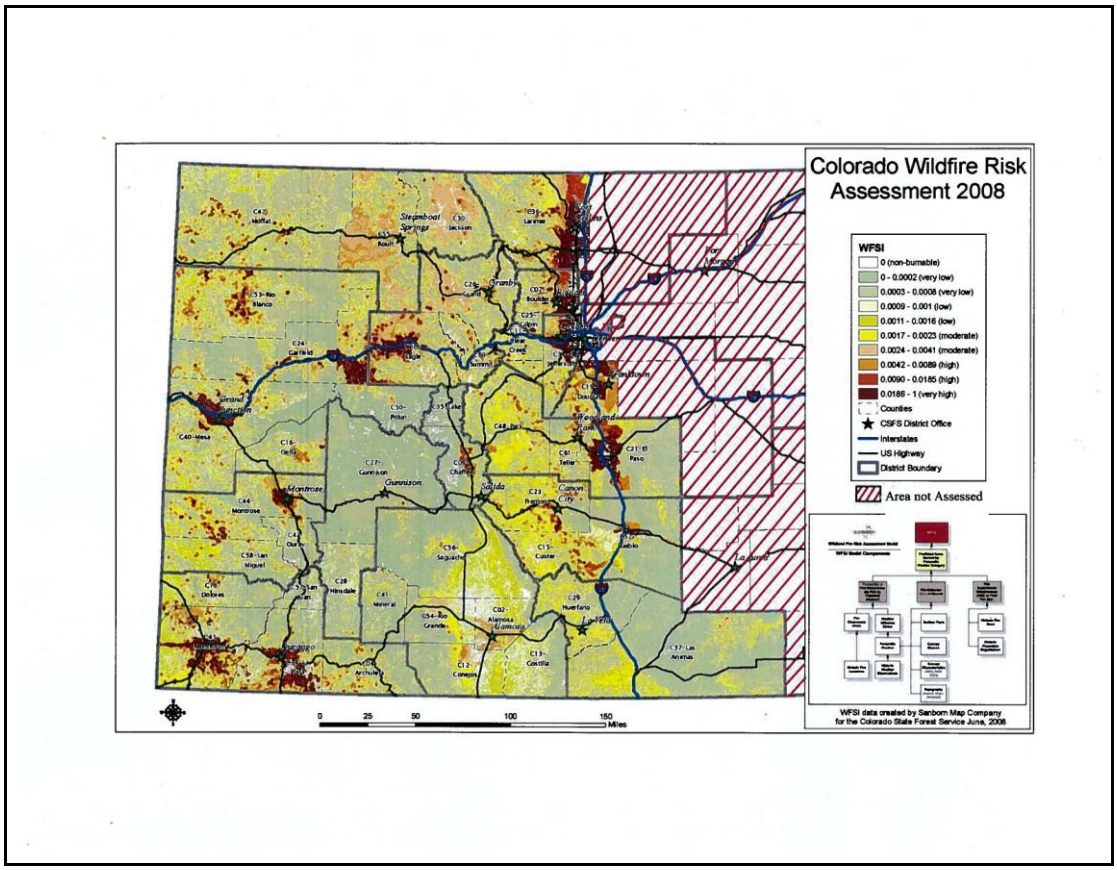


Figure 1. Colorado's 2008 Wildfire Risk Assessment

Many cities, towns, and communities within Garfield County are surrounded by BLM and USFS lands that are undeveloped and a source of vegetative-fuels and wildfire ignition potential. Residents of the County have demonstrated awareness of these risks, as well as the need to develop CWPPs and take action across multiple scales; from the individual home and subdivision to adjoining public lands under county, state, and federal management.

1.3 Project Goals and Objectives

Several goals and objectives can be achieved through the CWPP collaborative planning process and its implementation to reduce the risks and hazards of wildfire in the county (Table 1).

Table 1. Garfield County CWPP Goals and Objectives

Goal	Objective
Facilitate and develop a countywide CWPP	• Promote a collaborative planning process. • 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 county-wide wildfire risk assessment. • Identify WUI areas and define risks and contributing factors. • Determine the level of risk to communities.
Develop a mitigation plan	• Identify and prioritize vegetation-fuel treatment projects. • Identify and prioritize fire authority needs to improve response capacity. • Develop an action plan and implementation team to carry forward the CWPP. • Build relationships among federal, state, and county agencies, Fire Protection

Goal	Objective
	Districts (FPDs), and communities.
Facilitate emergency planning	• Develop strategies to strengthen wildfire emergency management, response, and evacuation capabilities.
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.

1.4 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 identified by the planning 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*, (Communities Committee et al. 2004) and the *Colorado State Forest Service Minimum Standards for Community Wildfire Protection Plans*, (CSFS 2009). Table 2 outlines the CWPP development process.

Table 2. 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 CSFS.
Two	Involve Federal Agencies	Engage local representatives of the BLM, 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 County 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 County CWPP and communicate the results to interested parties and stakeholders.

Source: Communities Committee et al. (2004)

The initial step in the development of the CWPP is to organize the planning team that serves as the decision-making committee (Table 3). This planning team consisted of representatives from local government, local fire authorities, BLM, USFS, and the CSFS. Together, these five entities were responsible for the development of the Garfield County CWPP. The planning team must mutually agree on the plan's final contents. The planning team should collaborate closely with relevant affected land management agencies and active community and Homeowners Association (HOA) stakeholders as the plan is implemented. Collaboration between agencies and communities is an important CWPP component because it promotes sharing of perspectives, plans, priorities, and other information that are useful to the planning process. Together these entities guide the development of the CWPP as described in the HFRA.

Table 3. Garfield County CWPP Planning Team Participants

Team Member	Organization	Phone Number
Chris Bornholdt	Garfield County Emergency Management	970-945-0453
Ron Biggers	Glenwood Springs FD	970-384-6433
Doug Paul	Upper Colorado River Interagency Fire Management Unit	970-623-6183
Ron Leach	Carbondale & Rural FPD	970-963-2491
David Blair	Grand Valley FPD	970-285-9119
Gary Tillotson	Glenwood Springs FD	970-384-6430
Kelly Rogers	Colorado State Forest Service	970-240-7325
Kamie Long	Colorado State Forest Service	970-240-7325
Keith Lammey	Battlement Mesa Service Association	970-285-7482
Mike Morgan	Rifle FPD	970-625-1243
Lathan Johnson	BLM Fuels	970-640-9165
Orrin Moon	Burning Mountains FPD	970-879-2932
Larry Sweeney	Bookcliff Conservation District & Colorado State Conservation Board	970-876-2854
Chad Harris	Rifle FPD	970-379-9681
Kevin Whelan	Rifle FPD	970-618-7388
Dwayne Gaymor	Colorado Department of Transportation	970-949-9361
Bill Gavette	Carbondale & Rural FPD	970-963-2491
Rob Willits	Rifle FPD	970-618-7388
Nick Marx	De Beque FPD	970-283-8632
Frank Cavaliere	Lower Valley FPD	970-858-3133
Rusty Stark	BLM Silt Fuels Program	970-876-9030
Alan Schroeder	Bureau of Reclamation	970-248-0692
Dan Cacho	Colorado Parks & Wildlife	970-456-7003
Tracy Fifarek	Upper Colorado River Interagency Fire Management Unit	970-257-4800

As a strategic plan, the real success of this CWPP hinges on effective and long-term implementation. The CWPP planning and development process must include efforts to identify a planning team that serves as the implementation organization and will oversee the execution of prioritized recommendations and maintain the CWPP as the characteristics of the WUIs change over time. Specific projects may be undertaken by individual Fire Protection Districts (FPDs), while larger-scale treatments may require collaboration among federal, county agencies, community, and private landowners. Original CWPP planning 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 successful CWPP utilizes relevant geographic information (e.g., GIS data) to develop a set of maps that provide information such as critical infrastructure, WUIs, and proposed vegetation fuel projects (Appendix A). Comprehensive 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 a community-based rating benchmark for comparative future assessments and project evaluations.

CWPP vegetation-fuel treatment recommendations derived from this analysis were prioritized through an open and collaborative effort with the planning team. Prioritized treatments target wildfire hazard reduction in the WUIs, including structural ignitability and critical supporting infrastructure. An action plan guides treatment implementation for high-priority projects over the span of several years.

The finalized CWPP represents a strategic plan with planning 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.

1.5 Policy Framework

This CWPP is a planning 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 the National Environmental Policy Act (NEPA). Action on private land may require compliance with county land use codes, building codes, and local covenants.

The following documents set policy and provide guidance to the development of the CWPP:

- HFRA (2003) – Federal legislation that promotes healthy forest and rangeland 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 plans that focus on firefighting coordination, firefighter safety, post-fire rehabilitation, hazardous fuels reduction, community assistance, and accountability.
- 10-Year Comprehensive Strategy : Implementation Plan (May 2002).
- 10-Year Comprehensive Strategy : Implementation Plan (May 2002).
- National Cohesive Wildland Fire Management Strategy Phase II National Report (June 2012).

- Federal Emergency Management Agency (FEMA) Disaster Mitigation Act (2000) – Provides criteria for state and local multiple-hazard and mitigation planning.
- State of Colorado Forest Improvement District House Bill 07-1168 (2007) – provides for the creation of forest improvement districts for wildland fire management including vegetation-fuel management.
- Garfield County Wildfire Annual Operating Plan (AOP) provides intergovernmental mutual aid agreements among fire authorities operating within the county.

1.5.1 BLM and USFS Policy

The recommendations identified in the CWPP will assist the BLM and USFS in identifying and prioritizing forest and rangeland treatments on federal lands in relation to adjacent populated areas. The appropriate environmental analysis and documentation through the NEPA process for vegetation-fuel treatments on BLM and USFS lands needs to be completed prior to any ground disturbing or vegetation management activities occurring. A completed CWPP does not authorize private landowners to conduct vegetation treatments on federal lands. Private land owners that own land adjacent to federal lands may not conduct defensible space treatments on BLM or USFS lands without written permission and the NEPA process being completed. The NEPA process can take up to a year to complete once a project location has been identified. The best approach for private landowners with property adjacent to federal lands is to contact the BLM or USFS and initiate appropriate planning.

1.6 Existing CWPPs

Four CWPPs have been completed and approved within Garfield County. These CWPPs are on file with the respective FPD and Garfield County Office of Emergency Management. These CWPPs were used in the completion of this countywide CWPP to identify community risk and vegetation-fuel management projects within their respective planning areas. The four CWPPs are:

- Garfield County Community Wildfire Protection Plan, May 2006.
- Glenwood Springs Fire Protection District; Wildland Urban Interface Community Protection Plan; April 2007.
- Community Wildfire Protection Plan (CWPP); Carbondale & Rural Fire Protection District, Basalt & Rural Fire Protection District; Garfield County and Eagle County; Colorado State Forest Service, Bureau of Land Management, and United States, Forest Service; May 14, 2010.
- Community Wildfire Protection Plan: Selected Areas within the Burning Mountains Fire Protection District; Garfield County, Colorado; February 2008.

2 Garfield County Profile

2.1 County Overview

Garfield County is located on the "West Slope" in the scenic plateau and canyon county of west-central Colorado. Glenwood Springs is the county seat. The County's land area is approximately 2,958 square miles. The BLM and USFS manage 62 percent of the land while 37 percent is managed by private landowners (Map 1; all maps are located in Appendix A).

Adjacent counties include Eagle, Routt, Rio Blanco, Mesa, and Pitkin. Grand and Uintah counties in Utah form a western border with Garfield County. All towns and communities are located on the Colorado River or Roaring Fork River in the eastern and central parts of the County and include Battlement Mesa, Carbondale, Glenwood Springs, New Castle, Parachute, Rifle, and Silt. The western part of the County is characterized by large ranches, few inhabitants, and few roads.

The County has the most important transportation corridors through western Colorado. The major highways are I-70, and State Highways 13, 82, and 139. A railroad corridor follows closely to the pattern of I-70 through the County along the Colorado River.

Garfield County is one of the fastest growing counties in western Colorado. According to the 2010 census, the county's population is 56,389 residents, which represents a 28 percent increase from the 2000 census. Approximately 60 percent of residents live within one of the incorporated towns. The unincorporated residences are mainly concentrated in the Roaring Fork Valley between Carbondale and Glenwood Springs and along I-70 between Glenwood Springs and Parachute. Demographers estimate that Garfield County will grow from the current population of 56,000 to approximately 118,000 by the year 2030. With this growth rate, it is anticipated that approximately 19,000 homes and associated infrastructure will be located in unincorporated areas or in areas with considerable wildfire hazards and risks.

Garfield County is known for year-round recreation such as hunting, hiking, camping, sightseeing, whitewater rafting, bird watching, skiing, and snowmobiling. Other important components of the economy include oil and gas (O&G), coal extraction, agriculture, and limited manufacturing and construction activities.

The grass, shrub, and forest vegetation types in Garfield County have adapted to a mixture of low- and high-severity fires along a broad range of historic frequencies. It is generally acknowledged by land managers and fire ecologists that a policy of fire suppression for the past 100 years has exacerbated the potential for high-intensity wildfire by increasing the density of living and dead fuels in these ecosystems.

Weather and terrain plays a critical role in determining fire frequency and behavior. Steep slopes, drainages, and hill-top saddles (common in Garfield County) are conducive to extreme fire behavior. The dry climate with strong gusty winds can turn an ignition from a discarded cigarette, vehicle parked over dry grass, or lightning into a major wildfire event in a matter of several minutes.

Garfield County is a desirable place to live because of diverse ecosystems, recreational opportunities, and aesthetics. However, the County is characterized by factors that promote catastrophic wildfires that include an abundance of vegetation-fuels, expansive occurrence of cheatgrass below 6,500 feet elevation, terrain that promotes extreme fire behavior, and weather conditions that encourage fire ignitions and rapid spread.

2.2 Land Ownership and Wildland Urban Interface

Garfield County has a land base of 2,958 square miles (Map 1). Land ownership is divided among federal, private, and other (i.e., state and local) landowners at 62, 37, and 1 percent, respectively. The WUI occurs where human infrastructure interfaces with wildland vegetation. The WUI in Garfield County was defined by the FPDs and approved by the planning team (Map 2). There are a total of 400,061 WUI acres in the County, which accounts for 21percent of the land base (Table 4). Proactive wildland fire management is needed in the WUI to protect human welfare and other economic and ecological values.

Table 4. Garfield County Wildland Urban Interface Areas

Wildland Urban Interface	Acres
Burning Mountains FPD	78,663
Carbondale & Rural FPD	24,402
De Beque FPD	75,492
Glenwood Springs Fire District	66,781
Grand Valley FPD	36,136
Gypsum FPD	3,982
Lower Valley FPD	12,185
Rifle FPD	102,420
Total	400,061

2.3 Climate

The climate of Garfield County is generally semi-arid with hot summers and cold winters (Table 5). Average monthly precipitation various from a low during the winter months to high during

the fall months. However, all months do receive precipitation. Gusty and sustained winds are common throughout the County.

Table 5. Glenwood Springs, Rifle, and Parachute Average Monthly and Annual Temperatures and Precipitation

Climate Attribute	Month												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Glenwood Springs (1981 – 2010)													
Avg. Max. Temp. (F)	37.5	43.5	53.6	62.0	72.0	82.6	88.8	86.6	78.0	65.1	47.8	37.8	63.1
Avg. Min. Temp. (F)	13.7	19.1	26.6	32.2	39.3	46.0	52.5	51.8	43.7	33.2	23.3	15.5	33.2
Avg. Total Precip. (in)	1.32	1.13	1.30	1.55	1.73	1.20	1.12	1.38	1.96	1.83	1.45	1.28	17.24
Rifle (1981 – 2010)													
Avg. Max. Temp. (F)	39.8	46.9	57.0	65.1	74.2	84.7	90.4	88.3	80.0	67.4	49.7	40.5	65.5
Avg. Min. Temp. (F)	11.6	18.8	26.3	32.0	39.7	46.6	53.1	52.4	43.4	32.1	22.1	13.8	32.8
Avg. Total Precip. (in)	0.77	0.94	1.01	1.26	1.29	0.89	1.22	1.15	1.45	1.40	1.16	0.93	13.45
Parachute (1981 – 2010)													
Avg. Max. Temp. (F)	38.4	46.9	56.3	65.2	75.6	88.7	94.1	92.1	82.2	66.1	49.6	40.2	66.5
Avg. Min. Temp. (F)	11.8	20.5	29.2	34.4	42.4	50.8	57.5	56.9	48.3	35.2	25.3	17.5	35.9
Avg. Total Precip. (in)	0.83	0.82	1.55	1.68	1.66	0.96	1.35	1.09	1.65	1.94	1.67	1.28	16.47

Source: Western Regional Climate Center, www.wrcc.dri.edu

2.4 Topography

Garfield County has considerable diversity in slope, aspect, and elevation. The flow of the Colorado River and Roaring Fork River over thousands of years has shaped the terrain of Garfield County with older flood plains increasing in elevation from the current river channel. Topographic features include plateaus, basins, mesas, and mountain ranges. Low to moderate slopes occur on the Colorado River and Roaring Fork River flood plains and plateaus while steep slopes are associated with foothills, mesas, and mountain ridges. Elevations vary from 4,950 feet along the Colorado River and other streams, such as Parachute Creek, to the high peaks at 12,340 feet (Figure 2).

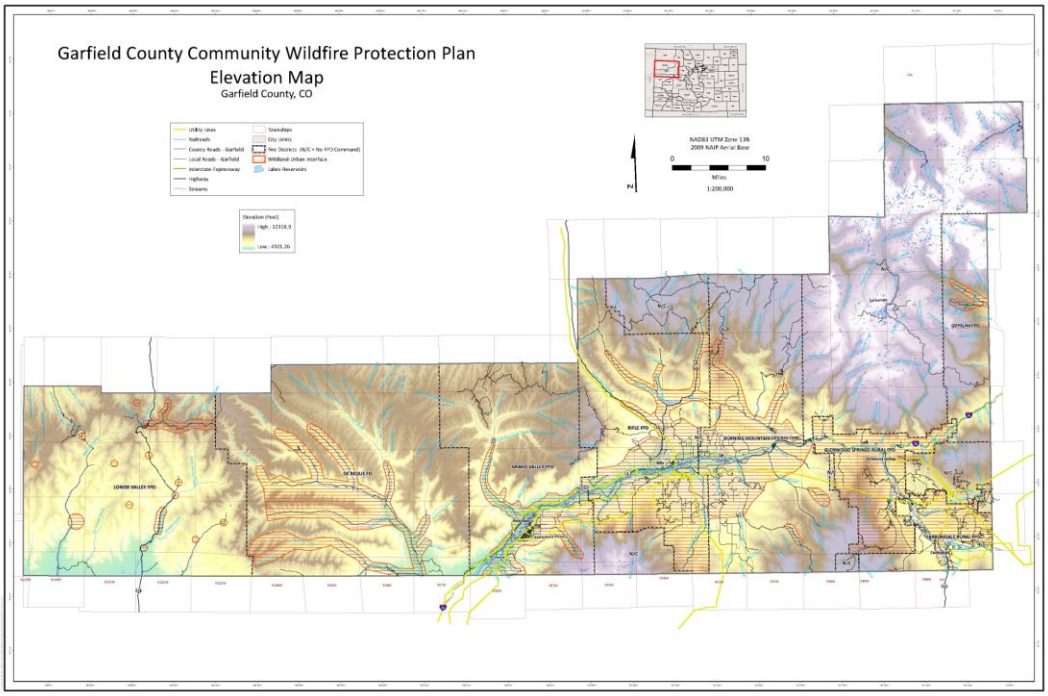


Figure 2. Garfield County Elevations

2.5 Wildland Vegetation and Fuels

Garfield County is home to a variety of vegetation types ranging from salt-desert shrub at lower elevations, pinion-juniper, oak brush, and sagebrush vegetation occurs at the mid-elevations and conifer forests to alpine vegetation are found at the highest elevations (Map 3). The four largest vegetation types in the county include conifer forest, pinion-juniper, sagebrush, and oak.

Variation in vegetation within the County is caused by diversities in elevation, terrain, climate, soil, and occurrence of wildfire. Activities such as livestock grazing, mining, and infrastructure development also impact vegetation types allowing the establishment of invasive non-native plants. Ecosystem boundaries are typically characterized by gradual species transitions rather than clear-cut boundaries. Agricultural lands occur around communities and include irrigated and non-irrigated pastures, alfalfa fields, and orchards.

Wildland vegetation-fuels include grass, leaves, twigs, ground litter, weeds, shrubs, and trees. Structures in the WUI are also a fuel source. Existing vegetation is the fuel source for wildland fire and has a direct effect on fire behavior. Vegetation types important to wildland fire and fuel management include conifer forest, pinion-juniper, sagebrush, and oak. These vegetation types occur throughout the County and are conducive to extreme fire behavior. Each type of vegetation-fuel presents unique challenges to reduce fuel hazards. Understanding the fire behavior characteristics of different vegetation-fuel types facilitates effective fuel-management and wildfire suppression strategies.

2.6 Wildfire History

Wildfire occurrence throughout Garfield County is common (Map 4). Fires occur in all FPDs with lightning strikes being the primary cause. The large, catastrophic fires have occurred mainly south of the Colorado River and east of Battlement Mesa on BLM and private lands below 6,500 feet due to tremendous amounts of oak brush, sagebrush and grass, and pinion-juniper vegetation. However, large fires have also occurred in the conifer forests in the north-eastern portion of the County on USFS lands. Table 6 lists the large fires that have occurred in the county. These large wildfire have been particularly catastrophic because of the loss of firefighters lives, the large number of acres burned, and the loss of homes and other resources. The scars of these fires are evident on the landscape.

Table 6. Garfield County Large Wildfires

Wildfire Name	Acres	Year
Battlement Creek	880	1976
Battlement Mesa	4,207	1987
Panorama I	796	1989
Divide Creek	726	1994
South Canyon	3,041	1994
Battlement Mesa III	512	1994
Monument Gulch	160	1999
Porcupine Creek	21	2001
Panorama II	1,603	2002
Coal Seam	11,425	2002
Brush Creek	3,785	2003
Dry Park	159	2003
Carr	123	2003
High Aspen	52	2004
Red Apple	828	2006
Jolley Mesa	662	2006
New Castle	1,216	2007
301	177	2007
100 Road	611	2008
Porcupine	183	2009

Source: CSFS

During the years of 1981 through 2010, there were 1,924 fires that occurred in the County for an average of 64 fires per year (Table 7). During the 30-year period there were 140,021 acres burned for an average of 4,667 acres per year. Approximately 92 percent of all wildfires burned less than 9.9 acres per fire, regardless of ignition source, while one percent of all fires burned over 1,000 acres. Natural fire sources include lightning strikes and coal-fire seam ignitions and

account for 87 percent of all fires. Thirteen percent of all fires were human-caused, which calculates to 8 per year.

Table 7. Wildfire History for the Years 1981–2010

Fire Size Class (Acres)	Acres Burned (%)	Number of Fires
A 0 – 0.25	152 (0.1)	152 (73.2)
B 0.25 – 9.9	647 (0.4)	354 (18.4)
C 9.9 – 99.9	3,744 (2.7)	108 (5.6)
D 100 – 299.9	3,578 (2.6)	16 (0.9)
E 300 – 999.9	11,040 (7.9)	16 (0.9)
F 1,000 – 4,999.9	24,472 (17.4)	13 (0.6)
G 5,000 – 9,999.9	96,388 (68.8)	8 (0.4)

Source: UCRIFMU and CSFS

2.7 Values at Risk

Human welfare receives priority protection in the event of a wildfire. Economic and ecological values are secondary to human welfare and they receive proper protection through collaborative planning as presented in this CWPP. Economic and ecological values are intermixed in Garfield County because of the economic base from the O&G industry, agriculture, tourism, and recreation. The O&G exploration, drilling, and extraction occurs throughout the County and is extremely important to its economy. Examples of values at risk to wildfire in Garfield County include:

- Agricultural lands
- Air quality
- Businesses and industries
- Community infrastructure
- Communication towers
- County and state parks
- Forest and rangelands
- Homes and structures
- Human welfare
- Local economies
- Municipal water supplies
- Natural vegetation
- Oil & gas industry
- Recreation and tourism
- Source water protection areas
- Transportation
- Viewsheds
- Watershed health and water quality
- Wildlife and aquatic habitats

Wildfires occur in all portions of the County and could have severe, long-term impacts on economic and ecological values. Catastrophic wildfire could impair water quality to Garfield County towns and communities through source water contamination. Wildfire could also impair Colorado River water quality for downstream cities, towns, and communities in Colorado, Utah, Nevada, and Arizona.

2.8 Wildfire Protection Authorities

The wildland fire protection authorities that operate in Garfield County include eight FPDs, two federal interagency fire management units, and the DFPC (Table 8). The FPDs include the Burning Mountains FPD, Carbondale & Rural FPD, De Beque FPD, Glenwood Springs Fire Department (FD) (herein grouped with the FPDs), Grand Valley FPD, Gypsum FPD, Lower Valley FPD, and Rifle FPD. The FPDs are responsible for the initial attack of wildfires on lands within their jurisdictions (Map 1).

Table 8. Wildfire Protection Authorities Response Capabilities in Garfield County

Fire Protection Authority	Apparatus	Trained Wildland Firefighters
Burning Mountains FPD	• 4 type 6 brush trucks • 2 type 3 brush trucks • 2 type 1 brush trucks • 3 type 2 tenders	• 35 FFT2 (not certified)
Carbondale & Rural FPD	• 2 type 6 engines • 5 type 3 engines • 2 1800-g tactical tenders	• 69 FFT2
De Beque FPD	• 3 brush trucks • 2 4,000-g tenders • 1 3,500-g tender • 2 drop tanks • 1 structure engine	• 13 FFT2
Glenwood Springs FD	• 3 type 1 engines • 2 type 3 tenders • 1 type 2 engine • 2 type 6 engines	• 21 basic training • 15 FFT2
Grand Valley FPD	• 3 type 5 brush trucks • 3 all-terrain vehicles • 1 type 3 tender • 2 type 2 tender • 3 type 1 engines	• 31 firefighters with training ranging from FFT2 to engine boss
Gypsum FPD	• 1 type 3 brush truck • 2 tenders	• 42 FFT2
Lower Valley FPD	• 2 type 6 engines • 1 4500-g tactical tender • 1 2600-g class A tinder 2 class A structural engines	• 6 FFT1 • 2 FFT2 • 1 strike team chief • 3 crew bosses
Rifle FPD	• 3 type 1 engines • 4 type 6 engines • 2 tenders	• 49 FFT2 • 2 FFT1
Upper Colorado River Interagency Fire Management Unit	• Three type 6 engines • One type 3 helicopter from June 1 – August 30	• 10 engine and crew bosses • 7 FFT1 • 7 FFT2

Fire Protection Authority	Apparatus	Trained Wildland Firefighters
Northern Colorado Interagency Fire Management Unit	• 1 type 6 engine • 1 enhanced type 6 engine	• 4 seasonal engine captains and 2 assistant capstans • 3 seasonal firefighter 2
Division of Fire Protection and Control	• 4 single engine air tankers	• State Department of Corrections (DOC) type 2 hand crew

Source: FPD fire chiefs, UCRIFMU, NCIFMU, and CSFS

The Upper Colorado River Interagency Fire Management Unit (UCRIFMU) and the Northern Colorado Interagency Fire Management Unit (NCIFMU) are responsible for responding to wildfires on federal lands within their jurisdictions. The UCRIFMU jurisdiction within Garfield County includes the BLM Colorado River Valley and Grand Junction Field Offices, and the USFS White River National Forest. The NCIFMU is responsible for the portion of the BLM White River Field Office that occurs in Garfield County.

Authority for wildland fire suppression on state and private lands rests with FPDs and/or the County Sheriff. DFPC can assume suppression authority under state emergency fire fund (EFF) procedures. Mutual aid agreements among the agencies provide guidance for initial wildfire attack and support during an incident. Wildfire protection within the County cannot be accomplished by one authority because of the complexity of land ownerships. Cooperation and coordination are keys to effective wildfire and fuels management, which is coordinated through the county's Wildfire AOP.

2.9 Oil and Gas Industry

The O&G exploration, drilling, and extraction activities occur throughout the county. The O&G industry is important to the economic wellbeing of the County but does pose positive and negative challenges to wildfire management including:

- Gas well production sites and associated infrastructure can be vulnerable to damage from wildfires.
- O&G activity and vehicle travel may occur in areas with flammable vegetation-fuels such as cheatgrass and oak brush.
- Disturbed areas are reseeded with native grasses but soil-surface disturbances may cause the increase of cheatgrass and other weeds.
- Exploration and production sites are generally in remote areas that may be difficult to reach quickly in the event of a wildfire ignition.
- Buried pipelines can pose dangerous situations to bulldozing fire breaks to contain a wildfire.
- O&G roads may serve as fire breaks in rangeland and forest vegetation and provide fast access to remote areas.
- O&G personal are frequently the first to report wildfires occurring in remote locations because of the line of sight provided by the elevated locations on hill slopes and ridge tops.

- Many O&G companies require that vehicles carry fire extinguishers to suppress small fires.
- During wildfire season, some companies have water trucks that can be made available for wildfire response.
- O&G companies must adhere to fire restrictions imposed by the FPDs or federal agencies due to a combination of things such as weather conditions, fuel conditions, time of year, and personal staffing shortages. Additionally, due to permitting requirements, the FPD that has jurisdiction over the well site will have maps showing the well site and ingress and egress to that well site.

2.10 Conservation Districts

The three conservation districts in Garfield County are Mount Sopris, South Side, and Bookcliff (Map 1). Conservation districts provide an important benefit to wildfire management by working with private landowners in addressing vegetation management issues such as weed abatement and the timely revegetation of disturbed sites. Conservation districts work with landowners to reduce wildfire hazards and risks through education programs such as the large and small acreage workshops. Also, appropriate soil and vegetation management are critical to provide for watershed health and water quality. Garfield County is a watershed not only for its own residents but also for all towns and cities that draw water downstream from the Colorado River. The conservation districts can also provide important information and resources for post-fire rehabilitation on private lands.

2.11 Insurance Services Office Fire Hazard Ratings

The Insurance Services Office (ISO) provides fire and wildfire hazard assessment services for residential and commercial property insurers to help establish a standardized basis for appropriate fire insurance premiums. The ISO ratings for Garfield County range from 4 to 10 depending on proximity to fire protection (Table 9). The insurance industry surveys more than 44,000 fire-response jurisdictions regularly for up-to-date information concerning a community's fire protection services. The Fire Suppression Rating Schedule provides a standardized methodology for reviewing the firefighting capabilities of individual communities. The schedule measures major elements of a community's fire-suppression capacity and develops a numerical grading known as a Public Protection Classification. Ratings range from 1 (best) to 10 (worst). These ratings are established based on the following factors and are developed independent of any findings and conclusions stated in this CWPP:

- **Fire alarms** – Ten percent of the overall grading are based on how well the fire department receives fire alarms and dispatches its fire-fighting resources.
- **Engine companies** –- Fifty percent of the overall grading is based on the number of "engine companies" and the amount of water a community needs to fight a fire. This includes suppression resource distribution, equipment maintenance, available personnel, and training.
- **Water supply** – Forty percent of the grading is based on the community's water supply. In urban interface settings where a municipal water supply is available, the water supply is

assessed for fire suppression capacity beyond daily maximum consumption, as well as the distribution of fire hydrants. In rural areas, documenting the ability to provide a continuous water supply to firefighting apparatus through a water tender relay may suffice.

Table 9. Garfield County ISO Ratings

Fire Protection District	ISO Rating
Burning Mountains	6 in hydrant areas; 9 within 5 miles from fire station; 10 elsewhere
Carbondale & Rural	5 in hydrant areas; 10 elsewhere
De Beque	6
Glenwood Springs	4 in hydrant areas; 9 elsewhere
Grand Valley	6 in hydrant areas; 9 within 5 miles from fire station, 10 elsewhere
Gypsum	5 in hydrant areas; 8 elsewhere
Lower Valley	6
Rifle	5 in hydrant areas; 9 within 5 miles from fire station; 10 elsewhere

Source: Garfield County FPDs

3 Wildland Fire Management Primer

3.1 Introduction

Wildland fire is defined as any fire burning in wildland fuels and includes prescribed fire, wildland fire for resource benefit, and wildfire. Prescribed fires are planned controlled fires ignited by land managers to accomplish specific natural resource improvement objectives. Fires that occur from natural causes, such as lightning, that are used to achieve management purposes under carefully controlled conditions with minimal suppression costs are known as wildland fire for resource benefits. Wildfires are unwanted and unplanned fires that result from natural ignition, unauthorized human-caused fire, or escaped prescribed fire.

Wildland fires may be further classified as ground, surface, or crown fires (see Appendix B for the glossary of terms). Ground fire refers to burning/smoldering materials beneath the surface including duff, tree or shrub roots, punky 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. Crown fires are usually the most devastating and dangerous of the three fire types because of their rapid spread rates and difficulty to suppress.

When assessing wildfire hazard and risk, wildfire hazard refers to vegetation or wildland fuel in terms of its contribution to problem fire behavior and its resistance to control. Risk is the probability of an actual ignition of wildland fuels. Values at risk include human welfare, infrastructure, structures, and natural resources that are likely to suffer long-term damage from the direct impacts of a wildfire.

3.2 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 evaluated at the fire line and described most simply in terms of 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 fire behavior chart (Table 10) is an excellent tool for measuring the safety and potential effectiveness of various fire line resources given a visual assessment of active flame length. The chart is valuable because it infers the relative intensity of the fire behavior to trigger points where mobilizing various resources to or away from an incident should be considered. The categories are not guides to personal safety because fires are dangerous at any level of intensity. As a matter of fact, most firefighter fatalities occur in small fires (Wilson 1977).

Table 10. Fire Behavior Characteristics Chart and Fire Suppressions Interpretations

Flame Length (Feet)	Fire line Intensity (BTU/Ft/Sec)	Interpretation
0-4	0−100	Fires can generally be attacked at the head or flank by persons using hand tools. Handline should hold the fire.
4-8	100−500	Fires are too intense for direct attack on the head by persons using handtools. Handline cannot 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 Appendix B (National Wildfire Coordinating Group 2006)

Fire risk is the chance of fire starting, as determined by the presence and activity of causative agents (NWCG 2012). Fire hazard is a fuel complex, defined by volume, type condition, arrangement, and location, that determines the degree of ease of ignition and of resistance to control. Fire severity, on the other hand, is the degree to which a site has been altered or disrupted by fire; loosely, a product of fire intensity and residence time.

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, density, vertical arrangement, and moisture content. Structures with flammable materials are also considered a vegetation-fuel source.

Fuels are often characterized in terms of fire behavior fuel models (FBFM), which are discussed in Section 5.3. Fuels may also be described in terms of size. The terms one-hour, ten-hour, one-hundred-hour, and one-thousand-hour timelag fuels refer to the amount of time required for the water content of the fuel particle to reach equilibrium with the ambient environment. This timelag corresponds to the diameter of the fuel particle.

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 FBFMs and using established mathematical models to predict potential fire behavior under specific climatic conditions. In this analysis, FBFMs were derived from the federal LANDFIRE project, which developed consistent and comprehensive maps and data describing vegetation, wildland fuels, and fire regimes across the United States.

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 intense on upslope than on level terrain. The effects of terrain can be particularly pronounced in steep narrow canyons often referred to as “chimneys” due to their convective characteristics. Wind tends to be the driving force in fire behavior in the most destructive WUI fires. Gusting or sustained winds can be problematic for firefighters.

3.3 History of Wildfire

Lightning-induced fire is a historic component of ecosystems in Garfield County, and its occurrence is important to maintaining the health of rangeland and forest ecosystems. Native Americans used fire as a tool for hunting, improving wildlife habitat, land clearing and warfare. As such, many of the plant species and communities have adapted to recurring fire through phonological, physiological, or anatomical attributes. Some plants, such as lodgepole pine and western wheatgrass, require reoccurring fire to persist.

European settlers, land use policy, and changing ecosystems have altered fire behavior and fuels accumulation from their historic setting. Euro-American settlers in Garfield 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, mining, and road construction. Livestock grazing reduced the amount of fine fuels such as grasses and forbs, which carried low-intensity fire across the landscape. Mining activities lead to large scale deforestation and removal of individual tree stands that formed the historical forest mosaic. The removal of the naturally occurring vegetation also facilitated the invasion of nonindigenous grasses and forbs, some of which create more flammable fuel beds than their native predecessors. Cheatgrass is an example of an introduced grass that is problematic for firefighters for the reasons that it is highly flammable and burns rapidly. Because of its continuous nature in many vegetation types it can carry fire across the landscape.

In addition, more than a century of fire-suppression has resulted in large accumulations of surface fuels, ladder fuels, and canopy fuels in western forests and shrublands. Fuel loads also increased as forests and shrublands encroached into grasslands. 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 tools, including prescribed fire and thinning treatments in order to manage vegetation to more desirable situations.

3.4 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). Burn Permits are obtained through the local FPD. Residents living outside a FPD may obtain a Burn Permit from the Garfield County Sheriff's Office.

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 are cost-prohibitive.

3.5 Hazardous Fuels Mitigation

Wildfire behavior and severity are dictated by fuel characteristics, 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, limb 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 evacuation routes and community access 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.

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 or 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 but may significantly vary based on percent of slope adjacent to the structure. The minimum distance is 30 feet from a structure. Recommended guidelines for creating effective defensible space are outlined in CSFS Bulletin 6.302 (Appendix F). Defensible space is defined as an area around a structure where fuels have been treated, thinned, or removed in order to reduce wildfire intensity as it moves towards a structure. Defensible space reduces the chances of a structure fire moving to the surrounding wildlands, and to provide room for firefighters to do their jobs.

While reducing hazardous fuels around a structure, it 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).

3.6 Site Restoration

Many times it is necessary to seed an area with an appropriate seed mix after a fuel treatment or fire because of the paucity of desirable plant seed or other propagules in the soil or from adjacent undisturbed vegetation. Reseeding the treated area with desirable species can be necessary to combat the establishment of weedy vegetation such as cheatgrass and annual mustards, which can exacerbate hazardous vegetation-fuel situation. Establishing a desirable plant cover as quickly as possible will also reduce the chances for soil erosion and is beneficial to restoring watershed quality and wildlife habitat. The seed mix should be adapted to the ecological conditions of the site and meet land management objectives. An appropriate seed mix can be developed through discussions with the CSFS, local conservation district, or Natural Resources Conservation Service (NRCS).

4 Community Outreach and Collaboration

4.1 Strategic Planning

The CWPP planning team was composed of representatives from the FPDs, federal agencies, state agencies, county agencies, communities, and conservation districts. Contacts from various governmental agencies, communities, and other organizations were invited to participate on the CWPP planning team and attend planning meetings via emails.

Four collaborative planning team meetings were convened throughout the course of the CWPP development (see Appendix C for meeting notes). The purposes of each meeting focused on a specific aspect of the CWPP planning process. Meetings were convened September 13, October 11, November 8, and December 5, 2011 at the Rifle Sheriff's Annex or Rifle Fire Station.

4.2 Fire Authority Interviews

Fire authorities in Garfield County include the FPDs, UCRIFMU, NCIFMU, and DFPC. These agencies coordinate and collaborate to provide protection to human welfare, infrastructure, and other values from wildfire loss. Interviews were conducted with each of the fire authorities to identify current resource capacity, potential vegetation-fuel projects, and resource needs to improve response capabilities. The majority of interviews and field tours occurred the week of October 10, 2011.

4.3 Community Outreach

The success of any CWPP is dependent upon community involvement for both strategic input and long-term ownership and implementation. The CWPP needs to accurately reflect the county's interests, concerns, and priorities to promote legitimacy and long-term success. The community outreach strategy employed was a multi-tiered approach to engage interested parties,

raise public awareness, and generate public input for mitigation recommendations through:

- Survey questionnaire;
- Community-based meetings; and
- County web site postings.

The goal of the community involvement activities for the Garfield County CWPP was two-fold: 1) to inform the community of the CWPP project and proposed actions to reduce hazardous vegetation-fuels and improve wildfire response capacity; and 2) to stress the value of public input during the review phase of the CWPP. Because this is a community-based plan, it was essential to obtain as much information as possible about the perceptions, concerns, and issues of residents and landowners in the WUI areas, as well as other watershed stakeholders. The primary means of collecting community input was through a distributed questionnaire and through five public meetings.

4.3.1 Questionnaire Strategy

A questionnaire survey was made available to all county residents on the Garfield County Emergency Management website and at the community meetings. The purpose of the survey was to gain information about how county residents perceived the potential risk of wildfire and their attitudes towards risk reduction and preparedness strategies. The survey results may be used to focus public outreach activities aimed at wildfire risk reduction and loss prevention. Additional benefits of the survey include educating and informing the public, incorporating public values into decision-making, improving the quality of decisions, and building trust in this planning process. Results from 21 responses (as of April 4, 2012) are tabulated and summarized in Appendix D. With regards to wildfire risk, 33 percent of the respondents considered wildfire risk to be moderate while 38 percent said that it was high. On the other hand, 29 percent consider wildfire risk to be low throughout the County, which is interesting given the number of large wildfires and acres burned since 1987 (Table 6). Seventy-one and 62 percent of the survey respondents considered vegetation-fuels management and public education, respectively, were the best ways to decrease wildfire risks throughout the county. Responses to the question on what action that need to be taken to reduce the risk of wildfire included:

- Better vegetation-fuels management;
- Increase public awareness; and
- Improved federal government participation.

4.4 Community Meetings

Communities meetings were held in Battlement Mesa, Rifle, Glenwood Springs, and Carbondale. In addition, CWPP information was made available at the Bookcliff, Mount Sopris, and Southside Conservation districts sponsored Large Acre Agriculture Day in New Castle. All community gatherings were held the week of January 23, 2012. The meetings were advertised through newspaper releases, radio announcements, postings on community marquees, and notes sent home to parents by students.

The public meetings presented a variety of information on wildfire including presentations by insurance representative, local FPD, CSFS, UCRIFMU, County Office of Emergency Management, and Walsh Environmental (see Appendix E for the proceedings of the meetings).

The main focus of the meetings was to present the findings of the CWPP and request participants to review the CWPP and provide comments as appropriate. The information was presented to help residents understand what actions are occurring in the County to reduce the risks of wildfire and private landowners' responsibilities on their properties. Pamphlets and brochures on Firewise landscaping and house construction were provided to meeting attendees.

4.5 CWPP Public Review

The draft CWPP was posted on the Garfield County Office of Emergency Management web site September 2012 to facilitate public review (http://www.garfield-county.com/ news/sheriffs-wildfire-plan.aspx). Interested community members and stakeholders could download a PDF document of the draft CWPP and associated maps for review. Review comments could be posted on the web site. All appropriate public comments were addressed in the final CWPP.

5 Community / Wildland Urban Interface Assessment

5.1 Methodology

Step 5 in the CWPP process is to assess wildfire risks and hazards associated with communities and their WUI within the planning area (Table 2). The planning area for this CWPP is defined by the boundary of Garfield County. There are eight FPDs that provide wildfire protection within the County. Those areas not under a FPD command fall under the jurisdiction of the Sheriff's Office (Map 1).

A WUI was defined within each FPD by the fire chief or his representative (Map 2). The WUI boundaries were presented at a planning team meeting for discussion and approval. Even though the WUIs vary greatly in size, populations, and geography, standardized assessments were conducted to assess wildfire hazards and risks.

A comprehensive community wildfire assessment takes into account a variety of factors in order to fully identify and assess wildfire risks and hazards. These include the nature of community infrastructure, terrain, proximity of hazardous fuels, and probability of wildfire occurrence. By analyzing these elements, including input from residents and FPDs, an understanding of wildfire risks and hazards can be developed that provides guidance for developing effective vegetation-fuel treatments and other mitigation opportunities to improve FPD response capabilities.

In addition to the community assessments, fire regime condition class (FRCC), FBFM, wildfire susceptibility index (WFSI), and wildfire intensity index (WFII) were evaluated within the WUIs. FRCC and FBFM are attributes of the vegetation-fuel and can be used to describe its degree of hazard to communities. WFSI is a metric that defines the probability of wildfire occurrence and its predicted rate of spread. WFII is a metric that defines the potential severity of wildfire.

The WUI risk to wildfire was calculated by summing the results of the five metrics and then dividing by 5 (Table 11). Community risk, FRCC, and FBFM received an equal weighting of 1 while WFSI and WFII received a weighting of 3.

Table 11. Wildland Urban Interface Hazard and Risk Ranking Approach

Risk Category	Score		Metric Weight
Low	1		Community risk = 1
Low to Moderate	2		FRCC = 1
Moderate	3		FBFM = 1
Moderate to High	4		WFSI = 3
High	5		WFII = 3
High to Very High	6		
Very High	7		
Extreme	8		

5.2 Community Hazard Assessment

The WUI areas were delineated by the FPDs based on their knowledge of fire occurrence and community risk (Map 2). The WUI focuses the interest of the CWPP because of economic considerations and the high percentage of residences. Mitigation actions are identified herein to reduce the risk of wildfire loss in the WUIs. The remainder of the County is characterized as rural. In these areas, isolated homes and ranches are best served through individual home and property hazard and risk assessments in consultation with the CSFS.

Field surveys were conducted during September and October 2011. 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 WUI (NFPA 2002).

The NFPA 1144 survey assesses means of ingress and egress, road conditions, fire service access, surrounding vegetation-fuel, defensible space around structures, surrounding terrain, weather conditions conducive to wildfire ignition and spread, structure building materials, available fire protection, and placement of utilities. Scores are assigned to each element and then totaled to determine the relative level of risk for each individual assessment. Low, moderate, high, and extreme hazard ratings were assigned based on the surveys (Table 12).

The NFPA 1144 surveys assessed the predominant characteristics important to wildfire risks within the communities of Parachute, Battlement Mesa, Rifle, Rulison, Silt, New Castle, and Carbondale. A representative sample of the scattered residences of Lower Valley, De Beque, and Gypsum FPDs were individually assessed using the NFPA 1144 procedure to collectively determine a “community wildfire risk.” Glenwood Springs and Missouri Heights wildfire risks were determined from the information presented in their previously completed CWPPs.

Table 12. Wildland Urban Interface Hazard Rating and Contributing Factors

Wildland Urban Interface	Community	CWPP Hazard Rating	Contributing Factors
Burning Mountains	New Castle	High	• (+) More than one way in and out • (+) All season paved roads with turnarounds • (+) Reflective street signs • (-) Moderate to heavy fuels in proximity to homes • (+) Defensible space 30-71 feet • (+) Generally fire resistant roofs and construction • (-) Steep slopes in proximity to homes • (-) Terrain and weather conditions conducive to extreme fire behavior • (-) Area with fire history • (-) Above ground gas and electrical utilities • (+) Excellent wildfire response capability and hydrants
Burning Mountains	Silt	Moderate	• (+) More than one way in and out • (+) All season paved roads with turnarounds • (+) Reflective street signs • (+) Light to fuels in proximity to homes • (+) Defensible space 30-71 feet • (+) Fire resistant roofs and construction • (-) Steep slopes in proximity to homes • (-) Terrain and weather conditions conducive to extreme fire behavior • (-) Area with fire history • (-) Above ground gas and electrical utilities • (+) Excellent wildfire response capability and hydrants
Carbondale & Rural	Carbondale	Moderate	• (+) More than one way in and out • (+) All season paved roads with turnarounds • (+) Reflective street signs • (+) Light to moderate fuels in proximity to homes • (+) Defensible space 30-71 feet • (+) Generally fire resistant roofs and construction • (-) Above ground electrical utilities • (-) Terrain and weather conditions conducive to extreme fire behavior • (+) Excellent wildfire response capability and hydrants
Carbondale & Rural	Missouri Heights	Moderate to Extreme	• Assessment results based on Carbondale & Rural Fire Protection District CWPP
De Beque	Dispersed	High	• (-) Generally one way in and out

Wildland Urban Interface	Community	CWPP Hazard Rating	Contributing Factors
			• (-) Non-surface roads • (-) Moderate to heavy fuels in proximity to homes • (-) Defensible space generally <30 feet • (-) Steep slopes in proximity to structures • (-) Terrain and weather conditions conducive to extreme fire behavior • (-) Area with fire history • (+/-) Fire resistant roofs with non-resistant siding and decks • (-) Water is hauled by fire department and drafting from ponds • (-) Fire department >5 miles from structures • (-) Above ground gas and electrical utilities
Glenwood Springs	Greater Glenwood Springs	High to Very High	• Assessment results based on Glenwood Springs Fire Protection District CWPP
Grand Valley	Battlement Mesa	Moderate	• (+) More than one way in and out • (+) All season paved roads with turnarounds • (+) Reflective street signs • (+) Moderate fuels in proximity to homes • (+) Defensible space 30-71 feet • (+) New homes with fire resistant roofs and construction • (-) Above ground gas and electrical utilities • (-) Steep slopes in proximity to community with heavy fuels • (-) Area with fire history • (-) Terrain and weather conditions conducive to extreme fire behavior • (+) Excellent wildfire response capability and hydrants
Grand Valley	Parachute	Moderate	• (+) More than one way in and out • (+) All season paved roads with turnarounds • (+) Reflective street signs and house numbers • (+) Moderate fuels in proximity to homes • (+) Defensible space 30-71 feet • (-) Older homes non-fire resistant roofs and construction • (-) Steep slopes in proximity to community with heavy fuels • (-)Terrain and weather conditions conducive to extreme fire behavior • (-) Area with fire history • (+) Excellent wildfire response capability and hydrants • (-) Above ground gas and electrical utilities
Grand Valley	Rulison	High	• (+) More than one way in and out

Wildland Urban Interface	Community	CWPP Hazard Rating	Contributing Factors
			• (+) All season paved roads with turnarounds • (+) Reflective street signs • (-) Houses with combustible roofs and siding • (-) Heavy fuels in proximity to homes • (+) Defensible space 30-71 feet • (-) Above ground gas and electrical utilities • (-) Steep slopes in proximity to homes • (-) Terrain and weather conditions conducive to extreme fire behavior • (-) Area with fire history • (+) Excellent wildfire response capability and Hydrants
Gypsum	Dispersed	High	• (-) Generally one way in and out • (-) Non-surface roads • (-) Moderate to heavy fuels in proximity to homes • (-) Defensible space < 30 feet • (-) Steep slopes in proximity to structures • (-) Terrain and weather conditions conducive to extreme fire behavior • (-/+) Fire resistant roofs with nonresistant siding and decks • (-) Water is hauled by fire department • (-) Above ground gas & electrical utilities • (-) Fire department > 5 miles from structures
Lower Valley	Dispersed	High	• (-) Generally one way in and out • (-) Non-surface roads with steep grades • (-) Street signs and house numbers not present • (-) Moderate to heavy fuels in proximity to homes • (+) Defensible space 30-71 feet • (-) Steep slopes in proximity to structures • (-) Terrain and weather conditions conducive to extreme fire behavior • (+/-) Fire resistant roofs with nonresistant siding and decks • (-) Water is hauled by fire department • (-) Area with fire history • (-) Fire department >5 miles from structures • (-) Above ground gas and electrical utilities
Rifle	Rifle	Moderate	• (+) More than one way in and out • (+) All season paved roads with turnarounds • (+) Reflective street signs

Wildland Urban Interface	Community	CWPP Hazard Rating	Contributing Factors
			• (+) Light fuels in proximity to homes • (+) Defensible space 71-100 feet • (+) Fire resistant roofs and construction • (-) Above ground gas and electrical utilities • (-) Steep slopes in proximity to homes • (-) Terrain and weather conditions conducive to extreme fire behavior • (-) Area with fire history • (+) Excellent wildfire response capability and hydrants

5.3 Fire Regime Condition Class

The Fire Regime Condition Class (FRCC) is a metric that classifies current vegetation cover according to its departure from an acceptable reference condition such as conditions prior to European settlement (Table 13). Vegetation changes from the historical conditions have resulted because of disturbance caused by European settlers and an aggressive fire exclusion policy.

The FRCC considers the current wildfire regime (i.e., wildfire return interval and its severity) and vegetation structure (i.e., vegetation composition and structure) in comparison to the reference condition. FRCC may be utilized, in combination with other factors, to help guide management objectives and set priorities for vegetation-fuel treatments and management. The classification of vegetation into FRCC considers only wildland vegetation and not vegetation associated with agricultural or urban areas. FRCC classes and the hazard ratings used for WUI assessment are shown in Table 13.

Table 13. Fire Regime Condition Class Definition, Hazard Rating, and Garfield County Occurrence

Fire Regime Condition Class	Definition	CWPP Hazard Rating	Garfield County Acres
I	FRCC I – Fire behavior, effects, and other associated disturbances are similar to those that occurred prior to fire exclusion (suppression) and other types of management that do not mimic the natural fire regime and associated vegetation and fuel characteristics. Composition and structure of vegetation and fuels are similar to the natural (historical) regime. Risk of loss of key ecosystem components (e.g., native species, large trees, and soil) is low.	Low	738,110
II	FRCC II – Fire behavior, effects, and other associated disturbances show moderate departure from the natural or historical conditions (more or less severe). Composition and structure of vegetation and fuel are moderately altered. Uncharacteristic conditions range from low to moderate. Risk of loss of key ecosystem components is moderate.	High	824,177
III	FRCC III – Fire behavior, effects, and other associated disturbances show a high departure from natural or historic conditions (more or less severe). Composition and structure of	Extreme	178,434

Fire Regime Condition Class	Definition	CWPP Hazard Rating	Garfield County Acres
	vegetation and fuel are highly altered. Uncharacteristic conditions range from moderate to high. Risk of loss of key ecosystem components is high.		

Source: www.landfire.gov

The majority of Garfield County wildland vegetation can be classified as FRCC II or FRCC III with 824,177 and 178,434 acres, respectively (Map 5). FRCC I accounts for 738,110 acres. Table 14 presents the dominant classes and the hazard classification for each WUIs.

Table 14. The Dominant Fire Regime Condition Classes and Hazard Ratings that occur in the Wildland Urban Interface Areas of Garfield County

Wildland Urban Interface	Dominant Class	Hazard Rating
Burning Mountains	• FRCC I = 17% • FRCC II = 55%	High
Carbondale & Rural	• FRCC I = 43% • FRCC II = 24%	Low to High
De Beque	• FRCC I = 23% • FRCC II = 59%	High
Glenwood Springs	• FRCC I = 29% • FRCC II = 47%	High
Grand Valley	• FRCC II = 53% • FRCC III = 17%	High
Gypsum	• FRCC I = 49% • FRCC II = 30%	Low to High
Rifle	• FRCC I = 15% • FRCC II = 60%	High
Lower Valley	• FRCC I = 22% • FRCC II = 66%	High

Source: www.landfire.gov

5.4 Fire Behavior Fuel Model

Existing vegetation is the fuel source for wildfire and has a direct effect on its behavior. Understanding the potential fire behavior characteristics of different vegetation types is paramount to predicting severity of a wildfire and the need vegetation-fuels management. There are several systems for classifying fuel models. This analysis utilizes a commonly used fuel modeling methodology known as the Anderson FBFM (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. The different vegetation types that occur in Garfield County (Map 3) can be classified into 8 FBFMs (Map 6). Table 15 defines each of the FBFMs that occur in the county and the hazard rating used to define WUI risks.

Table 15. Fire Behavior Fuel Model Definition, Hazard Rating, and Garfield County Occurrence

Fire Behavior Fuel Model	Definition	CWPP Hazard Rating	Garfield County Acres
1 Short Grass	**Grass Group** – Fire spread is determined by the fine, very porous, and continuous herbaceous fuels that have 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 78 chains per hour with flame lengths over 4 feet. Fuel loading (tons/acre): 1 hour = 0.74; 10 hour = 0.0,100 hour = 0.0; live = 0. Fuel bed depth (ft) = 1.0.	Moderate	96,488
2 Timber or shrub grass and understory	**Grass Group** – Fire spread occurs through curing or 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 oak brush stands that cover from one- to two-thirds of the area generally fit this model. Fire rate of spread can exceed 35 chains per hour with flame lengths over 6 feet. Fuel loading (tons/acre): 1 hour = 2.00; 10 hour = 1.0; 100 hour = 0.5; live = 0.5. Fuel bed depth (ft) = 1.0.	High	243,333
4 Mature Shrub	**Shrub Group** – Fire intensity and fast-spreading fires involve the foliage and live and dead fine woody material in the crowns of a nearly continuous secondary overstory. Fire rate of spread can exceed 75 chains per hour with flame lengths over 19 feet. Fuel loading (tons/acre): 1 hour = 5.01; 10 hour = 4.01; 100 hour = 2.00; live = 5.01. Fuel bed depth (ft) = 6.0.	High	9,231
5 Young Brush	**Shrub Group** – Fire is generally carried in the surface fuels that are made up of litter cast by the shrubs and grasses or forbs in the understory. The live vegetation produces poor burning qualities. Fire rate of spread can exceed 18 chains per hour with flame lengths over 4 feet. Fuel loading (tons/acre): 1 hour = 1.00; 10 hour = 0.50; 100 hour = 0.0; live = 2.00. Fuel bed depth (ft) = 2.0.	Moderate	82,082
6 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 oak brush and mountain mahogany less than 6 feet tall. Fire rate of spread can exceed 32 chains per hour with flame lengths over 6 feet. Fuel loading (tons/acre): 1 hour = 1.50; 10 hour = 2.50; 100 hour = 2.00; live = 0.0. Fuel bed depth (ft) = 2.5.	High	556,729
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 1.6 chains per hour with flame lengths of 1 foot. Fuel loading (tons/acre): 1 hour = 1.50; 10 hour = 1.00; 100 hour = 2.5; live = 0.0. Fuel bed depth (ft) = 0.2.	High	584,975
9 Hardwood or Long-	**Timber Group** – Fires run through the surface litter faster than in FBFM 8 and have longer flame lengths. These are	Low	48,373

Fire Behavior Fuel Model	Definition	CWPP Hazard Rating	Garfield County Acres
Needle or Timber Litter–Moderate Ground Fuel	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 7.5 chains per hour with flame lengths of 2.6 feet. Fuel loading (tons/acre): 1 hour = 2.92; 10 hour = 0.41; 100 hour = 0.15; live = 0.0. Fuel bed depth (ft) = 0.2.		
10 Mature/Overmature Timber and Understory	**Timber Group** – Surface fires burn with greater intensity than the other timber litter models. Dead and down are heavier than other timber models and the stands are more prone to hard-to-control fire behavior such as torching, spotting, and crown runs. Fire rate of spread is 7.9 chains per hour with flame lengths of 4.8 feet. Fuel loading (tons/acre): 1 hour = 3.01; 10 hour = 2.0; 100 hour = 5.01; live = 2.00. Fuel bed depth (ft) = 1.0.	Low	87,250

Source: Anderson (1982), www.landfire.gov, Grand Valley FPD

The dominant FBFMs in Garfield County include (Map 6): FBFM 2 (timber and shrub grass understory), FBFM 6 (dormant brush), and FBFM 8 (closed or short needle timber). These FBFM represent grass, sagebrush, oak brush, and pinion-juniper vegetation that occur throughout the county. Table 16 presents the dominant FBFMs that occur in each WUI and the hazard rating.

Table 16. The Dominant Fire Behavior Fuel Models and Hazard Ratings that occur in the Wildland Urban Interface Areas of Garfield County

Wildland Urban Interface	Dominant Class	Hazard Rating
Burning Mountains	• Timber grass = 29% • Dormant brush = 28% • Closed timber litter = 15%	High
Carbondale & Rural	• Closed timber litter = 62%, • Dormant brush = 5%	High
De Beque	• Timber grass = 21% • Dormant brush = 42% • Closed timber litter = 15%	High
Glenwood Springs	• Young brush = 11% • Dormant brush = 21% • Closed timber litter = 42%	High
Grand Valley	• Timber grass = 33%, • Dormant brush = 25%, • Closed timber litter = 16%	High
Gypsum	• Closed timber litter = 44% • Dormant brush = 15% • Young brush = 15%	High
Lower Valley	• Timber grass = 15% • Closed timber litter = 24% • Dormant brush = 34%	High
Rifle	• Timber grass = 36% • Dormant brush = 29% • Closed timber litter = 14%	High

Source: www.landfire.gov, Grand Valley FPD

5.5 Wildfire Susceptibility Index

The Wildfire Susceptibility Index (WFSI) is defined as the probability of wildfire occurrence and its predicted rate of spread once an ignition occurs. The WFIS data used in this CWPP assessment was derived from the Western Colorado Wildfire Risk Assessment that was presented in the CSFS report, *Colorado Statewide Forest Resource Assessment: A Foundation for Strategic Discussion and Implementation of Forest Management in Colorado*, published in 2008.

The purpose of the WFSI was to provide a measure of wildfire risk within the WUIs and communities. Data used by CSFS to develop the WFSI included topography, historic weather, historic wildfire, surface fuels, and vegetation canopy. WFSI is utilized to define the risk of wildfire occurrence in Garfield County (Map 7).

Table 17 defines the various WFSI classes and their occurrence within Garfield County. The largest and second-largest categories are moderate and high and they occur throughout the county in close proximity to all WUIs (Map 7). The low category occurs mainly in the rural areas of the county. The WFSI's very high category occurs mainly in the southeastern portions of the county in the Glenwood Springs and Carbondale WUIs. The classification of vegetation into WFSI as with the FRCC considers only wildland vegetation and not vegetation associated with agricultural or urban areas.

Table 17. Wildfire Susceptibility Index Definition, Risk Rating, and Garfield County Occurrence

Index	Definition (Probability of Occurrence)	CWPP Risk Rating	Garfield County Acres
Low	0.00−0.0016	Low	1,194,700
Moderate	0.0017−0.0041	Moderate	246,396
High	0.0042−0.0185	High	145,838
Very High	0.0186−1.00	Very High	65,790

Source: Colorado State Forest Service (2008)

Table 18 presents the dominant WFSI classes that occur in each WUI and the associated risk rating.

Table 18. The Dominant Wildfire Susceptibility Indices and Risk Ratings in the Wildland Urban Interface Areas of Garfield County

Wildland Urban Interface	Dominant Class	Risk Rating
Burning Mountains	• Low = 42% • Moderate = 27%	Low to Moderate
Carbondale & Rural	• High = 9% • Very High = 65%	Very High
De Beque	• Low = 68% • Moderate = 11%	Low
Glenwood Springs	• High = 36% • Very High = 65%	High to Very High
Grand Valley	• Low = 25% • Moderate = 41%	Low to Moderate

Wildland Urban Interface	Dominant Class	Risk Rating
Gypsum	• Low = 32% • Moderate = 37%	Low to Moderate
Lower Valley	• Low = 70% • Moderate = 13%	Low
Rifle	• Low = 60% • Moderate = 19%	Low

Source: Colorado State Forest Service (2008)

5.6 Wildfire Intensity Index

The wildfire intensity index (WFII) is a measure for the potential for high-intensity wildfire occurrence as defined by flame length and crown fire. This index was also developed for the CSFS 2008 forest resources assessment. Calculation of the WFII is based on fire behavior computer simulations using similar data as for the WFSI. WFII is used to define areas in the County that could support high intensity fires (Map 8).

Table 19 defines the various WFII classes and their occurrence within Garfield County. The largest and second-largest categories are low and moderate and they occur throughout the County (Map 8). The high and very high WFII classes are associated mainly with forest vegetation.

Table 19. The Wildfire Intensity Index Risk Rating and Garfield County Occurrence

Index	CWPP Risk Rating	Garfield County Acres
Low	Low	858,280
Moderate	Moderate	869,344
High	High	92,360
Very High	Very High	72,951

Source: Colorado State Forest Service (2008)

Table 20 presents the dominant WFII classes that occur in all WUIs and the associated hazard rating.

Table 20. Wildfire Intensity Indices and Risk Ratings that occur within the Wildland Urban Interface Areas of Garfield County

Wildland Urban Interface	Dominant Category	Risk Rating
Burning Mountains	• Low = 48% • Moderate = 49%	Low to Moderate
Carbondale & Rural	• High = 27% • Very High = 70%	Moderate
De Beque	• Low = 35% • Moderate = 60%	Low to Moderate
Glenwood Springs	• High = 40% • Very High = 50%	Low to Moderate
Grand Valley	• :Low = 39% • Moderate = 59%	Low to Moderate
Gypsum	• Low = 45% • Moderate = 47%	Low to Moderate
Lower Valley	• Low = 45% • Moderate = 46%	Low to Moderate
Rifle	• Low = 32% • Moderate = 66%	Moderate

Source: Colorado State Forest Service (2008)

5.7 Wildland Urban Interface Wildfire Risks

The Burning Mountains, De Beque, Grand Valley, Gypsum, Lower Valley, and Rifle WUI areas were determined to have an overall wildfire risk of high (Table 21). Glenwood Springs and Carbondale were judged to have an overall extreme wildfire risk.

Table 21. Overall Risk Summary for the Wildland Urban Interface Areas in Garfield County

Wildland Urban Interface	Community	NFPA 1144 Community Hazard Rating	FRCC Hazard Rating	FBFM Hazard Rating	WFSI Risk Rating	WFII Risk Rating	Overall Risk
Burning Mountains	Silt	Moderate	High	High	Low to Moderate	Low to Moderate	High
	New Castle	High					
Carbondale & Rural	Carbondale	Moderate	Low to High	High	Very High	Moderate	Extreme
	Missouri Heights	Moderate to Extreme[2]					
De Beque	Dispersed	High	High	High	Low	Low to Moderate	High
Glenwood Springs	Greater Glenwood Springs	High to Very High[1]	High	High	High to Very High	Low to Moderate	Extreme
Grand Valley	Battlement Mesa	Moderate	High	High	Low to Moderate	Low to Moderate	High
	Parachute	Moderate					
	Rulison	High					
Gypsum	Dispersed	High	Low to High	High	Low to Moderate	Low to Moderate	High
Lower Valley	Dispersed	High	High	High	Low	Low to Moderate	High
Rifle	Rifle	Moderate	High	High	Low	Moderate	High

[1] Based on Glenwood Springs Fire District CWPP
[2] Based on Carbondale & Rural Fire Protection District CWPP

6 Wildland Fire Emergency Operations

Wildland fire management in Garfield County is an interagency effort because of public and private land ownership patterns. Its management is governed by a variety of federal policies, state statutes, and cooperative agreements between jurisdictional agencies. In Garfield County, the Wildfire AOP allows the Sheriff to enter into cooperative agreements for fire protection with federal firefighting agencies. This is accomplished through an Interagency Cooperative Fire Protection Agreement, signed between the federal agencies and the DFPC, and an Agreement for Cooperative Wildfire Protection between the County and DFPC. Wildfire authorities in Garfield County include eight FPDs, County Sheriff, DFPC, UCRIFMU, and NWIFMU.

Within the FPDs, the Fire Chief has authority for wildfire suppression on all state and private lands unless or until that authority is delegated to the County Sheriff. The County Sheriff has authority for all state and private lands outside of the FPDs. Currently, the Garfield County Sheriff is working under a policy of full suppression for all wildfires within his jurisdiction. However, the County Sheriff has very little actual suppression capability. The County Sheriff relies largely on the FPDs or the County Road and Bridge Department for county resources as needed.

The eight FPDs that operate within Garfield County provide the structural and wildfire fire protection and rescue needs of the residents and business owners within their respective jurisdictions. In addition to fire suppression, the FPDs offer emergency first response medical services, initial attack WUI fire response hazardous materials response, and fire prevention advice for fire safety.

The DFPCS, USFS, and BLM all have wildfire suppression responsibilities in Garfield County. DFPC provides assistance to wildfire response on private and state lands. The DFPC works closely with the FPDs and the County Sheriff in fulfillment of these responsibilities. The USFS and BLM provide responses to wildfire on federal lands. These provisions are accomplished through the following:

Emergency Fire Fund (EFF): The State Emergency Fire Fund (EFF) is strictly a fire suppression fund, and cannot pay for rehabilitation. However repair of damage directly related to suppression (e.g., water bars on cat lines) may be authorized by a DFPC line officer if accomplished as a suppression component at the time of the fire suppression effort. Various cost-share programs for wildfire land rehabilitation are available for private land including the Emergency Watershed Stabilization Program from the U.S. Department of Interior (US DOI), NRCS.

The EFF was established in 1967 by a few counties that recognized that some fires may exceed the capabilities of county resources and abilities. County participation is voluntary. Currently, 43 counties and the Denver Water contribute into this insurance-type fund that can pay for catastrophic wildfires on state and private land that exceed a participating county's resources. EFF funding must be requested by the county sheriff, and can only be approved by the state forester. As identified in the AOP, there is a minimum commitment of equipment for EFF consideration. In Garfield County there are two dozers, two water tenders, and five engines. Alternate resources can be negotiated dependent on resources appropriate for the fire. The EFF is a necessary link to FEMA funds; however, federal agencies cannot obligate EFF funds. Since its inception, Garfield County has had a total of 15 fires declared eligible for EFF funding, including such notable fires as Battlement Mesa (1987), South Canyon (1994), and the Coal Seam Fire (2002). Garfield County is second only to Larimer County in total number of Colorado EFF incidents to date.

Wildfire Emergency Response Fund (WERF): This fund, created in 2003 by state statute (C.R.S. 23-30-310), allows state funding for aerial fire suppression resources as well as hand crews. The fund pays for the first load (retardant, water, and/or foam) from a single or multi engine air tanker for a fire on private or state land requested by a sheriff or fire department. A helicopter may be requested instead of an air tanker. In the case of a helicopter, the fund will pay for the first hour of rotor time including the pilot (rarely used in Garfield County due to the BLM Rifle helicopter considered as a mutual aid resource). The fund will not pay for ferry time to bring an aircraft in from out of state, nor will it pay for lead planes, aerial observation platforms, or additional personnel such as helitack crew. WERF will also pay for up to two shifts of a handcrew on a fire. The preference is for use of the State Department of Corrections (DOC) handcrews, although any handcrew will qualify for WERF payment.

All requests by Garfield County agencies for additional resources and assistance beyond the mutual aid period shall be through Garfield County (GARCO) 911 Dispatch Center. Requests for assistance beyond the capabilities of Garfield County shall be made through GARCO 911 Dispatch to the Grand Junction Dispatch Center or through the County Emergency Manager.

Due to new federal fire reporting requirements, the UCRIFMU and NCIFMU will require full size-up information for wildland fires originating on county lands when federal resources are requested for mutual aid. In addition, full size-up information is required when a county resource provides suppression on federal lands without federal resources on scene. Minimal required size-up information includes:

- Latitude/longitude location of point of origin;
- Discovery, initial attack, control and out times;
- Site data to include topography, aspect, slope and elevation;

- Fuel type; and
- Human or natural cause.

DFPC Resources

The DFPC contracts single engine air tankers (SEAT) to provide wildfire suppression support. The state SEATs are pre-positioned throughout Colorado based on fire danger. Garfield County Sheriff may request a state SEAT to be stationed locally. In addition, a State Wildland Inmate Fire Team is stationed in Rifle.

U.S. Forest Service

The USFS is responsible for all fire management activities on National Forest system lands within Garfield County. These lands include parts of the Rifle, Blanco, and Aspen-Sopris Ranger Districts of the White River National Forest. Fire Management on USFS lands is governed by the Federal Wildland Fire Management Policy, as well as the revised Land and Resource Management Plan for the White River National Forest (2002). Included in this plan are the following standards and guidelines for fire management on USFS lands:

- Decisions made concerning vegetation management activities including "no action" will minimize exposure of firefighters and the public to fire hazards.
- All ignitions will receive an appropriate management response (suppression or fire use) according to the White River Fire Management Plan.
- Where feasible and appropriate, utilize prescribed fire to accomplish resource management goals and objectives.
- Minimize ground-disturbing activities associated with fire management actions.
- Fire management activities should be designed to sustain ecosystems including the interrelated ecological, economic, and social components.
- Ignitions in areas covered by specific fire use plans (prescriptions) should be managed to accomplish resource management objectives.
- Fire management on USFS lands in Garfield County is integrated with other federal lands (primarily the BLM) through the UCRIFMU, which are staffed by both USFS and BLM personnel and is dispatched through the Grand Junction Interagency Dispatch Center.

Bureau of Land Management

The Bureau BLM is responsible for all fire management activities on BLM lands in Garfield County. These lands include the Colorado River Valley, Grand Junction, and White River Field Offices. The BLM provides a portion of the staffing of the UCRIFMU and NWCIFMU, as well as the Grand Junction Air Center facility located at Walker Field in Grand Junction. The BLM hosts a fire use module for prescribed fire and wildland fire use events in the UCRIFMU. The BLM also provides a contracted helicopter that is stationed at the Garfield County Regional Airport.

Fire management on BLM lands is governed by the Federal Wildland Fire Management Policy, which directs federal agencies to achieve a balance between suppression to protect life, property, and resources, and fire use to regulate fuels and maintain healthy ecosystems. In addition, each BLM field office has a Fire Management Plan (FMP) that becomes the on-the-ground, operational framework that implements national direction for wildfire suppression, wildland fire

use, fuels treatment, emergency stabilization and rehabilitation, and community assistance/protection programs.

6.1 Garfield County Wildfire Annual Operating Plan

The Garfield County Wildfire AOP sets the standards for operating procedures, agreed policies, and responsibilities to implement cooperative wildfire protection on lands within Garfield County. The AOP operates hand-in-hand with 2007 Garfield County Emergency Operations Plan (EOP). The EOP is an all-discipline, all-hazards plan that provides general guidelines and principals for managing and coordinating the overall response and recovery activities before, during and after major emergencies and disaster events that affect unincorporated areas of Garfield County. The AOP and EOP guidelines are consistent with the standards and principles of the National Incident Management System (NIMS) endorsed by the National Wildfire Coordinating Group (NWCG) and Department of Homeland Security.

6.1.1 Purpose and Scope

The purpose and scope is to provide courses of action; resource mobilization guidelines; and prescribe the responsibilities of local, state, and federal governments in providing for the detection and suppression of wildland fires that occur within Garfield County.

6.1.2 Planning Assumptions

Wildland firefighting will involve mobilizing, providing, managing, and coordinating personnel, equipment, and supplies in the detection and suppression of wildland fires. Successful suppression and extinguishment of wildland fires will require organized interagency cooperation at all levels. Land ownership in Garfield County includes BLM, USFS, Bureau of Reclamation, Department of Defense, state lands, county, municipal, and private. The authority for wildfire suppression activities comes from municipal ordinances, state statutes governing: FPDs, DFPC, Sheriff, and federal laws governing BLM and USFS.

Agreements

- The AOP is a working document compiled each year by the wildfire agencies participating in the Plan, and is attached to and part of the Interagency Cooperative Fire Protection Agreement. The AOP is an agreement between the federal agencies, the State of Colorado, and the County Sheriff.

Policies

- Wildland firefighting operations on all private lands within a FPD in Garfield will be the responsibility of the appropriate FPD. The FPDs are responsible to commence initial attack on any wildland fire within its response jurisdiction. The FPDs will be responsible for all wildland fires (command, operations, logistics, planning, and finance/administration, etc.). In the event a wildland fire exceeds the capability of the district fire chief to manage with his/her own and mutual aid resources, the responsibility for the coordination of fire suppression efforts transfers to the county sheriff. Fires that are not transferred to the sheriff, the state, or any federal agency shall remain the responsibility of the FPDs through containment, control, and mop-up.

- Wildland firefighting operations on state and private lands outside of FPDs will be the responsibility of the Garfield County Sheriff.
- The Sheriff shall have the responsibility for any and all wildland fire response and suppression obligations that are delegated to the Sheriff.
- The incident commander (IC) on scene should be the most qualified firefighter by NIMS standards.
- Mutual Aid from outside agencies may be activated by the IC in consultation with respective agency representatives.
- Out-of-county resources will be activated by the IC. The County Commissioners may declare a disaster and request State assistance.
- Local and State Fire Fighting Forces may be augmented by Federal Agencies.
- All operations will be conducted under the Incident Command System (ICS) and the NIMS.
- Support/Mutual Aid Agencies are responsible for the following:
    - Notifying, activating, and mobilizing all personnel and equipment to perform or support assigned functions as designated within the Basic Plan of this document.
    - Coordination of all actions of the support agency with the primary agency in performing assigned missions.
    - Identifying all personnel and resource requirements to perform assigned missions that are within the support agencies' capabilities.

6.1.3 Concepts of Operations

General

- Wildland firefighting personnel will be needed when a wildland fire has been reported in Garfield County or a valid request has been received from the IC at the scene of a wildland fire.
- Standard ICS will be utilized.
- All emergency operations will be directed by the IC.
- Operations will be handled by standard procedures set forth by the FPD. In the event that an incident is too great in magnitude or duration for the responsible jurisdiction to adequately handle, outside resources will be requested as needed in accordance with the AOP.
- Federal agencies will assume primary responsibility for fires on federal lands. These agencies will typically provide support and/or leadership in the case of an extended incident within Garfield County.

Activation Procedures

After the Garfield County (GARCO) 911 Dispatch Center is notified of a wildland fire the appropriate agencies will be contacted per the GARCO 911 Dispatch Center Standard Operating Procedures.

Mutual Aid Period

Mutual aid wildfire protection has been established county-wide between all fire authorities that operate in the County. It is agreed that there should be no delay in initial attack pending determination of the precise location of the fire, land ownership, or responsibility. County and

state mutual aid resources available from supporting agencies have been identified in the Garfield County Wildfire AOP. The BLM type 3 helicopter stationed in Rifle is considered a mutual aid resource, and if not assigned to another fire, is available without charge to county fire agencies for the mutual aid period (24 hr. after initial report of the fire). Any federal resources positioned within the UCRIFMU are considered mutual aid, with the exception of air tankers, the type 1 helicopter, and smokejumpers. Severity resources are also considered mutual aid.

Garfield County has executed agreements that establish a non-reimbursable initial attack first operational period of time when assistance is provided among Garfield County, FPDs, FFPC, USFS, and BLM. When agencies assist each other, they have agreed to be responsible for costs for their own personnel and equipment for the initial attack operational period from the time the equipment is dispatched.

Mutual Aid means the period of fire suppression from the time of initial report of the fire and ending 24 hours later. The mutual aid period may end earlier by mutual agreement. This non-reimbursable mutual aid period will also apply to any local Incident Management Team (IMT), which may form to provide overhead fire assistance. Aircraft, handcrews, dozers, smokejumpers, and helitack resources are not considered mutual aid.

Staging Areas

The IC shall designate a staging area as soon as possible. The IC will identify to dispatch the location of the staging area, assign a Staging Area Manager and notify dispatch that all resources not given a direct line assignment should report to the staging area.

Resource Order Process

Fire suppression resources from local and mutual aid response agencies include the FPDs, DFPC, UCRIFMU, and NCIFMU. Resources from outside the mutual aid agencies will be requested through Grand Junction Interagency Dispatch Center by the IC either directly or through the GARCO 911 Dispatch Center.

Requests for state and federal fire resources will be made only by those authorized to do so (see list below) either through the GARCO Dispatch or directly to the Grand Junction Interagency Dispatch Center.

Authorized Personnel to Order State and Federal Resources

The list of persons authorized to order state and federal fire management resources in Garfield County includes the following:

- Garfield County Sheriff or Representative;
- Garfield County Emergency Manager;
- Garfield County Commissioners;
- Garfield County FPD's Fire Chief or Authorized Designee;
- DFPC appointed Fire Duty Officer on an active fire being considered for EFF activation; and
- USDA Forest Service or BLM appointed IC (only for federally supervised fires).

This includes, but is not limited to, fixed wing aircraft, rotary wing aircraft, hand crews, strike teams, incident management teams, heavy equipment, engines, and personnel.

Aircraft Request Considerations

The Wildfire Emergency Response Fund (WERF) (C.R.S. 23-30-310) will reimburse the County for the first load of retardant dropped and the first hour of operation by any aircraft (fixed wing or rotary wing) on private and public land wildland fires.

However, other costs associated with air support will be the responsibility of Garfield County. These costs may include:

- Cost of a lead plane;
- Cost of air attack aircraft (in-flight supervisor);
- Travel time to Colorado;
- Cost of ground support personnel, vehicles and fuel;
- Cost of lodging, food and miscellaneous expenses for the pilot and crew; and
- Cost for additional loads of retardant.

It is important to remember that under most circumstances wildland fires that require one drop will require several more.

Special Management Considerations

Mechanized equipment such as bulldozers, graders, etc., are not permitted on federal lands without the express approval of the headquarters agency or district office.

The use of aerial retardants is restricted within 100 feet of lakes, rivers, and live streams on federal lands.

Multi-Agency Coordination Group

The Garfield County Multi-Agency Coordination Group (MACG) aids in establishing priorities among the incidents and associated resource allocations, resolving agency policy conflicts, and providing strategic guidance to support incident management activities. This group is made up of County department heads and outside agency heads with authority to make decisions and commit resources. This will be accomplished through the GARCO Emergency Operation Center (EOC) according to the procedure set forth in the EOP.

7 Wildfire Mitigation

7.1 WUI Mitigation Opportunities

Mitigation objectives ultimately support the overarching goals of enhancing the safety and welfare of the County's residents and emergency responders. The protection of economic and ecological values is a secondary objective. These objectives are achieved by reducing the threat of catastrophic wildfire through strategic vegetation-fuels treatments, reducing structure ignitability, and improving the response and wildfire suppression capacities of the FPDs. Sustaining community outreach through education and public relations efforts are equally important to the mitigation process.

Collaborative planning among UCRIFMU, NCIFMU, DFPC, FPDs, county agencies, and private landowners is necessary for effective wildfire mitigation to occur. The mitigation recommendations presented in the following sections directly address these factors identified through the community hazard and risk assessment process and interviews with the fire authorities.

7.1.1 Wildfire Ignitions

Wildfires will occur in Garfield County (Tables 6 and 7). Natural caused fire ignitions are the most common but human-caused fires also occur. No amount of emergency preparedness will prevent wildfire ignitions. However, a prompt incident response by a fire authority that operates in the county will determine the fate of an ignition, which may be complete suppression or allow the fire to burn under controlled conditions for resource benefits. The most effect way to control a wildfire after its ignition is to manipulate the vegetation—the fuel component of the fire triangle (Figure 3). Air, heat, and fuel are the three requirements for fire ignition. If one of the three components is lacking then fire will not occur.

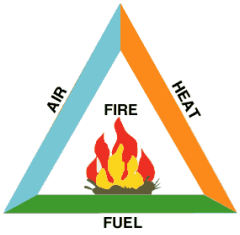


Figure 3. The Fire Triangle

7.1.2 Vegetation-Fuels Mitigation

Mitigation of the fuel component of the fire triangle is usually the most efficient way to reduce the risks of wildfire occurrence. Vegetation-fuel management through such things as tree and shrub thinning or reducing the amount of herbaceous vegetation decreases the chances of fire propagation across the landscape by breaking-up the horizontal and vertical continuity of fuel. This reduces fireline intensity, significantly lowers the risk of structure loss, and creates a safer situation in which to deploy suppression resources.

Vegetation management around homes, structures, and other valued resources to reduce the chances of loss from wildfire is known as defensible space (Appendix F). Effective implementation can greatly reduce or eliminate the need for structure triage or suppression resource assignment in the event of a wildfire incident. Defensible space around a home or adjacent homes on private property is the easiest and most effective fuels treatment to implement on a local scale. Larger treatments that involve multiple property owners or public lands become more complex to implement, although results may have a broader positive effect for the entire community are known as fuelbreaks (Appendix G). A fuelbreak is a natural or manmade change in the vegetation-fuel characteristics, which affects fire behavior so that fires burning into them can be more readily controlled.

7.2 Completed Vegetation-Fuel Projects

The BLM, USFS, and CSFS have been active in vegetation-fuels management since 2003 with the goal to protect important values in Garfield County and reduce the chances of catastrophic wildfire (Table 22, Map 9). The vegetation-fuel treatments conducted by the BLM, USFS, and CSFS included mechanical treatments, prescribed fires, herbicide applications, and wildland fires for resource benefits to develop fuelbreaks, defensible space around structures, and to reduce the amounts of hazardous fuels at specific locations.

Table 22. Vegetation-Fuel Projects Completed in Years 2003−2009

Agency	Acres	Treatment
CSFS	150	Fuelbreak, defensible space
BLM	15,474	Mechanical, chemical, prescribed fire
USFS	129,969	Mechanical, chemical, prescribed fire, wildland fire for resource benefit

Source: BLM & CSFS

The fuel treatments conducted on federal lands occurred within oak brush, grass, mountain brush, pinion-juniper, sagebrush, and aspen vegetation types (Table 23). All these vegetation types except for the aspen stands are known to carry fire across the landscape and to be conducive to catastrophic fire behavior. Aspen stands are usually a fire deterrent because of their high water content within the plants. Vegetation treatments, within the aspen stands, would improve stand vigor and wildlife habitat.

The discrepancy of 121,596 acres on USFS lands as reported in Tables 22 and 23 results because wildland fire for resource benefit was employed on some wildfires to achieve vegetation-fuels

management objectives but these fires were not considered pre-planned fuel treatments. Wildland fire for resource benefit occurs when a naturally-ignited wildfire is allowed to burn under carefully controlled conditions to accomplish pre-defined specific resource management objectives.

Table 23. Vegetation-Fuel Projects Completed on BLM and USFS Lands

Vegetation Type	Treatment (Acres)		
	Chemical	Mechanical	Prescribed Fire
BLM			
Mountain shrub	74	1,672	1,267
Oak brush	9	79	11,058
Pinion-juniper	0	83	85
Pinion-juniper & sagebrush	0	1,070	0
Sagebrush & mountain shrub	0	78	0
Totals	74	2,982	12,410
USFS			
Oak/shrub	0	0	3,576
Oak/shrub	0	6	0
Oak/shrub, aspen	0	0	3,179
Oak/shrub, pinion-juniper	0	500	0
Pinion-juniper	0	94	0
Grass	0	0	1,024
Totals	0	594	7,779

Source: BLM and USFS

7.3 Proposed Vegetation-Fuel Projects

The FPDs, BLM, and USFS need to work together to reduce hazardous fuels throughout the County. Active vegetation-fuels management to reduce fire risks can improve forest and rangeland health, protect water quality, and improve wildlife habitat diversity. Unfortunately actual application of these beneficial management projects is limited because of budget constraints from the national to the local county level. With limited resources, supported projects need to be well defined and address multiple goals and objectives. Collaborative planning is essential to maximize resource benefits from implemented vegetation-fuel projects.

Possible vegetation-fuel management projects were identified through the WUI community risk assessments and interviews with the Garfield County fire authorities (Table 24). The various fuels treatment includes defensible space, fuelbreaks, vegetation mowing along roads, and overall improved vegetation management to achieve desired results such as improving the FRCC of vegetation (Table 13). The lead organization is the responsible party to initiate and organize efforts to carry out the fuel treatment. The purpose of the priority rating of high, moderate, or low

is to identify the importance of the fuel treatment to protect infrastructure. The priority rating does not necessarily mean that the fuel treatments need to occur in a set order. Defensible space has a high rating because that is the primary and fastest way for homeowners to protect their homes and other structures. Fuelbreaks associated with communities were ranked by the FPDs based on the type and amount of vegetation-fuel that poses a hazard to the community. The goal of vegetation management is to conduct practices that will bring the plant communities in line with their historic vegetation structure and fire regime (FRCC I). Two examples of vegetation management to improve FRCC classification are to reduce the dominance of cheatgrass in sagebrush plant communities and to reduce tree density in pinion-juniper overstocked stands.

Table 24. Proposed Vegetation-Fuel Projects

Wildland-Urban Interface	Fuel Treatments (Priority)	Lead Organization
Burning Mountains	▪ Defensible space around homes and out buildings	▪ Landowner
	▪ Fuelbreak Lakota areas, east side of Faas Ranch Road (#18 on Map 9)	▪ FPD
	▪ Fuelbreak at tow slope east of schools and water tank on USFS land near Castle Valley Ranch road (#19 on Map 9)	▪ FPD
	▪ Fuelbreaks Hidden Valley and Elk Run area (#20 on Map 9)	▪ FPD
	▪ Fuelbreak and tree thinning Elk Creek Campground (#21 on Map 9)	▪ FPD
	▪ Tree thinning on Elk Creek road near 1700 area (#22 on Map 9)	▪ FPD
	▪ Tree thinning and fuelbreaks near 3724-3768 on Harvey Gap Road (#23 on Map 9)	▪ FPD
	▪ Firewise developing for future subdivision off of Harvey Gap Road (#24 on Map 9)	▪ FPD
	▪ Tree thinning along Hodien Dr (#25 on Map 9)	▪ FPD
	▪ Tree thinning and fuelbreaks in Ram Lane area (#26 on Map 9)	▪ FPD
	▪ Defensible space around water tanks north of Silt (#27 on Map 9)	▪ FPD
	▪ Fuelbreaks in Mineota estates area (#28 on Map 9)	▪ FPD
	▪ Fuelbreaks along Divide Creek road (#29 on Map 9)	▪ FPD
	▪ Fuelbreaks along Middle Elk Creek road (#36 on Map 9)	▪ FPD
	▪ Mowing vegetation along roads	▪ State, county, and private landowner
	▪ Manage FRCC II and III vegetation to FRCC I	▪ BLM, USFS, private landowner
Carbondale & Rural	▪ Defensible space around homes, outbuildings and structures (high)	▪ Landowner
	▪ Huebinger Drive fuelbreak (#35 on Map 9) (moderate)	▪ FPD
	▪ Road vegetation mowing (moderate)	▪ State, county, private landowner
	▪ Manage FRCC II and III vegetation to FRCC I (low)	▪ BLM, private landowner
De Beque	▪ Defensible space around homes and out buildings (high)	▪ Landowner
	▪ Kimball Mountain fuelbreak (#1 on Map 9) (high)	▪ BLM
	▪ Mow vegetation along roads (moderate)	▪ State, county, private landowner
	▪ Manage FRCC II and III vegetation to FRCC I (low)	▪ BLM, USFS, private landowner
Lower Valley	▪ Defensible space around homes and out buildings (high)	▪ Landowner
	▪ Continue wildland fire for resource benefit practice (high)	▪ BLM and private landowner

Wildland-Urban Interface	Fuel Treatments (Priority)	Lead Organization
	▪ Mow vegetation along roads (moderate) ▪ Manage FRCC II and III vegetation to FRCC I (low)	▪ State, county, private landowner ▪ BLM, USFS, private landowner
Glenwood Springs	▪ Defensible space around homes and out buildings (high) ▪ Four Mile fuels reduction as described in Glenwood Springs FPD CWPP (#30 on Map 9) (high) ▪ Mountain Springs/Three Mile fuels reduction as described in Glenwood Springs FPD CWPP (#31 on Map 9)work to date includes defensible space around 6-8 homes, mowing of vegetation along roads on the north side of the subdivision, and second egress has been created, BLM/CDPW are discussing a fuelbreak and helicopter dipping site (high) ▪ Complete the Glenwood Adventure Park 40 acre fuel reduction project spring 2012 as described in Glenwood Springs FPD CWPP (#32 on Map 9) (high) ▪ Midland fuels reduction as described in Glenwood Springs FPD CWPP (#33 on Map 9) is being reviewed by the UCRIFMU (high) ▪ Canyon Creek fuel reduction north of subdivision, fuelbreak along irrigation ditch southwest of subdivision #34 on Map 9 (High) ▪ Mow vegetation along roads (moderate) ▪ Manage FRCC II and III vegetation to FRCC I (low)	▪ Landowner ▪ FD ▪ FD ▪ FD ▪ FD ▪ FD ▪ State, county, private landowner ▪ BLM, private landowner
Grand Valley	▪ Defensible space around homes and out buildings (high) ▪ Defensible space around Parachute Water Treatment Facility (#5 on Map 9) (high) ▪ Fuelbreaks on slopes below communities such as Morrisania Mesa, Holmes Mesa, and Battlement Mesa, (#2,3,4 on Map 9) (high) ▪ Fuelbreak on hill slopes south of Rulison (#6 on Map 9) (high) ▪ Mowing vegetation along roads (moderate) ▪ Manage FRCC II and III vegetation to FRCC I (low)	▪ Landowner ▪ Town of Parachute, FPD ▪ Landowner, FPD ▪ Landowner, FPD ▪ State, county, and private landowner ▪ BLM, USFS, private landowner
Gypsum	▪ Defensible space around homes and out buildings (high) ▪ Shaded fuelbreaks along County Roads 150 (#37 on Map 9) and 151 (#38 on Map 9) (moderate) ▪ Manage FRCC II and III vegetation to FRCC I (low)	▪ Landowner ▪ FPD ▪ BLM, USFS, private landowner
Rifle	▪ Defensible space around homes and out buildings (high) ▪ Mowing vegetation along roads (moderate) ▪ Fuelbreak for Porcupine Creek Subdivision (#7 on Map 9) (high) ▪ Fuelbreak for Beaver Creek Manor (#8 on Map 9) (high) ▪ Fuelbreak for Red Apple area (#9 on Map 9) (low) ▪ Fuelbreak for River Village (#10 on Map 9) (moderate) ▪ Fuel management Grass Mesa area (#11 on Map 9) (high) ▪ Fuelbreak for Cedar Springs (#12 on Map 9) (moderate) ▪ Fuelbreak for Teepee Bible Camp (#13 on Map 9)	▪ Landowner ▪ State, county, and private landowner ▪ FPD ▪ FPD ▪ FPD ▪ FPD ▪ FPD ▪ FPD ▪ FPD

Wildland-Urban Interface	Fuel Treatments (Priority)	Lead Organization
	(moderate) ▪ Fuel reduction along Rifle Creek in Rifle (#14 on Map 9) (moderate) ▪ Fuelbreaks around multiple subdivision north, west, and east of Rifle (#15 on Map 9) (moderate) ▪ Fuel treatments around Rifle Estates and Upper Rifle Creek drainage (#16 on Map 9) (high) ▪ Fuelbreak for Jewell (#17 on Map 9) (high) ▪ Mow vegetation along roads (moderate) ▪ Manage FRCC II and III vegetation to FRCC I (low)	▪ FPD ▪ FPD ▪ FPD ▪ FPD ▪ State, county, and private landowner ▪ BLM, USFS, private landowner
Areas Outside of FPDs	▪ Defensible space around homes and out buildings (high) ▪ Mow vegetation along roads (moderate) ▪ Manage FRCC II and III vegetation to FRCC I (low)	▪ Landowner ▪ State, county, and private landowner ▪ BLM, USFS, private landowner

Source: FPD fire chiefs

Map 9 illustrates the various vegetation-fuel projects that are planned for future years. These proposed projects are not all-inclusive. Other projects may be warranted with appropriate scoping. It is recognized that opportunities may arise to complete hazard mitigation projects in addition to these proposals, outside of recognized WUI areas. Additional project proposals will be evaluated as they arise, and may be eligible for implementation funding.

The green dots on Map 9 represent 38 different vegetation-fuel treatments areas identified by the FPDs to protect communities and other WUI values from wildfire. The treatment acres and treatment methods will need to be fully defined as the treatment plan is finalized for each project. The numbers associated with each fuelbreak or thinning project in Table 23 corresponds to the numbered green dots on Map 9.

The land ownership profile in Garfield County is dominated by USFS and BLM (Map 1). As such, these federal agencies need to be major participants in vegetation-fuel management to reduce wildfire hazards. The USFS and BLM are in the planning stages to identify future vegetation-fuels projects. The USFS is in the preliminary stages of planning and they have not identified specific areas for vegetation-fuel treatments for the out years. The BLM has identified potential vegetation-fuel projects on 97,588 acres in Garfield County to be conducted in future years (Map 9). The projects are located in or in close proximity to the Lower Valley, De Beque, Rifle, Burning Mountains, Glenwood Springs, and Carbondale WUIs. These projects would be implemented in various vegetation types using prescribed fire, mechanical methods, and chemical treatments. The project goals would reduce hazardous loads for the protection of human welfare, and to shelter important economic and ecological values through the management of FRCC II and FRCC III vegetation to FRCC I vegetation.

The Colorado Parks and Wildfire (CPW) is a state agency that could support vegetation-fuels projects through its Habitat Partnership Program (HPP). The purpose of the HPP is to minimize wildlife conflicts between livestock forage, agriculture crops, and to assist the agency in meeting management goals. One way to minimize big game conflict is by increasing forage availability through wildlife habitat improvements. The HPP is authorized by the State Legislature and the Colorado Wildlife Commission. Financial support for these projects is derived from the sale of

big game hunting licenses and cost sharing with landowners. An important aspect of the HPP is big game habitat improvement through brush control, prescribed fire, seeding, fertilization, and grazing management. The CPW is considering the implementation of about 30 HPP projects on approximately 216,037 acres of forest and rangeland throughout the County (Map 9). These projects that are in the preliminary stages of planning could also be targeted through collaborative planning with FPDs, BLM, USFS, and private landowners to reduce hazards fuels in addition to improving big game habitat. These projects would be implemented in various vegetation types using prescribed fire and mechanical methods coupled with the seeding of desirable forage species. The project goals would be to improve big game habitat and reduce hazardous fuel loads. The implementation of the HPP and BLM projects coupled with the creation of defensible space around homes, and the FPD identified projects to protect communities should greatly decrease the chances of wildfire loss in Garfield County.

7.4 Vegetation-Fuels Mitigation Strategies

Collaborative planning among fire authorities, state and county agencies, and private landowners is essential to plan and implement successful vegetation-fuel projects.

7.4.1 Gain and Maintain Momentum through Public Education

The most effective means to initiate action is through community education and public outreach. An annual community meeting in the spring can spur action on the part of communities and individuals. This can be a forum for presentations by experts and allow for coordination of "cleanup" efforts within the community. Firewise materials and postings should be made available to the public at each fire station, post office, community meetings, and elementary school on a regular basis. A disposal method for yard waste should be coordinated every spring. This may be coordinated with community spring cleanup activities and may include the a central disposal site, mobile chipping services, or a hauling service. The conservation districts could be highly effective in organizing these activities.

An example would be the scheduling of an annual "Slash Day," taking place every first Saturday of October. A community, HOA, or neighborhood would hire a contractor to chip the slash stacked in front of each residence. Each landowner would pay for the time it took to chip their slash with the equipment and scheduling costs would be distributed among all participating landowners.

Community and stakeholder involvement is a critical component of developing a successful CWPP, but the same is true implementing, sustaining, and monitoring the plan over time. It is important to maintain momentum within the community after the CWPP is completed. Ongoing supporting actions also include grant application efforts, county statutes review, AOP and EOP review and updates, pre-suppression planning, resource mapping updates, and ongoing collaboration and planning with neighboring agencies and jurisdictions.

7.4.2 Defensible Space and Structural Ignitability

The use of fire safe building materials such as a Class A fire resistant roof and reducing vegetative fuels that surround homes are key to reducing structure ignitability. However, completely fireproof structures can be prohibitively expensive. Conversely, trying to provide a defensible space large enough for a typical, combustible structure may not be practical because

fire brands are known to be carried by winds for over a mile away from a fire. Choosing a combination of these two strategies may be the best alternative for a particular site. The purpose of the defensible space is to reduce the amount of fuel in close proximity to the home and provide a space for firefighters to protect the home (Appendix F).

Research has demonstrated that homes with a Class A rate roof and a defensible space have about a 85 percent chance of surviving a wildfire. The Class A rated roof protects the home from firebrands that may blow onto the roof from a nearby wildfire. Firebrands have been observed to be carried by the wind for distances of over a mile. The structural integrity of the house can also be improved by using fire resistant siding and other building materials. The wooden decking, in particular, should be avoided because it can be a significant source of home ignitions much like wood roofing material.

The 1996 County Wildfire Mitigation Plan establishes criteria for effective wildfire hazard reduction and provides a basis for home and property inspection. County criteria are consistent with CSFS guidelines as set forth in *Creating Wildfire Defensible Zones,* Bulletin No. 6.302 (Dennis 2003). For current homeowners, the Wildfire Mitigation Plan outlines common sense practices for creating defensible space on a voluntary basis.

The County Wildfire Mitigation Plan was developed in order to address the increasing hazards associated with the spread of development into the less accessible and more heavily forested areas of the county. Currently, the county has no requirements for Firewise construction or defensible space. However, the creation of defensible space in the county's building packet is referenced. A recommendation is that the county adopts a uniform WUI building code.

Establishing a Defensible Space

The document Creating *Wildfire Defensible Zones,* Bulletin No. 6.302 (Dennis 2003) provides guidelines for creating a defensible space (Appendix F). To develop the most effective defensible space plan possible, the property is evaluated and divided into 3 Zones (Figure 5).

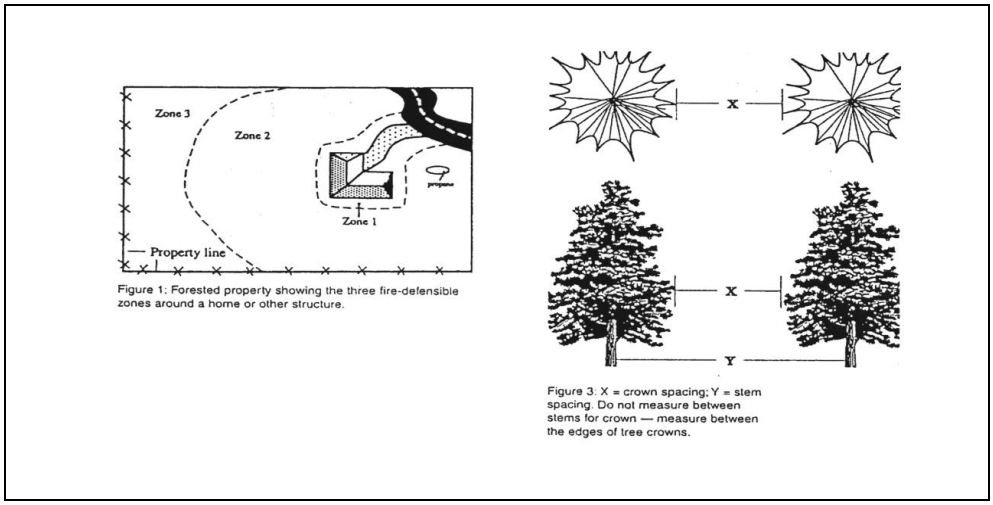


Figure 1: Forested property showing the three fire-defensible zones around a home or other structure.

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

Figure 4. Defensible Space Guidelines and Standards (Dennis 2006)

Zone 1 is the defensible space area immediately adjacent to the structure and the driveway. This

area is where the greatest modification of thinning and cleanup will occur. 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.

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. Trees and large shrubs should be thinned 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. On steep slopes, allow more space between tree crowns. Remove all ladder fuels from under the remaining trees. Carefully prune trees to a height of 10 feet.

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

Locate propane tanks at least 30 feet from any structures, preferably on the same elevation as the house. Flammable vegetation should be cleared within 10 feet of these tanks. Under no circumstances should propane tanks be screened with shrubs or vegetation.

Dispose of slash (limbs, branches, and other woody debris) removed from trees and shrubs through chipping or by piling and burning. Contact the local FPD, CAPCD, or the sheriff's office in unincorporated Garfield County for information about burning slash piles. Only if neither of these alternatives are possible, lop and scatter slash by cutting it into very small pieces and distributing over the ground. Avoid heavy accumulations of slash; lie close to the ground to speed decomposition. If desired, no more than two or three small, widely spaced brush piles may be left for wildlife purposes. Locate these uphill towards the outer portions of the defensible space.

Zone 3 is the area of existing forest from the edge of Zone 2 out to the property boundaries. Traditional forest management in this area will target dead, diseased, and damaged trees allowing continued health of the surrounding forest and the property's aesthetics.

The following are important considerations concerning defensible space:

According to the NWCG, defensible space is defined as a fuelbreak adjacent to infrastructure, in which you can safely defend it. In order for a structure to survive a wildfire, radiated heat and fire

intensity must be kept to a minimum. This is accomplished by a combination of clearing and thinning trees and other vegetation around the proposed or existing structures, and along the driveway. Defensible space requirements are designed to minimize the impact to the property while still providing safety for the structures, the inhabitants, and the firefighters.

Trees and shrubs are selected for removal by considering the crown spacing, flammability of the tree or shrub, plant health, and topographical characteristics of the property. As a fire grows in intensity, it can move into the crowns of shrubs and trees, and by a heat transfer mechanism known as convection, rapidly move up slope and down wind. A crown fire can outrun the surface fire and cause ground fires to start as it passes. The crown spacing must then be wider closer to the home and can be narrower as the distance from the home increases. Smaller trees and diseased trees will be selected first. The homeowners' selection of "special" trees, for screening and aesthetics, can be considered and worked around whenever possible.

The area immediately adjacent to the home is for defensible space is 3 to 5 feet wide. If the home is sided with flammable material, it is advised not to plant any trees, shrubs, or flammable ground cover in this area. If non-combustible siding is used, widely spaced shrubs are acceptable but should not be planted under windows or next to vents. From this zone, extending out away from the home, crown spacing decreases gradually and additional lower branches are allowed to remain.

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/pages/wildfire.html. 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. 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.

Some more important but often overlooked items of defensible space include:

- Posting signs for quick address identification, designated emergency vehicle parking areas, and bridge load limits;
- Routine maintenance of the defensible space;
- Annually clearing of debris from roof and gutters;
- Removal of branches overhanging the chimney;
- Outdoor water supply availability complete with hose and nozzle;
- Fire extinguishers are checked and in working condition;
- Storing tools, such as rakes, hoes, axes, and shovels in an easily accessible area for use in case of a fire;
- Practicing family fire drills and fire evacuation plan. Assembly areas should be open with good visibility all around. Meadows, rock outcrops, and wide roads are good examples;
- Proper screening of attic, roof and eave openings, and proper skirting, screening or enclosing the sides of stilt type foundations;
- Replacing flammable decking materials where feasible. Wooden decking is a major source of home ignition during wildfires;
- If time allows, as the wildfire approaches, covering window shutters or heavy draping and moving furniture to the center of rooms; and

- Monitoring structures after a fire for smoldering embers that may have lodged in crevices of the roof and siding.

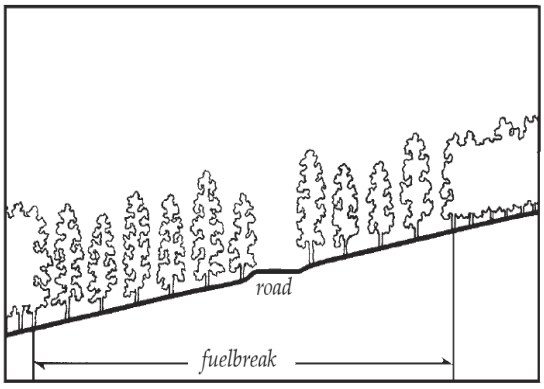
7.4.3 Community Access and Evacuation

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.

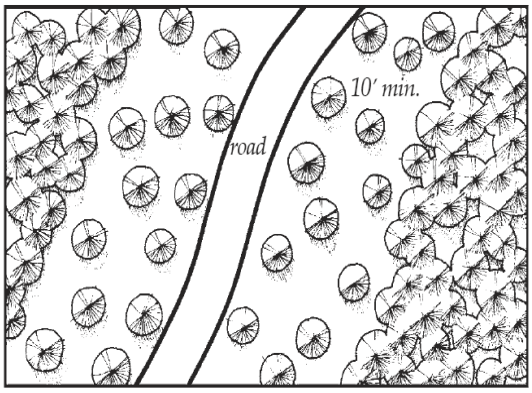
Road improvements to primary or secondary evacuation routes may be as straight forward as seasonal grading, constructing or improving turnarounds at dead ends, widening a particularly tight switchback, or improving a section of road that would not support fire access.

7.4.4 Fuelbreak

A fuelbreak occurs where trees and shrub density has been reduced to break-up horizontal and vertical fuel loads (Figure 5, Appendix G). Fuelbreaks are proposed for around numerous communities to provide a degree of protection from wildfire and a few roads. Reducing the amount of vegetation-fuel in close proximity to communities and along access roads enhances the effectiveness of the physical canopy break the road provides, as well as critical safety factors along likely evacuation and incident access routes. This creates a safer emergency ingress/egress scenario while greatly aiding potential tactical suppression efforts. Fuelbreaks can be created by harvesting dead, diseased and malformed trees and shrubs; removing ladder fuels; and sufficiently thinning trees and shrubs so that there is approximately 10 to 15 feet between plant canopies.



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



Plan view of fuelbreak showing minimum distance between tree crowns.

Figure 5. Diagram of a Fuelbreak (Dennis not dated)

7.4.5 Strategic Shrub and Forest Thinning

Thinning recommendations may also target shrub and forest stands posing a specific wildfire hazard to communities or other important values. Strategically placed fuelbreaks may be designed with fuelbreak characteristics or as a fuel-free buffer zone for more aggressive fuel reduction. Strategically place 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 vegetation 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, pile burning is often the only feasible option for the removal of slash.

Because treatment areas may span multiple ownership boundaries, planning, and coordination with landowners and public agencies is essential. In Garfield County, these areas are typically located on federal land and would require full review by BLM and USFS fire and project planners as well as NEPA assessment. Fuel treatment recommendations on federal land are an important component of this CWPP as the process was designed to help influence where and how federal agencies implement fuel reduction projects on federal lands and how additional federal funds may be distributed for projects on non-federal lands.

7.5 Vegetation-Fuel Treatment Options

The development of defensible space around structures and fuelbreaks around communities can be accomplished using a variety of means and equipment. 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 (Table 25). Vegetation-fuel treatment costs can vary tremendously based on project complexity, but generally run $300 to $1,200 per acre depending upon:

- Type of vegetation-fuel;
- Size of trees or shrubs;
- Acreage of project;
- Steepness of slope;
- Density of fuels;
- Disposal of slash;
- 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 is recommended.

Table 25. Vegetation-fuel Treatment Alternatives and Costs

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 opportunity 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 (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.

7.6 Project Support

This section provides information on resources that may 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 fuel reduction on both private and public lands. Possible sources for grant funding include:

CSFS Assistance Programs – Communities and Agencies:

- Cooperators, communities, organizations, agencies – apply through DFPC Offices;
- Applications received and approved during the identified funding windows;
- Matching expenses or in-kind activities by applicants are generally required; and
- Applications for activities listed in current CWPPs are normally ranked highest for funding:

1. **WUI Incentives** – WUI 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** (DFPC/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 the 2nd year following award; subject to continued funding through Colorado Legislature.
4. **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. For assistance in grant writing visit: http://www.theideabank.com/freeguide.html.

One of the major issues confronting defensible space and hazardous fuels mitigation is the need for ongoing maintenance. Treatment projects in timber or shrub fuels have an effective life span of approximately 10 to 15 years before vegetation regeneration once again creates hazardous fuel loads. In addition, defensible buffers and fuelbreaks mowed in grasslands are beneficial only for one growing season.

7.7 Improving Wildfire Response Capacity

Improving FPD response time and capacity in the county is an effective way to protect economic and ecological values from wildfire (Table 26). Vegetation-fuels mitigation and improving FPD response capacity go hand-in-hand. The resources and training needs were identified by each of the FPDs. Common resource needs across all FPDs include identifying and mapping water drafting sites, developing FPD specific CWPPs, public Firewise education, and FPD maintenance of wildfire training certificates. In addition, action items that apply countywide include adopting a WUI building code to promote Firewise home construction, redrawing FPD boundaries so that all areas in the county are included in FPD, and Firewise community outreach which needs to occur on a continual basis.

Table 26. Recommended Fire Protection District Resources and Training Needs

Fire Authority	Resources Needs	Training Needs
Burning Mountains	▪ Strategically locate 10,000-g buried water tanks in Elk Creek, Dry Hollow, Divide Creek, Silt Mesa ▪ Develop year around drafting sites through the FPD ▪ Map all current drafting sites ▪ Obtain fuels treatment equipment such as a hydro-axe, brush hog, and chipper ▪ Certify bridge weight limits on	▪ Annual NWCG wildfire training ▪ Require NWCG FFT2 certification including pack test ▪ Encourage NWCG certification at the FF1 and higher levels such as crew boss and engine boss

Fire Authority	Resources Needs	Training Needs
	critical bridges such as on Elk Road, Divide Creek, and Garfield Creek ▪ Improve road and address signage as needed ▪ Develop automatic aid agreements for certain response areas for all sides of District ▪ Develop FPD specific CWPP ▪ Community Firewise training	
Carbondale	▪ County Road 112 needs 10,000 g buried water tank ▪ Develop and alterative evacuation route for West Bank Mesa ▪ Obtain a 1800-g tactical tender for Station 85 ▪ Obtain a Type 3 engine for Station 81 ▪ Create Spring Valley Ranch FPD ▪ Firewise community outreach	▪ Annual NWCG wildfire training ▪ Maintain current NWCG certifications
De Beque FPD	▪ Cell phone tower at the end of Kimball Mountain Road ▪ Maintain good communication with oil companies ▪ Firewise public outreach ▪ Develop FPD specific CWPP	▪ Annual wildfire training ▪ Maintain current NWCG certifications ▪ Encourage FFT2 to certify at FFT1
Glenwood Springs Rural	▪ Develop water sources such as drafting sites or buried 10,000-g tanks as appropriate in Chelyn acres, Upper Mitchell Creek Road, Three Mile Creek Road, and County Road 132 ▪ Develop alternative evacuation routes for those areas with only one way in and out ▪ Firewise community outreach	▪ Annual NWCG wildfire training ▪ Maintain current NWCG certifications ▪ WUI wildland firefighting and incident command training
Grand Valley FPD	▪ Water tanks and cisterns located in eastern part of district ▪ Water tanks and cisterns located up County Road 215 near Guard Shacks ▪ Develop ability to draft water from dam at top of County Road 215 ▪ Upgrade equipment to match USFS/BLM equipment ▪ Repair roads as needed to improve response times ▪ Post weight limit signs on bridges and culverts where needed ▪ Improve addressing to actual locations ▪ Pre-plan WUI response areas ▪ Develop mutual aid agreements with other counties ▪ Develop automatic aid agreements for certain response areas for all sides of District ▪ Firewise public outreach ▪ Develop FPD specific CWPP	▪ Annual NWCG wildfire training ▪ Maintain current NWCG certifications ▪ Require part-time employees to be at least NWCG FFT2 certified

Fire Authority	Resources Needs	Training Needs
Gypsum	▪ Develop strategic water sources County Roads 150 and 151 ▪ Road improvements as appropriate ▪ Develop backup evacuation route for Sweetwater residents ▪ Firewise community outreach	▪ Annual NWCG wildfire training ▪ Maintain current NWCG certifications ▪ Encourage FFT2 to certify at FFT1
Lower Valley FPD	▪ Additional water sources – Red Cliff Mine will be a water source ▪ Maintain good communication with oil companies on wildfire issues ▪ Improve State Road 139 in Douglas Pass ▪ Firewise public outreach ▪ Develop FPD specific CWPP	▪ Annual NWCG wildfire training ▪ Maintain current NWCG certifications
Rifle	▪ Determine the need to identify more water sources ▪ Firewise public outreach ▪ Develop FPD specific CWPP	▪ Annual wildfire training ▪ Maintain current NWCG certifications ▪ WUI training for line firefighters, NWCG 215 class
Countywide−All FPDs (excluding Grand Valley FPD)	▪ Develop one or more wildfire specific wildfire crews and staff them during the fire season ▪ Develop and adopt by ordinance county wide WUI building standards or adopt the International Wildland Urban Interface Code ▪ Redraw each FPD boundary so that all areas of the county are within in a FPD ▪ Create a new wildland fire specialist position to handle non-wildfire firefighting projects like vegetation-fuels treatments, community outreach, mapping of high hazard home areas, coordination with all fire authorities ▪ Community Firewise outreach and encouragement to develop defensible space	▪ Not applicable

Source: FPD fire chiefs

8 Source Water Protection

The 1996 Amendments to the Safe Drinking Water Act directed states to develop a Source Water Assessment and Protection Program (SWAPP). The Colorado SWAP is administered by the CDPHE. The SWAPP encourages communities to be actively involved in strategies to ensure public drinking water sources are protected from all kinds of contamination. A source water protection plan (SWPP) is a tool to help ensure communities collect high-quality drinking water from surrounding watersheds. The steps in the SWPP process includes the delineation of the source water protection area (SWPA), an inventory of potential sources of water contaminants, a prioritization of those potential contaminant sources based on the volume of release, the likelihood of release, the proximity of the source waters, and the health hazard.

The inherent activities of wildland fire management are potential sources of source water contamination even though these actions are intended to protect human welfare, economic values, and ecological values. Vegetation-fuel treatments, wildfire suppression activities, and burned areas are potential sources for source water contamination. The types of potential contaminants delivered to surface waters resulting from vegetation-fuel projects depend on the type of treatment. For example, mechanical treatments may increase sediment loads to surface waters from soil-surface disturbances. Vegetation herbicide treatments could result in chemical contamination of surface waters. Prescribed fire may increase sediment and ash flows into surface waters. Wildfire suppression sources of contaminants may include increased sediment, debris, and ash flows into surface waters. The fire burned area or scar may also result in increased sediment, debris, and ash flows into surface water until vegetation is re-established. Burned areas can be especially susceptible to accelerated erosion from subsequent precipitation events for years after fire suppression. The degree of contamination would be a function of the size of the affected area, distance to surface water, remaining vegetation cover, terrain, soil erosion potential, subsequent precipitation, and management action taken to minimize impacts.

Several actions can occur to reduce the risks of source water contamination from wildland fire activities. BLM and the USFS would need to follow their fire management plans and resource management plan stipulations with regards to vegetation-fuel

management, fire suppression, and post-fire stabilization. Private landowners should work with the CSFS, conservation district, or NRCS to address ways to protect water sources from wildland fire management on their properties. Additional caution such as installing erosion control devise around source water intake may be necessary during and after any wildland fire management activities. Each source water intake will need to be evaluated to identify actions needed to provide protection from wildland fire contaminants.

An important step in the SWPP process is the delineation of SWPAs. A SWPA is the watershed headwaters and streams that provide public water supply to the water intake source. The SWPA is then further defined based on community values and management issues. The SWPA is important because it is the area that requires priority protection from potential contaminates such as wildland fire management activities. A SWPA for a community may occur on both public and private lands.

Garfield County is working with 12 communities to develop SWPPs. The communities are Canyon Creek Estates, Colorado Mountain College – Spring Valley, Glenwood Springs, King's Row HOA, Mitchell Copper Ditch Pipeline, New Castle, Rifle, Parachute, Silt, Talbott Enterprises Inc., Westbank Mesa HOA, and Westbank Ranch HOA. There are 123,910 SWPA acres that have been delineated in the County with 81,629 acres occurring within a designated WUI (Map 10, Table 27).

Table 27. Source Water Protection Area within a Fire Protection District and Wildland Urban Interface

Fire Protection District	Source Water Protection Area (Acres)	Source Water Protection Area within the Wildland Urban Interface (Acres)
Burning Mountains	47,831	38,495
Carbondale & Rural	3,283	1,974
Glenwood Springs	6,734	6,734
Grand Valley	18,765	9,324
Rifle	25,102	25,102
County	22,192	0
Total	123,907	81,629

Garfield County watersheds provide water for such uses as culinary, irrigation, agriculture, recreation, and industry. However, the SWPP focus is on drinking water. Because of the high probability of wildfire occurrence in the County, which dictates the need for vegetation-fuel treatments, watershed health and water quality are at risk to impairment and contamination from wildfire. A recommendation is for the County to develop a Critical Community Watershed Wildfire Protection Plan (CCWWPP) as part of the SWPPs to identify watersheds that are important to source water protection and at risk to wildfire. The CCWWPP is similar in nature to the CWPP but its emphasis is on watershed protection and not the WUI. The CCWWPP can be downloaded from http://www.colorado.gov by searching on "Critical Community Watershed Wildfire Protection Plan".

The Front Range Watershed Wildfire Protection Working Group developed a strategy to identify

and rank watersheds importance to source water protection and evaluate the risks of catastrophic wildfire occurrence. Their approach would also be applicable to the ranking of Garfield County watersheds as to their importance for source water protection from wildfire.

The Working Group methodology uses wildfire hazards, flooding or debris flow risk, soil erosion potential, and water use rankings to develop a composite score. The composite score categorizes watershed risk to wildfire damage from low to very high. The watershed comparative analysis can then be used to develop appropriate management plans compliant with the level of watershed risk. Initial attack strategies and/or vegetation-fuel treatments could be employed to reduce the potential for watershed damage from loss of vegetation cover and soil surface disturbance. Also, appropriate post-fire response plans could be put in place prior to a wildfire incidence that would identify specific treatments and locations that need to occur to protect streams and reservoirs from contamination. Such treatments could include emergency stabilization in strategic locations such as highly erosive soils and sediment control devices along critical streams and around reservoirs.

9 Monitoring and Evaluation

9.1 Community Wildfire Protection Plan Adoption

The Garfield County CWPP is a strategic planning document that is developed and approved by the planning team. An important component of the development process includes a CWPP implementation team that will move the plan forward, implement the mitigation recommendations, and maintain the plan as the characteristics of the eight WUI areas change through time and vegetation-fuel projects are completed. Organizing and maintaining the implementation team are often the most challenging components of the CWPP process. The implementation team is essential in the process of converting the CWPP proposed projects from a plan into action items. A recommendation is that the CWPP planning team transition into the CWPP implementation team.

The implementation team would work closely with the FPDs, community organizations, private landowners, and public agencies to coordinate and implement the identified vegetation-fuels treatments and other recommended mitigation actions. Semi-annual meetings should occur to move the CWPP forward. Building partnerships among community organizations, FPDs, local governments, BLM, USFS, 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 communities and home-owner associations to take an active role in identifying needs, developing strategies, and implementing solutions to address wildfire hazards and risks by assisting with the development of local community wildfire plans and participating in fire prevention activities.

The Garfield County CWPP is a valuable resource that provides the foundation for understanding wildfire risks and hazards, and presents attainable milestones designed to reduce potential losses from wildfire. Communities, home-owner associations, and FPDs can take further action by developing their own CWPP, which would tier to the countywide CWPP.

9.2 Sustaining CWPP Momentum

The Garfield County CWPP serves as the foundation to develop safer WUIs through hazard assessments and strategic planning focusing on reducing the threat of wildfire to human welfare, and economic and ecological values. The mitigation strategies outlined in this plan will greatly reduce wildfire risk, but only if implemented. Converting strategy into action is the key to achieving this important goal.

Communities can be made safer by reducing the risks of wildfire loss, and this CWPP presents realistic measures to achieve this goal. The CWPP process encourages homeowners to take an active role as fuel treatment strategies are developed and prioritized around their communities. Ownership of CWPP implementation at the local level is the most effective means to achieving successful results and sustaining the effort from year to year. Communities and homeowners can seek support and guidance through a variety of local, state, and federal resources identified in this plan including FPDs, DFPC, CSFS, BLM, USFS, and conservation districts.

9.3 Monitoring and Evaluation

Monitoring is a critical component of all natural resource management programs. Monitoring provides information on whether a program is meeting its goals and objectives. Adaptive management allows for program changes to occur if they are warranted. The purpose of this monitoring strategy is to track implementation of planned activities and evaluate how the goals of the CWPP are being met over time. The data gathered will help to determine if the objectives of the plan are being met, if updates need to be made, and if the plan is useful and being implemented as envisioned. This CWPP is a "living" document and must be continually monitored and updated as conditions and community values change. It is recommended that monitoring CWPP progress be maintained by the FPDs and provide updates to the Garfield County Office of Emergency Management and the DFPC on a regular basis.

The purpose of this monitoring strategy is to track implementation of activities and evaluate how well the goals of the CWPP are being met over time. The following are the components of effective monitoring:

- **Identify**: Did you identify what specifically needs to be done?
- **Plan**: Did you plan how the action would occur?
- **Implementation**: Was the project implemented according to plan?
- **Monitoring**: Did treatments meet the objectives?
- **Verification**: Did actions lead to the outcomes that were expected?
- **Adaptive Management**: What changes to the project implementation plan, if any, need to be made to facilitate the execution of the next similar project?

Each functional element of the CWPP provides monitoring tasks for recommended action items. Table 28 provides a summary of monitoring tasks for each of these functional areas. Evaluations are to be conducted on an annual basis.

Table 28. Monitoring and Evaluation Worksheet

Objective	Tasks
Risk Assessment	• Update GIS for fire occurrence and fire perimeter. Compile BLM, USFS, and county data. • Update hazards and risk assessments as new data becomes available. • Continue to assess values at risk and include additions in CWPP updates.
Fuels Reduction	• Identify and prioritize fuels treatment projects. • Track total acres of treatment on public and private lands. • Track grants and other funding sources and make appropriate application. • Track defensible space projects on private lands. • Monitor project effectiveness and coordinate activities and strategies with UCRIFMU, NCIFMU, and DFPC.
FPD Capacity Improvements	• Maintain compliance with the county EOP and Wildfire AOP processes. • Track progress on water supply improvements and mapping. • Track progress of resource improvements. • Review mutual aid resources and agreements.
Public Outreach	• Review public outreach material and update as necessary. • Maintain web presence on county site. • Coordinate with communities for presentations. • Coordinate with DFPC for neighborhood Firewise seminars and include CWPP discussion. • Evaluate techniques used to motivate and educate private landowners.

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Maps

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- Map 8. Wildland Fire Intensity Index
- Map 9. Vegetation-Fuels Projects
- Map 10. Source Water Protection Areas

B

Glossary of Wildfire Terms

Aerial Fuels Standing and supported live and dead combustibles not in direct contact with the ground and consisting mainly of foliage, twigs, branches, stems, cones, bark, and vines.

Aspect Cardinal direction towards which a slope faces.

Chain Unit of measure in land survey, equal to 66 feet (20 M) (80 chains equal 1 mile). Commonly used to report fire perimeters and other fireline distances, this unit is popular in fire management because of its convenience in calculating acreage (e.g., 10 square chains equal one acre).

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 A fire that advances from top to top of trees or shrubs more or less independent of a surface fire. Crown fires are sometimes classed as running or dependent to distinguish the degree of independence from the surface fire.

Dead Fuels Fuels with no living tissue in which moisture content is governed almost entirely by absorption or evaporation of atmospheric moisture (relative humidity and precipitation).

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 the loss of life, property, or resources. 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 Any treatment applied directly to burning fuel such as wetting, smothering, or chemically quenching the fire or by physically separating the burning from the unburned fuel.

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

Fire Danger Sum of constant danger and variable danger factors affecting the inception, spread, and resistance to control, and subsequent fire damage; often expressed as an index.

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 A fuel complex, defined by volume, type condition, arrangement, and location, that determines the degree of ease of ignition and of resistance to control.

Fire Intensity A general term relating to the heat energy released by a fire.

Fire Regime Description of the patterns of fire occurrences, frequency, size, severity, and sometimes vegetation and fire effects as well, in a given area or ecosystem. A fire regime is a generalization based on fire histories at individual sites. Fire regimes can often be described as cycles because some parts of the histories usually get repeated, and the repetitions can be counted and measured, such as fire return interval.

Fire Risk The chance of fire starting, as determined by the presence and activity of causative agents.

Fire Severity Degree to which a site has been altered or disrupted by fire; loosely, a product of fire intensity and residence time.

Fire Weather Weather conditions that influence fire ignition, behavior, and suppression.

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

Flaming Front That zone of a moving fire where the combustion is primarily flaming. Behind this flaming zone combustion is primarily glowing or involves the burning out of larger fuels (greater than about 3 inches in diameter). Light fuels typically have a shallow flaming front, whereas heavy fuels have a deeper front.

Fuel Any combustible material, especially petroleum-based products and wildland fuels. 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.

Fuelbreak A natural or manmade change in fuel characteristics that affects fire behavior so that fires burning into them can be more readily controlled.

Fuel Loading The amount of fuel present expressed quantitatively in terms of weight of fuel per unit area. This may be available fuel (consumable fuel) or total fuel and is usually dry weight.

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.

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, punky wood, peat, and sawdust that normally support a glowing combustion without flame.
Indirect Attack	A method of suppression in which the control line is located some considerable distance away from the fire's active edge. Generally done in the case of a fast-spreading or high-intensity fire and to utilize natural or constructed firebreaks or fuelbreaks and favorable breaks in the topography. The intervening fuel is usually backfired; but occasionally the main fire is allowed to burn to the line, depending on conditions.
Intensity	A measure of the rate of heat released by a fire. It includes both radiant and convectional heat.
Initial Attack	A planned response to a wildfire given the wildfire's potential fire behavior. The objective of initial attack is to stop the fire and put it out in a manner consistent with firefighter and public safety and values to be protected.
Ladder Fuels	Fuels which provide vertical continuity between strata, thereby allowing fire to carry from surface fuels into the crowns of trees or shrubs with relative ease. They help initiate and assure 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.
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 to meet specific objectives. A written, approved prescribed fire plan must exist, and NEPA requirements (where applicable) 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.
Surface Fire	Fire that burns loose debris on the surface, which includes dead branches, leaves, and low vegetation.
Surface Fuel	Fuels lying on or near the surface of the ground, consisting of leaf and needle litter, dead branch material, downed logs, bark, tree cones, and low stature living plants.
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	Topography is the configuration of the earth's surface including its relief and the position of its natural and man-made features.
Torching	The burning of the foliage of a single tree or a small group of trees, from the bottom up.
Wildfire	An unplanned, unwanted wildland fire including unauthorized human-caused fires, escaped wildland fire use events, escaped prescribed fire projects, and all other wildland fires where the objective is to put the fire out.
Wildfire Susceptibility Index	A metric that defines the probability of wildfire occurrence and its predicted rate of spread once an ignition occurs.
Wildfire Intensity Index	A measure for the potential for high-intensity wildfire occurrence as defined by flame length and crown fire.
Wildland Fire	Any non-structure fire that occurs in the wildland. Three distinct types of wildland fire have been defined and include wildfire, wildland fire use, and prescribed fire.
Wildland Fire for	The application of the appropriate management response to naturally-ignited

Resource Benefit wildland fires to accomplish specific resource management objectives in pre-defined designated areas outlined in Fire Management Plans.

C Planning Team Meeting Notes

Project Start-Up Meeting

Garfield County CWPP Project Start-Up Meeting Notes
Rifle Sheriff's Annex
10:00 a.m., September 13, 2011

Meeting Purpose: Initial meeting with Chris Bornholdt.

Attendees:

Name	Organization	Email	Phone
Chris Bornholdt	Garfield County EM	cbornholdt@garcosheriff.com	970-945-0453
Jerry Barker	Walsh	jbarker@walshenv.com	303-443-3828
Kathleen Stevenson	Walsh	kstevenson@walshenv.com	303-443-3282
Daniele Cassidy	Walsh	dcassidy@walshenv.com	303-443-3282

- GIS for Garfield County is Rob Hykys.
- Walsh requested a county road map, which includes the communities.
- Chris is the chairperson of the core team. Chris agreed that information can be sent out the entire group (i.e., information and communication does not have to be filtered through him).
- Walsh requested from Chris assistance in stakeholder identification.
- Walsh confirmed the schedule (i.e., that the process of the CWPP needed to be started before end of 2011; however, the CWPP does not have to be completed by the end of 2011).
- Chris requested that Walsh provide a receipt of prepay be sent to him.
- Chris also confirmed that this CWPP includes the entire county including the areas covered by Gypsum FD, De Beque, and Lower Valley.
- Walsh noted that some of the communities in the County already have CWPPs and that we will be reviewing them and possibly including some of their findings and language in Walsh's CWPP. Chris agreed that the documents provided by the County could be used within the CWPP. The CWPPs already developed for Burning Mountain and Glenwood Springs could be incorporated into the County CWPP.
- The goal of the countywide CWPP is to do an overarching CWPP so specific communities or FPDs will be able to link to when they do their own plan.
- Chris noted that Doug Long may be the one point of contact for federal lands in Garfield County (i.e. BLM, USFS and NPS).
- Regarding the Wildfire Response Plan (WRP), Chris stated a key goal is to have everyone on the same page. Chris would like to see the departments respond in a similar manner to an incident so that when the Sheriff's Office (SO) takes command, the SO knows where the FD is in the process and that the scene transition is as seamless and as smooth as possible including the appropriate scene and incident knowledge transfer. Chris also noted what will be key in the WRP is establishing the correct procedure for notification

and approval for ordering resources (e.g. tankers) through the SO county. The process is outlined in the county AOP (which was forwarded to Walsh).

- Chris indicated that the current map provided by Walsh was inaccurate in the depiction Hanging Lake FD's jurisdiction. Hanging Lake only responds to the interstate to put out fires. Walsh noted this and agreed to make the map changes.
- Chris also assisted Walsh in identifying who had initial response in areas that were not identified as being in one particular FD's jurisdiction.
- Chris assisted in identifying where the greatest population/community concentration was as well as assist in identifying a proposed WUI boundary.
- Chris mentioned that Williams and Encana would be good prospective stakeholders as representatives for the oil and gas companies. Kevin McDermott was identified as the Williams safety contact.
- Chris indicated that if the core team was not responsive that Walsh makes him aware and that he would assist in getting a response.
- Chris noted the existence of the current Garfield County Fire Plan and would forward a copy to Walsh.
- Chris noted that Rifle, Burning Mountain, and Glenwood are already starting to share resources.
- Walsh stated its plan of being back in Garfield County on October 10th to 14th to talk with the FD chiefs.
- Walsh proposed four community meetings in the following locations: Rifle, Parachute, Glenwood Springs, and Silt/New Castle. These proposed meeting locations were approved by Chris. Additionally Chris offered to assist in locating meeting space.
- Chris offered the use of a helicopter to expedite Walsh's survey of the county. Walsh agreed and the possible helicopter flight would occur potentially the week of October 11th.

Questions:

-JB: How do we define "community" for field work level of detail?

CB: Do perimeter of different communities as one item, treat it like a city.

-JB: Define "WUI"

The consensus was to make it the wide corridor surrounding I-70 that encompasses all the places defined as WUI by Colorado State Forest Service.

-JB: Grand Mesa and White River National Forests? Is Doug Paul the contact for these?

(Information gathered at the core team meeting…Yes, he is).

Oil and Gas:

-JB: What about oil and gas? Are the pipelines and rig structures you want to protect?

CB: These areas are mostly near De Beque and Lower Valley FPDs. The main companies would be Encana and Williams. They have a lot of private-access roads. Maybe it is best to fly this area. We can do this with DBS during the week of October 10th to 14th.

Is the oil and gas industry a wildfire risk? They do an annual educational/safety seminar.

Do Encana/Williams have fire plans?

Action Items:

1. Remind Chris to send us a CD or post to our ftp site, all the relevant GIS layers they have, e.g., roads, utilities, pipelines and rigs, corrected FPDs (Hanging Lake Tunnel FD), etc. (Their GIS guy is Rob Hykys).

2. How can we get contact information for stakeholders, e.g., HOAs, CDOW (rep. for the SWAs), BOR/State Parks (rep. for Rifle Gap State Park) and others we need to participate? Can we get this information from Chris?
    a. Encana and Williams should be invited to be part of the stakeholders group.

3. Who else should we add to the core group?
    a. Doug Paul with Upper Colorado River Interagency Fire (BLM, USFS, Parks).
    b. Lathan Johnson, who does fuels work for BLM.

4. Invite Gypsum FPD to be part of the core team (see below).

5. Have Chris ask the Hanging Lake Tunnel FPD if they are interested in participating in this project.

6. Schedule helicopter flight (contact Chris/DBS), community assessments, and to meet with more fire chiefs during week of October 10th to 14th.

7. Follow up with Doug Paul to get the raw fire history data from his agency. Their GIS person is Lindy.

First Planning Team Meeting

Garfield County CWPP Planning Team Meeting Notes
Rifle Fire Station, 419 Last Chance Rd, Rifle
September 13, 2011

Meeting Purpose: To review CWPP process, plans for community outreach, and review draft base maps.

Attendees:

Name	Organization	Email	Phone
Kamie Long	CSFS	Kamie.Long@colostate.edu	970-248-7235
Doug Paul	UCRIFMU USFS/BLM	dpaul@blm.gov	970-623-6183
Ron Leach	Carbondale Fire	Leach@carbondalefire.org	970-963-2491
Jerry Barker	Walsh	jbarker@walshenv.com	303-443-3828
Ron Biggers	Glenwood Spring FD	Ron.biggers@cogs.us	970-384-6433
Kathleen Stevenson	Walsh	kstevenson@walshenv.com	303-443-3282
Daniele Cassidy	Walsh	dcassidy@walshenv.com	303-443-3282

- Core team attendance sheet was handed out and signed by those in attendance.
- Jerry Barker from Walsh did a presentation of the core team responsibility, schedule outline and events; Walsh will survey the county and meet with the fire chiefs the week of October 11th. Draft CWPP is tentatively due 12/6/09 – 1/10/10 with the final CWPP being due 2/10/2012.
- The oil and gas industry was identified by the core team as being possible stakeholders.
- The federal representative sought clarification on whether or not the CWPP includes County lands; Walsh stated that we can do that. BLM wanted to know that there are good mitigation opportunities on BLM land and this information would assist BLM in prioritizing projects. Walsh stated that yes we can assist BLM in identifying mitigation opportunities.
- Walsh stated that this is a county wide (umbrella) CWPP; however, the CWPP results will encourage each FD to do their own CWPP.
- Lindy → has access to an ftp site for GIS information from the federal intra agency representative.
- Doug Long provided a general fire history map.
- Walsh noted that they will be interviewing the fire chiefs for local preparedness and response capabilities to be included in the CWPP and the WRP.
- Group discussion of the WRP included concerns on how the SO and FDs need to talk about air resources (who orders and when ordered); exactly how does mutual aid work; fire authority and movement of resources and how resources are ordered; communication plan (800 v. VHF); would like to get federal and county dispatchers to meet.

Additional information:

- Gypsum FPD is in this project even though they are in Eagle County. We don't know if they have an existing CWPP. They should be invited.
- In the CWPP, we'll say there are no issues with the Hanging Lake Tunnel FPD in terms of fuels. There isn't even anything to mow.
    - The Hanging Lake FPD, located only in the canyon along I-70 extending to the tunnel at the western boundary, is likely not interested in being involved in this countywide CWPP process. Chris will ask them to be sure.
- Chris emailed Kathleen and Jerry copies of the Colorado State Forest Service's AOP. He said it is fine to "plagiarize" from this document as we need.

Press:

Chris can post anything to the County and to the SO's websites. He has someone that can draft and post press releases in the local newspaper.

We should have four (maybe five) community meetings in the following locations:

- Rifle,
- Glenwood,
- Parachute/Battlement Mesa,
- Silt/New Castle, and
- Carbondale (suggested by Ron at the core team meeting).

Communication during Project Process:

Walsh will keep a participant list of who does what to give to Chris at the end.

Second Planning Team Meeting

Garfield County CWPP Planning Team Meeting Notes
Rifle Fire Station, 419 Last Chance Rd, Rifle
October 11, 2011

Meeting Purpose: To review community risk assessment process and results, community outreach effort, and review draft base maps

Attendees:

Name	Organization	Email	Phone
David Blair	GVFPD	gfgpd@sopris.net	970-2859-119
Doug Paul	UCRIFMU USFS/BLM	dpaul@blm.gov	970-623-6183
Ron Leach	Carbondale Fire	Leach@carbondalefire.org	970-963-2491
Jerry Barker	Walsh	jbarker@walshenv.com	303-443-3828
Ron Biggers	Glenwood Spring FD	ron.biggers@cogs.us	970-384-6433
Chris Bornholdt	Garfield County EM	cbornholdt@garcosheriff.com	970-945-0453
Daniele Cassidy	Walsh	dcassidy@walshenv.com	303-443-3282
Gary Tillotson	GSFD	gary.tollotson@cogs.us	970-384-6430
Kelly Rogers	CSFS	Kelly.rogers@colostate.edu	970-240-7325
Keith Lammey	BMSA	klammey@elkpeaks.com	970-285-7482
Mike Morgan	RFPD	mimorgan@riflefiredept.org	970-625-1243
Lathan Johnson	BLM fuels	lwjohso@blm.gov	970-640-9165
Orrin Moon	BMFPD	orrrinmoom@burningmountainsfire.org	970-879-2932
Larry Sweeney	Bookcliff CD & CO State Conservation BD	sweeneylw@gmail.com	970-876-2854
Chad Harris	RFPD	chharris@riflefiredept.org	970-379-9681

Action Items:

- Talk to Larry Sweeney about presentation at the Ag Day and perhaps the small acreage event too.
- Add a community meeting time for Silt/New Castle (includes Burning Mountains).
- Ask/remind Kelly that we want all the data on past mitigation efforts/accomplishments.
- Ask Chris: is the West Wide Wildfire Risk Assessment data something we want to include?
- Add our email addresses to the questionnaire.
- Talk to Mike Morgan: can we get the watershed.shp overlay to help define WUI areas?
- Talk to county and industry oil and gas liaisons to get appropriate information.

- Determine the percent of human-caused vs. naturally-caused wildfires.

Meeting Agenda:
Jerry Barker and Danielle Cassidy conducted the meeting and welcomed everyone. They used a PowerPoint presentation to lead the discussion. The PPT is available on the ftp site.

1. Introductions
    a. Everyone introduced themselves.

2. CWPP purpose and process
    a. Discussed CWPP beginning;
    b. Garfield County Red Zones as defined by CSFS;
        i. Mike Morgan stated that the red zone or WUI should be identified in each FPD to modify the map presented in the PPT.
    c. CWPP is countywide;
    d. Discussed already completed CWPPs that will be beneficial to the Garfield County CWPP.
        i. Information from completed CWPPs will be incorporated into countywide CWPP as appropriate.

3. Planning team responsibilities
    a. listed planning team members expectations throughout the planning process

4. Wildfire risk assessment procedures
    a. Discussed the steps to the planning process as presented in "Preparing a Community Wildfire Protection Plan: A Handbook for Wildland-Interface Communities."
    b. NFPA 1144 procedure to assess communities
        i. Communities to be assessed – Parachute/Battlement Mesa, Rifle, New Castle, Rulison, Carbondale, Glenwood Springs.
    c. Interviewed representatives for each FPD in County.
    d. West Wide Wildfire Risk Assessment information will be available in February 2012. We may want to use this information in the CWPP.
        i. Kelly Rogers stated that CSFS conducted a similar assessment in 2010. Work was done by Sanborn. Jerry Barker will look into using this information.
    e. Lathan Johnson stated that cheatgrass is a fuel concern for elevation below 6500 feet.
    f. Fire history data
        i. Map presented in PPT is using only federal response data. Maybe able to get more data from CSFS for private lands.
    g. Need to identify values at risk in each FPD: e.g., human welfare, structures, forests and grasslands, wildlife and aquatic habitats, water quality and quantity, watersheds, air quality, cultural sites, recreational areas, etc.

5. Community outreach

a. Meetings are planned for the week of January 30.
b. Discussed holding meetings to be held in Parachute, Rifle, New Castle/Silt, and Carbondale.
    i. Mike Morgan said that more meetings were needed so that a particular community would not be alienated.
c. Kelly raised a concern that the dates for the meetings were a red flag because they are scheduled during winter. A big effort will be needed to get people out.
    i. Discussed using door prizes or food as a "carrot" to get people to attend.
d. Ag Day on January 25 at the Ag Center in New Castle was presented by Larry Sweeney as a possibility to present CWPP findings and Firewise practices.
e. Larry also said that there is a Small Acreage event in February that draws Carbondale and the horse community. This could be another event for outreach.
f. Newspaper articles and radio announcements will present information on meeting times and locations.
g. The County will setup a website to inform people of the CWPP process and how they can be involved. Newspaper articles will advertise the website.

6. Mitigation possibilities – to be identified by FPDs, BLM, USFS, etc.
    a. Defensible space – outreach to private land owners.
    b. Fuelbreaks in appropriate areas.
    c. Prescribed fire.
    d. Non-fuel mitigation – water supply, improved response capacity, public outreach, etc.

7. CWPP base maps – discussed base map
    a. The preliminary WUI area is to be amended based on discussions with FPDs. Define WUI in each FPD.
    b. Also presented maps showing fire history and FRCC vegetation classification in County.
        i. There was a discussion on how to get complete fire history inventory. This would be a huge effort outside CWPP scope. Kelly will work to obtain data for private lands.

8. Communication
    a. Weekly progress report;
    b. Emails;
    c. Core team meetings;
    d. Conference calls as needed;
    e. ftp site for document transfer:
        i. Using "My Computer," go to ftp://ftp.walshenv.com
        ii. Username: Garfield
        iii. Password: CWPP

9. Other issues?
    a. None were identified

10. Next team planning meetings:
    Date: November 8, 2011
    Location: Garfield County Sheriff's Office Annex in Rifle
    Start time: 9:00 am, should be about a two-hour meeting

Third Planning Team Meeting

Garfield County CWPP Planning Team Meeting Notes
Sheriff's Office Annex, Rifle
November 8, 2011

Meeting Purpose: To discuss WUI and community risks to wildfire.

Attendees:

Name	Organization	Email	Phone
David Blair	GVFPD	gfgpd@sopris.net	970-285-9119
Doug Paul	UCRIFMU USFS/BLM	dpaul@blm.gov	970-623-6183
Kevin Whelan	Rifle Fire	kewhelan@riflefiredept.org	970-618-7388
Jerry Barker	Walsh	jbarker@walshenv.com	303-443-3828
Ron Biggers	Glenwood Spring FD	ron.biggers@cogs.us	970-384-6433
Chris Bornholdt	Garfield County EM	cbornholdt@garcosheriff.com	970-945-0453
Dwayne Gaymore	CDOT	Dwayne.gaymore@cot.state.co.us	970-949-9361
Gary Tillotson	GSFD	gary.tollotson@cogs.us	970-384-6430
Kelly Rogers	CSFS	Kelly.rogers@colostate.edu	970-240-7325
Bill Gavette	Carbondale Fire	gavette@carbondalefire.org	970-963-2491
Mike Morgan	RFPD	mimorgan@riflefiredept.org	970-625-1243
Lathan Johnson	BLM fuels	lwjohso@blm.gov	970-640-9165
Orrin Moon	BMFPD	orrrinmoom@burningmountainsfire.org	970-879-2932
Larry Sweeney	Bookcliff CD & CO State Conv BD	sweeneylw@gmail.com	970-876-2854
Rob Willits	Rifle Fire	rowillits@riflefiredept.org	970-618-7388
Rusty Stark	BLM Silt fuels program	rnstark@blm.gov	970-876-9030

Decisions:

- Walsh will present CWPP information at the Large Acre Ag Day in New Castle on January 25, 2012.
- Community meetings will be convened January 23 to 26 in Parachute/Battlement Mesa, Rifle, Glenwood Springs, and Carbondale (Note: at our meeting New Castle was scheduled for one of the meetings but a subsequent email exchange between Chris Bornholdt and Ron Biggers changed the meeting to Glenwood Springs). Danielle will work with the FPD to determine the specifics for each meeting.
- Walsh was reminded that Rulison is in the Grand Valley FPD and not Rifle FPD.

- The correct FPD boundary description between Grand Valley and Rifle FPDs near Rulison was provided to Walsh.
- The FRCC class hazard ratings were changed as follows per Lathan Johnson's professional experience to better reflect the hazards of vegetation-fuels within the County:

FRCC	Definition	Old hazard rating	New hazard rating
I	Current vegetation and fire regime are similar to reference conditions	Low	Low
II	Current vegetation and/or fire regime show moderate departure from reference conditions	Moderate	High
III	Current vegetation and/or fire regime show extreme departure from reference conditions	High	Extreme

- The Fire Behavior Fuel Model hazard ratings were changed per Lathan Johnson's professional experience to be reflect reality of the assessment area because oak brush and PJ is underestimated in the traditional definitions:

FBFM	Fuel type	Old hazard rating	New hazard rating
1	Short grass	Low	Moderate
2	Timber grass	Low	High
4	Chaparral >6'	High	Extreme
5	Brush <2'	Low	Moderate
6	Dormant brush	Moderate	High
8	Closed timber litter	Moderate	High
9	Hardwood litter	Moderate	Low
10	Timber litter and understory	High	Low

Action Items:

- Barker to recalculate the hazard and risk ratings for FRCC and FBFM based on changes described above.
- Danielle to work with appropriate FPDs to setup community meetings.
- Kelly to provide additional fire history information in addition to what he has already provided for private lands
- Talk to county and industry oil and gas liaisons to get appropriate information.
- Determine the percent of human-caused vs. naturally-caused wildfires.
- Barker to get background information on the wildfire susceptibility and intensity indices.

Meeting Agenda:

Jerry Barker conducted the meeting and welcomed everyone. A PowerPoint (PPT) presentation was used to lead the discussion. The PPT is available on the ftp site.

1. Introductions

2. Community meetings
    a. See information presented under "Discussions."

3. Wildland Urban Interfaces (WUIs)
    a. A map was presented that defined the WUIs within each FPD. Jerry Barker asked Bill Gavette of the Carbondale WUI if the town of Carbondale could be included since the community received a moderate rating using the NFPA 1144 evaluation procedure. Bill said yes.

4. WUI risk characterization
    a. Community assessments;
    b. Fire regime condition class;
    c. Fire behavior fuel model;
    d. Wildland fire susceptibility index;
    e. Wildland fire intensity index; and
    f. Overall risk.

The hazard and risk ratings for each of the above items were presented and discussed. It was determined that the overall level of wildfire risk for the WUIs were underestimated. Corrections to the risk ratings for FRCC and FBFM were revised based on the professional experience of the planning team. The changes are presented above.

Jerry Barker will check on the wildfire susceptibility and intensity indices to ensure that risk is defined only within the WUI and not the entire FPD.

5. Next steps: the dates for the next meeting and deliverable dates are as follows:
    a. Next planning meeting: December 5 at 9:00 a.m., location to be determined;
    b. Draft CWPP due January 10;
    c. Planning team review of draft CWPP – January 10-20;
    d. Community meetings: January 23-27;
    e. Public comment period: January 28–February 17; and
    f. Final CPP: March 9.

6. Other issues
    a. No other issues were raised by the planning team for discussion.

7. Review maps
    a. Hard copies of several maps were available for team review and discussion.

Fourth Planning Team Meeting

Garfield County CWPP Planning Team Meeting Notes
Sheriff's Office Annex, Rifle
December 5, 2011

Meeting Purpose: To discuss vegetation-fuel treatments and ways to improve FPD response capacity.

Attendees:

Name	Organization	Email	Phone
David Blair	GVFPD	gfgpd@sopris.net	970-285-9119
Doug Paul	UCRIFMU USFS/BLM	dpaul@blm.gov	970-623-6183
Kathleen Stevenson	Walsh	kstevenson@walshenv.com	303-443-3282
Jerry Barker	Walsh	jbarker@walshenv.com	303-443-3828
Ron Biggers	Glenwood Spring FD	ron.biggers@cogs.us	970-384-6433
Chris Bornholdt	Garfield County EM	cbornholdt@garcosheriff.com	970-945-0453
Dan Cacho	CO Parks & Wildlife	Dan.cacho@state.co.us	970-456-7003
Gary Tillotson	GSFD	gary.tollotson@cogs.us	970-384-6430
Kelly Rogers	CSFS	Kelly.rogers@colostate.edu	970-240-7325
Bill Gavette	Carbondale Fire	gavette@carbondalefire.org	970-963-2491
Mike Morgan	RFPD	mimorgan@riflefiredept.org	970-625-1243
Lathan Johnson	BLM fuels	lwjohso@blm.gov	970-640-9165
Orrin Moon	BMFPD	orrrinmoom@burningmountainsfire.org	970-879-2932
Larry Sweeney	Bookcliff CD & CO State Conv BD	sweeneylw@gmail.com	970-876-2854
Rob Willits	Rifle Fire	rowillits@riflefiredept.org	970-618-7388
Rusty Stark	BLM Silt fuels program	rnstark@blm.gov	970-876-9030
Tracy Fifarek	UCR	tfifarek@fs.fed.us	970-257-4800

Decisions:

- Rank fuel treatment priorities as high, moderate, or low.
- The CWPP needs to accommodate all possible fuel treatments within the County. Those within the WUIs would be priority but treatments outside the WUI need consideration. Perhaps managing vegetation to improve FRCC would be the appropriate means.

Action Items:

- Lathan to provide more information on UCR proposed fuel projects.
- Danielle to work with appropriate FPDs to set-up community meeting agenda.
- Jerry to approach Rifle FPD to define specific fuel projects
- Kathleen to talk industry oil and gas liaisons to get appropriate information on wildfire management
- Ron to identify communities that need evacuation roads.
- Ron to provide specifics on vegetation treatment status and new projects that are planned.

Meeting Agenda:

Jerry Barker conducted the meeting and welcomed everyone. A PowerPoint presentation was used to lead the discussion. The PPT is available on the ftp site.

1. Introductions

2. WUI risk assessments
    a. Reviewed again the community risk ratings per discussion in the November 8 meeting. Based on changes to fire regime condition class, fire behavior fuel models, and the weighting of the wildfire susceptibility index and wildfire intensity index, the new WUI risk ratings are:

WUI	Risk
Lower Valley	High
De Beque	High
Grand Valley	High
Rifle	High
Burning Mountains	High
Glenwood Springs	Extreme
Carbondale	Extreme
Gypsum	High

3. Fire history

4. Proposed fuel projects
    a. Presented a map that showed past fuel projects and proposed fuel projects. Map is posted on the ftp site. Proposed fuel projects are presented on the attached table.

5. Non-fuel mitigation
    a. Discussed FPD resource needs to improve wildfire response capacity (see attached table).

6. Community meetings

Date	Town and Time	Location
Monday 1/23	Rifle @ 6:30 pm	Station 41
Tuesday 1/24	Glenwood Springs @ 6:00 pm	Community Center
Wednesday 1/25	Ag Day @ 9:00 – 3:00	New Castle Community Center
Wednesday 1/25	Carbondale @ 5:30 pm	FPD headquarters
Thursday 1/26	Battlement Mesa @ 6:30 pm	Station #1

7. Next steps

Activity	Date
Draft CWPP	January 10
Planning team review of Draft CWPP	January 10 - 20
Community meetings	January 23-27
Public comment period	January 28 – February 17
Final CWPP	March 9

8. Other issues
    a. Nothing presented.

Draft Priority Fuels Treatments for WUIs

Wildland-Urban Interface	Priority Fuel Treatments	Lead
Lower Valley	▪ Defensible space around homes and out buildings ▪ Continue wildland fire use policy ▪ Mowing vegetation along roads ▪ Manage FRCC II and III vegetation to FRCC I	▪ Landowner ▪ BLM and private landowner ▪ State, county, and private landowner ▪ BLM, USFS, private landowner
De Beque	▪ Defensible space around homes and out buildings ▪ Kimball Mountain fuelbreak (#1 on Map x) ▪ Mow vegetation along roads ▪ Manage FRCC II and III vegetation to FRCC I	▪ Landowner ▪ BLM ▪ State, county, and private landowner ▪ BLM, USFS, private landowner
Grand Valley	▪ Defensible space around homes and out buildings ▪ Defensible space around Parachute Water Treatment Facility (#5 on Map x) ▪ Fuelbreaks on slopes below communities such as Battlement Mesa, Morrisania Mesa, and Holmes Mesa (#2,3,4 on Map x) ▪ Fuelbreak on hill slopes south of Rulison (#6 on Map x) ▪ Mowing vegetation along roads ▪ Manage FRCC II and III vegetation to FRCC I	▪ Landowner ▪ FPD ▪ FPD ▪ FPD ▪ State, county, and private landowner ▪ BLM, USFS, private landowner
Rifle	▪ Defensible space around homes and out buildings ▪ Mowing vegetation along roads ▪ Manage FRCC II and III vegetation to FRCC I	▪ Landowner ▪ State, county, and private landowner ▪ BLM, USFS, private landowner

Wildland-Urban Interface	Priority Fuel Treatments	Lead
Burning Mountains	▪ Defensible space around homes and out buildings	▪ Landowner
	▪ Fuelbreak Lakota areas, east side of Fras Ranch Road (#7 on Map x)	▪ FPD
	▪ Fuelbreak at tow slope east of schools and water tank on USFS land near Castle Valley Ranch road (#8 on Map x)	▪ FPD
	▪ Fuelbreaks Hidden Valley and Elk Run area (#9 on Map x)	▪ FPD
	▪ Fuelbreak and tree thinning Elk Creek Campground (#10 on Map x)	▪ FPD
	▪ Tree thinning on Elk Creek road near 1700 area (#11 on Map x)	▪ FPD
	▪ Tree thinning and fuelbreaks near 3724-3768 on Harvey Gap Road (#12 on Map x)	▪ FPD
	▪ Firewise developing for future subdivision off of Harvey Gap Road (#13 on Map x)	▪ FPD
	▪ Tree thinning along Hodien Dr (#14 on Map x)	▪ FPD
	▪ Tree thinning and fuelbreaks in Ram Lane area (#15 on Map x)	▪ FPD
	▪ Defensible space around water tanks north of Silt (#16 on Map x)	▪ FPD
	▪ Fuelbreaks in Mineota estates area (#17 on Map x)	▪ FPD
	▪ Fuelbreaks along Divide Creek road (#18 on Map x)	▪ FPD
	▪ Mowing vegetation along roads	▪ State, county, and private landowner
	▪ Manage FRCC II and III vegetation to FRCC I	▪ BLM, USFS, private landowner
Glenwood Springs Rural	▪ Defensible space around homes and out buildings	▪ Landowner
	▪ Four Mile fuels reduction t as described in Glenwood Springs FPD CWPP (#19 on Map x)	▪ FPD
	▪ Mountain Springs/Three Mile fuels reduction as described in Glenwood Springs FPD CWPP (#20 on Map x)	▪ FPD
	▪ Glenwood Springs Gondola fuels break as described in Glenwood Springs FPD CWPP (#21 on Map x)	▪ FPD
	▪ Midland fuels reduction as described in Glenwood Springs FPD CWPP (#22 on Map x)	▪ FPD
	▪ Road vegetation mowing	▪ State, county, private landowner
	▪ Manage FRCC II and III vegetation to FRCC I	▪ BLM and private landowner
Carbondale	▪ Defensible space around home, outbuildings and structures	▪ Landowner
	▪ Huebinger Drive fuelbreak (#23 on Map x)	▪ FPD
	▪ Road vegetation mowing	▪ County and private landowner
	▪ Manage FRCC II and III vegetation to FRCC I	▪ B:M and private landowner
Gypsum	▪ Defensible space around homes and out buildings	▪ Landowner
	▪ Shaded fuelbreaks along County Roads 150 and 151	▪ FPD
	▪ Manage FRCC II and III vegetation to FRCC I	▪ BLM, USFS, and private landowner
Northwest	▪ No recommended fuels management	▪ NWCFMU

Wildland-Urban Interface	Priority Fuel Treatments	Lead
Colorado Fire Management Unit		
Upper Colorado River Interagency Fire Management Unit	▪ Strategically located fuelbreaks needed to protect communities	▪ UCRIFMU, FPD, CSFA, and private landowner
Colorado State Forest Service	▪ Defensible space around home, outbuildings and structures ▪ Strategically located fuelbreaks needed to protect communities	▪ Landowner ▪ UCRIFMU, FPD, CSFA, and private landowner

Draft Wildfire Protection Authority Resources and Training Needs

Fire Authority	Resources Needs	Training Needs
Lowe Valley FPD	▪ Additional water sources – Red Cliff Mine will be a water source ▪ Maintain good communication with oil companies on wildfire issues ▪ Improve State Road 139 in Douglas Pass ▪ Develop FPD specific CWPP	▪ Annual NWCG wildfire training ▪ Maintain current NWCG certifications
De Beque FPD	▪ Cell phone tower at the end of Kimball Mountain Road ▪ Maintain good communication with oil companies ▪ Develop FPD specific CWPP	▪ Annual wildfire training ▪ Maintain current NWCG certifications ▪ Encourage FFII to certify at FFI
Grand Valley FPD	▪ Water tanks and cisterns located in eastern part of district ▪ Water tanks and cisterns located up County Road 215 near Guard Shacks ▪ Develop ability to draft water from dam at top of County Road 215 ▪ Upgrade equipment to match USFS/BLM equipment ▪ Repair roads as needed to improve response times ▪ Post weight limit signs on bridges and culverts where needed ▪ Improve addressing to actual locations ▪ Pre-plan WUI response areas ▪ Develop mutual aid agreements with other counties ▪ Develop automatic aid agreements for certain response areas for all sides of District ▪ Develop FPD specific CWPP	▪ Annual NWCG wildfire training ▪ Maintain current NWCG certifications ▪ Require part-time employees to beat least NWCG FFII certified
Rifle	▪ Determine the need to identify more water sources	▪ Annual wildfire training ▪ Maintain current NWCG certifications ▪ WUI training for line firefighters, NWCG 215 class
Burning Mountains	▪ Strategically locate 10,000-g	▪ Annual NWCG wildfire

Fire Authority	Resources Needs	Training Needs
	buried water tanks in Elk Creek, Dry Hollow, Divide Creek, Silt Mesa ▪ Develop year around drafting sites through the FPD ▪ Map all current drafting sites ▪ Obtain fuels treatment equipment such as a hydro-axe, brush hog, and chipper ▪ Certify bridge weight limits on critical bridges such as on Elk Road, Divide Creek, and Garfield Creek ▪ Improve road and address signage as needed ▪ Develop automatic aid agreements for certain response areas for all sides of District ▪ Develop FPD specific CWPP ▪ Community Firewise training	training ▪ Require NWCG FFII certification including pack test ▪ Encourage NWCG certification at the FFI and higher levels such as crew boss and engine boss
Glenwood Springs Rural	▪ Develop water sources such as drafting sites or buried 10,000-g tanks as appropriate in Chelyn acres, Black Diamond Mine Road, Upper Mitchell Creek Road, Three Mile Creek Road, and County Road 132 ▪ Develop alternative evacuation routes for those areas with only one way in and out	▪ Annual NWCG wildfire training ▪ Maintain current NWCG certifications ▪ WUI wildland firefighting and incident command training
Carbondale	▪ County Road 112 needs 10,000 g buried water tank ▪ Develop and alterative evacuation route for West Bank Mesa ▪ Obtain a 1800-g tactical tender for Station 85 ▪ Obtain a Type 3 engine for Station 81 ▪ Create Spring Valley Ranch FPD	▪ Annual NWCG wildfire training ▪ Maintain current NWCG certifications
Gypsum	▪ Develop strategic water sources County Roads 150 and 151 ▪ Road improvements as appropriate ▪ Develop backup evacuation route for Sweetwater residents	▪ Annual NWCG wildfire training ▪ Maintain current NWCG certifications ▪ Encourage FFII to certify at FFI
Countywide−All FPDs (except Grand Valley FPD)	▪ Develop one or more wildfire specific wildfire crews and staff them during the fire season ▪ Develop and adopt by ordinance county wide WUI building standards or adopt the International Wildland Urban Interface Code ▪ Redraw each FPD boundary so that all areas of the County are in a fire protection district ▪ Create a new wildland fire specialist position to handle none wildfire fir fighting projects like	▪ Not applicable

Fire Authority	Resources Needs	Training Needs
	vegetation-fuels treatments, community outreach, mapping of high hazard home areas, coordination with all fire authorities ▪ Community Firewise outreach	
Northwest Colorado Fire Management Unit & Upper Colorado Interagency Fire Management Unit	▪ None identified	▪ Annual NWCG wildfire training ▪ Maintain current NWCG certifications
Colorado State Forest Service	▪ None identified	▪ Annual NWCG wildfire training ▪ Maintain current NWCG certifications

D Questionnaire Survey

Questionnaire: Garfield County Wildland Fire Assessment

October 2011

With the help of the Garfield County's Emergency Management Office, Walsh Environmental Scientists and Engineers, LLC is assessing the risk of wildland fire in Garfield County. We are looking to reduce fire risk by identifying hazardous fuel and non-fuel mitigation actions.

Please help us by providing information and suggestions on your perceptions of wildland fire and potential mitigation projects.

1. What **community** do you live in or are you closest to?	☐ Battlement Mesa ☐ Burning Mountain ☐ Carbondale ☐ Glenwood Springs ☐ Parachute ☐ Lower Valley ☐ New Castle ☐ Rifle ☐ Rulison ☐ Silt ☐ Other _____
2. How great a **risk** do wildfires pose to your property and community?	☐ Extreme Risk ☐ Moderate Risk ☐ Low Risk ☐ No Risk
3. What areas do you think are an **extreme fire hazard** and pose a risk to homes or property?	☐ Forestlands ☐ Grasslands ☐ Sagebrush Areas ☐ Juniper Stands ☐ Farmland ☐ Other areas: _____ **Location:**
4. What do you think would be the best way to **mitigate or reduce** these hazards?	☐ Vegetation-fuels management (grasses, trees, etc.) by thinning or controlled burns, fuelbreaks ☐ Increase fire department equipment (more trucks, water tenders, etc.) ☐ Increase the number of fire fighters ☐ Increase water availability ☐ Public education

5. Do you know of **recent actions** taken to reduce the risk of wildfires or to protect residents from wildfire spreading from public lands onto private lands or vice versa?	☐ No, I am not aware of any ☐ Yes, if so, please explain:
6. Have there been recent **fire education programs** in your community?	☐ No, I am not aware of any ☐ Yes, if so, please explain:
7. Do you think that the community in which you live is **prepared** to combat wildfire?	☐ No, if not, why not: ☐ Yes, if so, how come: ☐ I do not know
8. What **actions** do you think need to be taken to reduce the risk of wildfire?	

Please provide **contact information** in case we have further questions:

Name	
Address	
Phone	

Responses

The following are the responses of the 21 survey participants (not all participants responded to all questions) as of February 17, 2012:

1. What community do your live in or are closest to:
   - Battlement Mesa – 0%
   - Burning Mountains – 0%
   - Carbondale – 5%
   - Glenwood Springs– 40%
   - Parachute – 0%
   - Low Valley area – 0%
   - New Castle – 15%
   - Rifle – 15%

Rulison – 0%
Silt – 20%
Harvey Gap – 5%

2. How great a risk does wildfire pose to your property and community?
   Extreme risk – 29%
   Moderate risk – 33%
   Low risk – 38%
   No risk – 0%

3. What areas do you think are an extreme fire hazard and pose a risk to homes or property (multiple answers possible)?
   Forestlands – 33%
   Grasslands – 43%
   Sagebrush areas – 38%
   Juniper stands – 38%
   Farmland – 10%
   Other areas – 0%

4. What do you think would be the best way to mitigate or reduce these hazards (multiple answers possible)?
   Vegetation-fuels management by thinning, controlled burns, or fuel breaks – 71%
   Increase fire department equipment – 14%
   Increase the number of fire fighters – 14%
   Increase water availability – 14%
   Public education – 62%

5. Do you know of recent actions taken to reduce the risk of wildfires or to protect residents from wildfire spreading from public lands onto private lands or vice versa?
   No – 53%
   Yes – 47%

6. Have there been recent fire education programs in your community?
   No – 88%
   Yes – 12%

7. Do you think that the community in which you live is prepared to combat wildfire?
   No – 66%
   Yes – 19%
   Do not know – 14%

8. What actions do you think need to be taken to reduce the risk of wildfire?
   Public awareness – 6 responses
   Better government participation
   Vegetation-fuels management

E Community Meetings

Garfield County CWPP Community Meeting Notes

The Draft Garfield County Community Wildfire Protection Plan was presented for public review at the following sessions:

- Monday, January 23, 2012, 6:30 p.m., at Rifle Fire Protection District Station 1, at 202 Railroad Ave., Rifle, CO. Phone 970-625-1220; 15 people in attendance.

- Tuesday, January 24, 2012, 6:00 p.m. at Glenwood Community Center, 100 Wulfsohn Rd., Glenwood Springs, CO. Phone 970-384-6433; 16 people in attendance.

- Wednesday, January 25, 2012, Garfield County Agricultural Day (Ag-Day) sessions, at New Castle Community Center, 433 West Main St., New Castle. The Ag-Day sessions covered a number of topics and ran from 9 a.m. to 3 p.m. The CWPP was presented in the morning session. A booth was available with information on the CWPP, proposed vegetation-fuel projects, and Firewise landscaping and construction. The public questionnaire was also available for meeting participants to respond. Over 100 people attended the workshop.

- Wednesday, January 25, 2012, 5:30 p.m. at the Carbondale and Rural Fire Protection District Headquarter, at 300 Meadow Wood Dr., Carbondale, CO. Phone 970-963-2491; 9 people were in attendance.

- Thursday, January 26, 2012, 6:30 p.m., at Grand Valley Fire Protection District Station 1, 0124 Stone Query Rd., in the Battlement Mesa subdivision. Phone 970-285-9119; 12 people were in attendance.

The Rifle and Glenwood Springs meetings presented the following information:

- CWPP findings and recommendations;
- CSFS grants to help with the costs of removing wildfire hazard fuels;
- Federal agency wildfire hazard fuel removal projects in your community and how to attract their interest in doing a project in your neighborhood on adjacent federal lands;
- Local insurance agents discussed the value of how doing defensible space around your home may affect your homeowners insurance; and
- Learn basic steps to take to protect and prepare your family and property for wildfire.

The following information was presented at the Carbondale and Parachute meetings:

- CWPP findings and recommendations;
- CSFS grants to help with the cost of removing wildfire hazard fuels;
- BLM and USFS project occurring in the Carbondale area; and
- Learn steps to protect and prepare your family and property for wildfire.

In addition, pamphlets and brochures on Firewise landscaping and construction were provided to the participants. Also, the survey questionnaire was available for meeting participants to respond. Meeting participants were provided information on how they could obtain the draft

CWPP from the Garfield County Office of Emergency Management website to review it in detail and provide comments.

F

CSFS Defensible Space Guidelines

NATURAL RESOURCES SERIES

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.

Colorado State University Cooperative Extension

Putting Knowledge to Work

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,

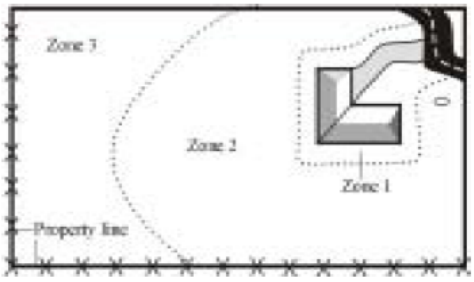


Figure 1: Forested property showing the three fire-defensible zones around a home or other structure.

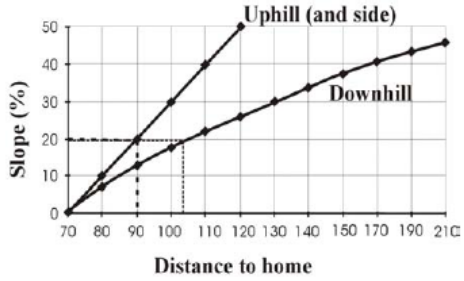


Figure 2: This chart indicates the *minimum recommended* dimensions for defensible space from the home to the outer edge of Zone 2. For example, if your home is situated on a 20 percent slope, the minimum defensible space dimensions would be 90 feet uphill and to the sides of the home and 104 feet downhill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

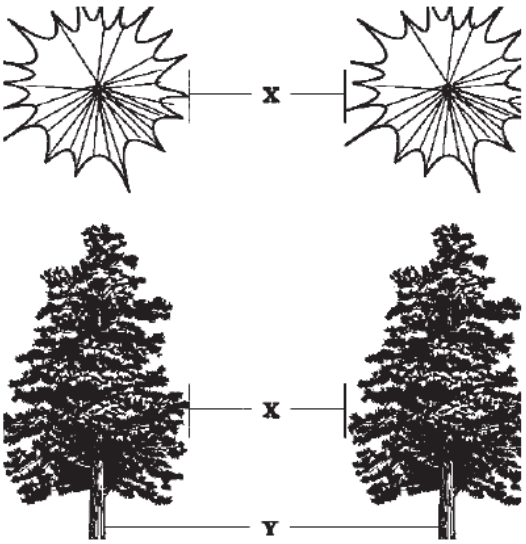


Figure 3: X = crown spacing; Y = stem spacing. Do not measure between stems for crown — measure between the edges of tree crowns.

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.*

G CSFS Fuelbreak Guidelines

Fuelbreak Guidelines for Forested Subdivisions & Communities

By

Frank C. Dennis

Colorado State Forest Service

Knowledge to Go Places

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

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

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

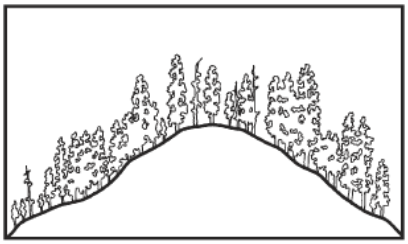
But with development inevitably comes a higher risk of wildfire as well as an ever-increasing potential for loss of life and property. Methods of fire suppression, pre-suppression needs, and homeowner and fire crew safety must all be considered in the planning and review of new developments as well as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

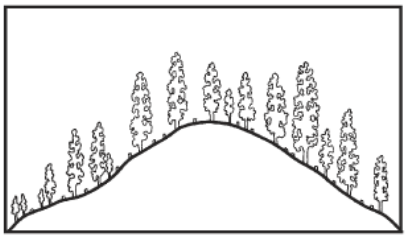
Fuelbreaks should be considered in fire management planning for subdivisions and developments; however, the following are guidelines **only**. They should be customized to local areas by professional foresters experienced in Rocky Mountain wildfire behavior and suppression tactics.

Fuelbreak vs Firebreak

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

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





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

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

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

Fuelbreak Limitations

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

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

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

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

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

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

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

The Need For A Fuelbreak

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

Potential Problem Indicator

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

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

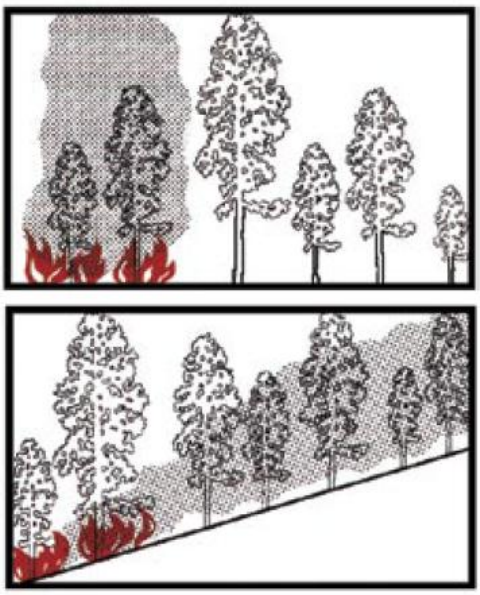
Legend: 5 – Problem may be crucial; 4 – Problem very likely;
3 – Exercise caution; 2 – Problem usually limited;
1 – No rating possible

Wildfire Hazard Maps

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

Slope

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



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

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

Topography

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

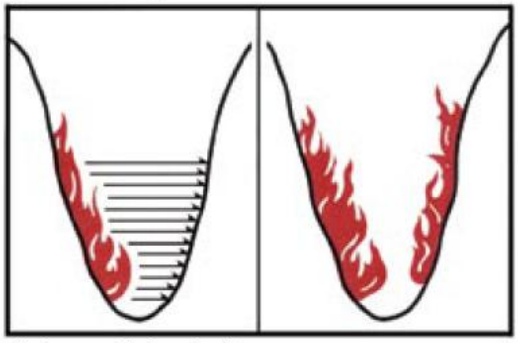
- Chimneys are densely vegetated drainages on slopes greater than 30 percent. Wind, as well as air pre-heated by a fire, tends to funnel up these drainages, rapidly spreading fire upslope.

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

Chimney.

Saddle.

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



4 *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.

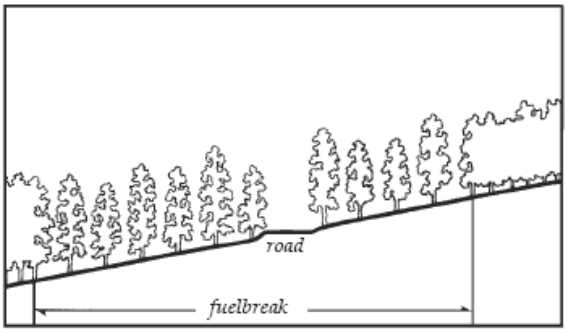
Aesthetics

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:

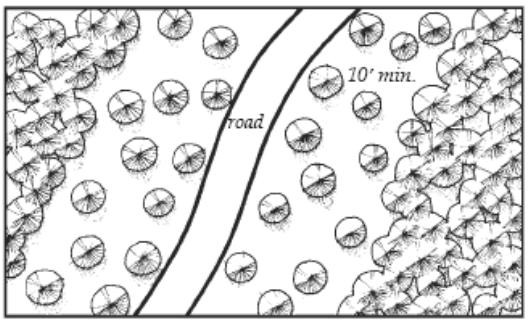
Fuelbreak Width/Slope

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

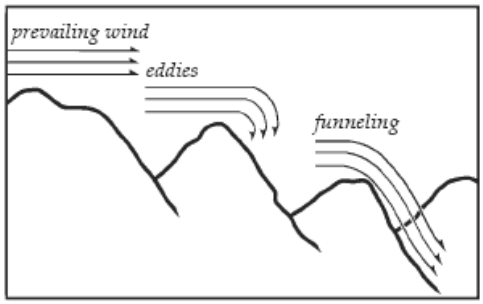
Crown separation is a more critical factor for fuelbreaks than a fixed tree density level. A *minimum* 10-foot spacing between the edges of tree crowns is recommended on level ground. As slope increases, crown spacing should also increase. However, small, isolated groups of trees may be retained for 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.*

H Web References

Resource	Web Site
Colorado Department of Public Health and Environment Source Water Assessment and Protection	http://www.cdphe.state.co.us/wq/sw/swaphom.html
Colorado Forest Industries Directory	http://csfs.colostate.edu/pdfs/COForIndDirectory.pdf
Colorado State Forest Service	http://csfs.colostate.edu/
Colorado State Forest Service Library	http://csfs.colostate.edu/pages/library.html
Critical Community Watershed Wildfire Protection Plan	http://www.colorado.gov/cs/Satellite?blobcol=urldata&blobheadername1=Content-Disposition&blobheadername2=Content-Type&blobheadervalue1=inline%3B+filename%3D%22Critical+Community+Watershed+Wildfire+Protection+Plans+%28CWP%292+Guidelines+for+Implementation.pdf%22&blobheadervalue2=application%2Fpdf&blobkey=id&blobtable=MungoBlobs&blobwhere=1251807302379&ssbinary=true
Division of Fire Protection and Control	http://dfs.state.co.us/
Fire Regime Condition Class	http://www.frames.gov/partner-sites/frcc/frcc-home/
Garfield County	http://www.garfield-county.com/
Garfield County Office of Emergency Management	http://www.garcosheriff.com/emergency_management.html
Grand Junction Dispatch Center	http://gacc.nifc.gov/rmcc/dispatch_centers/r2gjc/
Landfire Geospatial Data	http://www.landfire.gov/products_overview.php
National Fire Protection Association, Firewise Communities	http://firewise.org/
National Fire Weather	http://radar.srh.noaa.gov/fire/
National Climatic Data Center	http://www.ncdc.noaa.gov/
Searchable Grants Database	http://www.rockymountainwildlandfire.info/grants.htm
Source Water Assessment and Protection	http://www.colorado.gov/cs/Satellite/CDPHE-WQ/CBON/1251596793639
USGS Hazard Support System	http://nhss.cr.usgs.gov/
Western Regional Climate Center	http://www.wrcc.dri.edu

List of Preparers

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