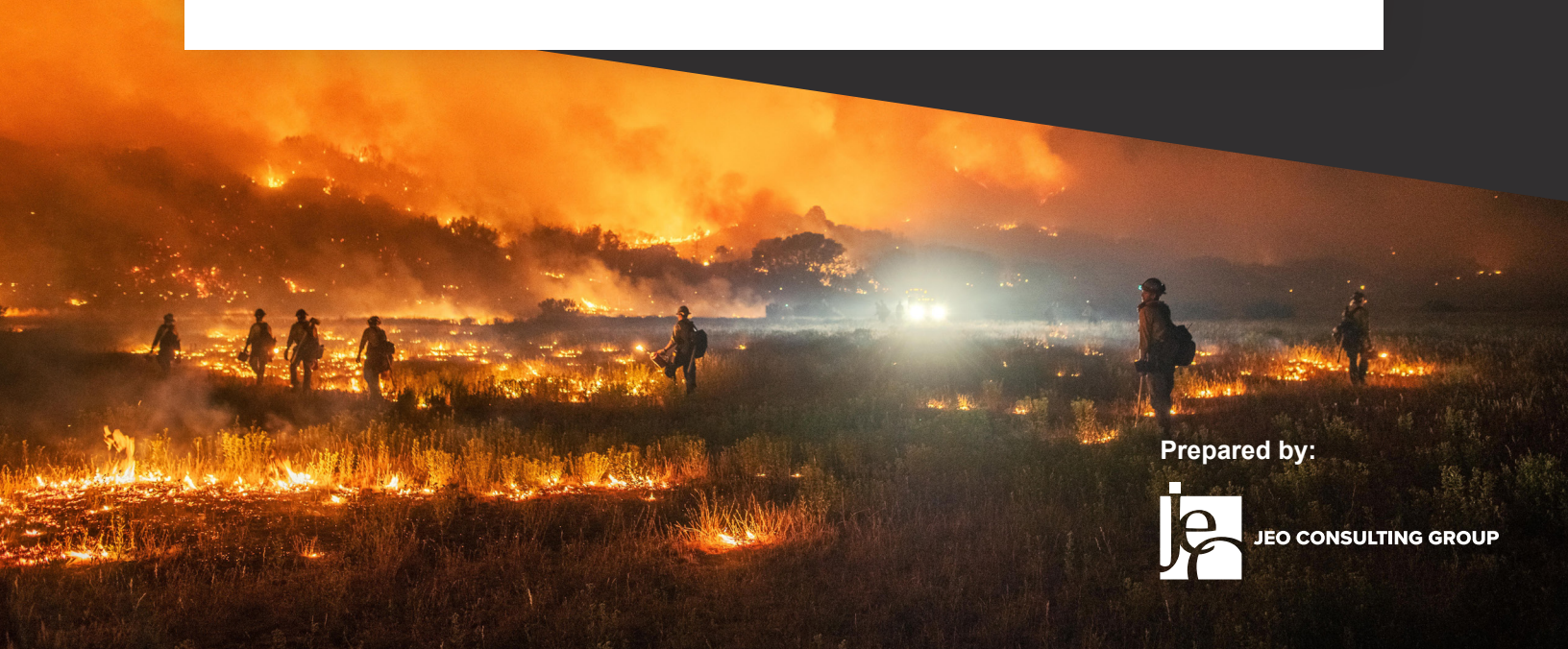




2022 Garfield County Community Wildfire Protection Plan



Prepared by:



JEO CONSULTING GROUP

1. 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 (2022). 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

Date

Garfield County Fire Protection District Representative

Date

Garfield County Fire Protection District Representative	Date
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Garfield County Fire Protection District Representative	Date
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Garfield County Fire Protection District Representative	Date
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Table of Contents

1.	CWPP Certification	1
	Table of Contents	3
	Table of Tables	6
	Table of Figures	6
	List of Acronyms	7
2.	Executive Summary	10
3.	Introduction	12
	The Purpose	12
	The Need	12
	Policy Framework	15
	Existing CWPPs	15
	BLM and USFS Policy	15
	Project Goals and Objectives	16
4.	Wildland Fire Management Primer	19
	Introduction	19
	Wildland Fire Behavior	19
	Ecological Benefits of Wildfire	21
	Prescribed Fire	21
	Hazardous Fuels Mitigation	22
	Site Restoration	23
5.	Planning Process and Community Collaboration	25
	The CWPP Planning Process	25
	Core Planning Team	26
	Fire Authority Meetings	27
	Community Outreach	27
	Public Survey	27
6.	Garfield County Profile	33
	County Overview	33
	Climate	34
	Topography	38
	Wildland Vegetation	38
	Wildfire Protection Authorities	39

Values at Risk	40
Oil and Gas Industry	41
Conservation Districts	42
Insurance Services Office Fire Hazard Ratings	44
7. Risk Assessment	45
Wildfire History	45
Wildland Urban Interface Definition.....	46
Study Area Analysis.....	46
Fire Regime Condition Class.....	58
8. Wildland Fire Emergency Operations and Capabilities.....	60
State and Federal Resources.....	61
DFPC Resources.....	61
U.S. Forest Service	62
Bureau of Land Management	62
Garfield County Resources.....	62
Wildfire Response Capacity	63
Garfield County Wildland Fire Operating Plan.....	66
Community Access and Evacuation	66
Grand Valley FPD.....	66
Carbondale & Rural FPD.....	67
Glenwood Springs FPD	68
9. Wildfire Mitigation Strategy	70
WUI Mitigation Opportunities	70
Mitigation Project Types	70
Proposed Vegetation-Fuel Projects	75
Other Potential Vegetation-Fuels Mitigation Strategies	81
Gain and Maintain Momentum through Public Education.....	81
Fuelbreaks and Defensible Space	81
Structural Ignitability	82
Strategic Shrub and Forest Thinning.....	83
Vegetation-Fuel Treatment Costs.....	83
Project Support and Funding Opportunities.....	84
10. Source Water Protection	87

11.	Monitoring and Evaluation	91
	Community Wildfire Protection Plan Adoption	91
	Sustaining CWPP Momentum	91
	Monitoring and Evaluation	92
12.	Bibliography and Resources	95
13.	Glossary of Wildfire Terms.....	99

Table of Tables

Table 1: Garfield County CWPP Goals and Objectives	16
Table 2: Fire Behavior Characteristics Chart and Fire Suppressions Interpretations	20
Table 3: CWPP Development Process.....	25
Table 4: Garfield County CWPP Core Planning Team Members	26
Table 5: Areas Represented in CWPP Survey.....	28
Table 6: Survey Responses – WUI Questions.....	29
Table 7: Survey Responses – Evacuation Questions.....	29
Table 8: Household Wildfire Mitigation Question	31
Table 9: Survey Responses – Building Code Questions.....	32
Table 10: Garfield County Average Monthly and Annual Temperatures and Precipitation.....	37
Table 11: Wildfire Protection Authorities Response Capabilities in Garfield County.....	39
Table 12: Garfield County ISO Ratings	44
Table 13: Forest Study Area Assets Vulnerable to Wildfire	49
Table 14: Resource Lands Study Area Assets Vulnerable to Wildfire	51
Table 15: Urban Interface Lands Study Area Assets Vulnerable to Wildfire	53
Table 16: Community Hazard Contributing Factors.....	55
Table 17: Fire Regime Condition Class Definition, Hazard Rating, and Garfield County Occurrence.....	58
Table 18: Recommended Fire Protection District Resources and Training Needs	63
Table 19: Wildland Fire Mitigation Project Types.....	70
Table 20: Proposed Vegetation-Fuel Projects.....	76
Table 21: Vegetation-fuel Treatment Alternatives and Costs	84
Table 22: Monitoring Tasks per Objective in Garfield County.....	92

Table of Figures

Figure 1: Garfield County Wildfire Risk.....	14
Figure 2: Social Media Post Example	28
Figure 3: Monthly Average Temperature in Garfield County	34
Figure 4: Colorado Average Temperature (1895-2020).....	35
Figure 5: Average Monthly Precipitation.....	36
Figure 6: Vegetation Types in Garfield County (CSFS)	38
Figure 7: Values at Risk Rating for Garfield County	41
Figure 8: Mount Sopris Conservation District.....	42
Figure 9: South Side Conservation District	43
Figure 10: Bookcliff Conservation District	43
Figure 11: Wildland Urban Interface	48
Figure 12: Forest Study Area Wildfire Hazard Area	50
Figure 13: Resource Lands Study Area Wildfire Hazard Areas.....	52
Figure 14: Urban Interface Study Area Wildfire Hazard Areas	54
Figure 15: Parachute and Battlement Mesa Evacuation Corridors	67
Figure 16: Missouri Heights Evacuation Zones	68
Figure 17: Proposed Vegetation - Fuel Projects.....	80
Figure 18: Home Ignition Zone.....	82

Figure 19: Drinking Water Importance Areas in Garfield County	88
Figure 20: Drinking Water Risk Index in Garfield County	89

List of Acronyms

BLM	Bureau of Land Management
BTU	British Thermal Unit
CAPCD	Colorado Air Pollution Control Division
CDPHE	Colorado Department of Public Health and Environment
CSFS	Colorado State Forest Service
CWPP	Community Wildfire Protection Plan
DFPC	Division of Fire Prevention and Control
DHS	Department of Homeland Security
DOC	Department of Corrections
EFF	Emergency Fire Fund
EOP	Emergency Operations Plan
FD	Fire Department
FEMA	Federal Emergency Management Agency
FMP	Fire Management Plan
FPD	Fire Protection District
FRCC	Fire Regime Condition Class
GARCO	Garfield County
GIS	Geographic Information System
HFRA	Healthy Forests Restoration Act
HMP	Hazard Mitigation Plan
HOA	Homeowners Association
I-70	Interstate 70
ISO	Insurance Services Office
NCIFMU	Northern Colorado Interagency Fire Management Unit
NEPA	National Environmental Policy Act
NIMS	National Incident Management System
NRCS	Natural Resources Conservation Service
NWCG	National Wildfire Coordinating Group
O&G	Oil and Gas
OP	Operating Plan
SEAT	Single Engine Air Tanker
SWAPP	Source Water Assessment and Protection Program
SWPA	Source Water Protection Area
SWPP	Source Water Protection Plan
US DOI	U.S. Department of Interior
UCRIFMU	Upper Colorado River Interagency Fire Management Unit
USFS	United States Forest Service
WERF	Wildfire Emergency Response Fund
WUI	Wildland-Urban Interface

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2. 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 at a higher-level types of wildfire risks, including fuel hazards, structure flammability, vegetation-fuel treatments, and ways to improve fire protection response capabilities. More specifically this is a long-term plan for strategy implementation. 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, especially as drier climate and extended drought conditions persist across the nation contributing to larger and more destructive wildfire events. 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, identifies wildfire threats within these areas, and prioritizes mitigation actions that are designed to reduce wildfire hazards and risks. The accumulation of hazardous fuels and inaccessible terrain 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, private landowners, and other stakeholders 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 core 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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3. Introduction

The Purpose

The Garfield County Community Wildfire Protection Plan (CWPP) is a strategic plan that identifies specific wildland fire risks facing communities and districts within Garfield County, Colorado and provides prioritized mitigation recommendations designed to reduce those risks.

The need for a CWPP is crucial as families and businesses continue to develop into 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.

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. CWPPs are designed to 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 provided 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.

The CWPP brings together diverse local interests to discuss their mutual concerns for public safety, community sustainability, and natural resources. The plan 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 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 are the opportunity for jurisdictions to establish a localized definition and boundary for the WUI and to identify or shape fuels treatment priorities on surrounding federal and non-federal lands in Garfield County.

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.

The Need

Wildfire is a naturally occurring and important component of the oak shrubland, pinyon-juniper forest, shrubland, and spruce-fir forest vegetation types that dominate much of Garfield County, Colorado. Some of these vegetation types are “fire-dependent” ecosystems that have evolved over thousands of

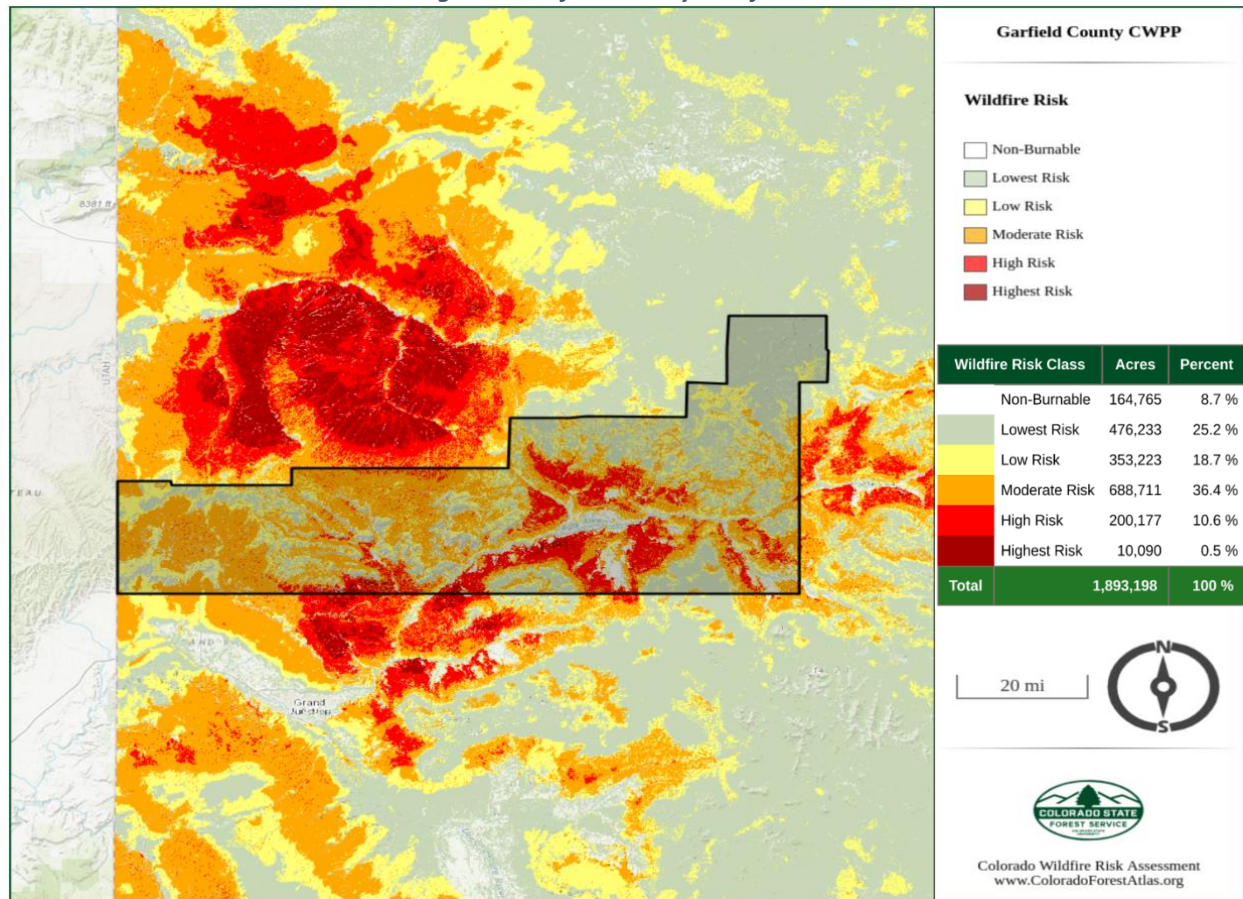
years to be resilient to wildfire occurrence, and in the case of many plant species, dependent on wildfire to maintain stand health and trigger reproduction. Even though fires naturally occur and are important for ecosystem function, they present considerable risks to human welfare and economic values.

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 suppression led to a wide range of negative consequences. Without natural wildfire cycles, weedy species such as cheatgrass, shrub growth, or other forest stands have accumulated to hazardous levels.

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 2017, CSFS sponsored a Risk Assessment Summary Report to assess the risk of wildfire in many of the forested counties including Garfield. The resulting report provided a wide range of information including a composite wildfire risk. Wildfire risk ratings are obtained by combining the probability of a fire occurring with the individual risk layers and values (WUI risk, drinking water risk, forest assets risk, and riparian areas risk) (Figure 1). Approximately, 48 percent of the County is classified with a moderate to highest wildfire risk. The wildfire risk areas were identified through a spatial analysis using Geographical Information System (GIS) 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: Garfield County Wildfire Risk



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).
- 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 Wildland Fire Operating Plan provides intergovernmental mutual aid agreements among fire authorities operating within the county.
- 2022 Garfield County Hazard Mitigation Plan (HMP)

Existing CWPPs

As of March 2021, three CWPPs have been completed and approved within Garfield County. These CWPPs are on file with their respective FPD, Garfield County Office of Emergency Management, and Colorado State Forest Service. 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. These CWPPs are:

- Garfield County Community Wildfire Protection Plan, May 2012.
- Glenwood Springs Fire Protection District; Wildland Urban Interface Community Protection Plan; April 2007.
- Community Wildfire Protection Plan: Selected Areas within the Burning Mountains Fire Protection District; Garfield County, Colorado; February 2008.
- Missouri Heights Wildfire Protection Plan, 2009.

Other surrounding areas have developed county-level CWPPs which should be reviewed and evaluated for partnership opportunities in fuel reduction priority areas on adjacent lands. These include Mesa County, Rio Blanco County, Routt County, Eagle County, and Pitkin County.

BLM and USFS Policy

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.

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 landowners 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.

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	Objectives
Facilitate and develop a countywide CWPP	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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 Districts (FPDs), and communities.
Facilitate emergency planning	<ul style="list-style-type: none"> Develop strategies to strengthen wildfire emergency management, response, and evacuation capabilities.

Facilitate public outreach	<ul style="list-style-type: none">• 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.
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4. Wildland Fire Management Primer

Introduction

Wildland fire is defined as any fire burning in wildland fuels and includes prescribed fire, wildland fire for resource benefit, and wildfire events. 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 and canopy 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.

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 described in the table below 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 identified action stages for decision makers. Specific trigger points can indicate when to mobilize various resources, change fire suppression strategies, or request additional specialized equipment and/or assistance. It is important to note that the listed categories do not to be used for personnel safety measures. Wildfire events are dangerous and can shift rapidly, putting first responders and staff at risk. According to Wilson (1977), most firefighter fatalities occur in small fires.

Table 2: Fire Behavior Characteristics Chart and Fire Suppressions Interpretations

Flame Length (Ft)	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 hand tools. 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 (NWCG) 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 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.

Groupings of trees comprise a mosaic and effective management of the mosaic can influence fuel loads, such as with Pinion/Juniper stands. Forestry managers may increase spacing between groups to reduce potential crown spread. However, in some species of trees, root interdependency is an important element for trees survival (rhizome interactions).

Potential surface fire behavior may be estimated by classifying vegetation in terms of Fire Behavior Fuel Models and using established mathematical models to predict potential fire behavior under specific climatic conditions. 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.

Ecological Benefits 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 phenological, 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 led 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 as it is highly flammable and burns rapidly. Because of its continuous nature in many vegetation types it can easily 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.

Prescribed Fire

Prescribed fire is a, typically small scale, planned fire and 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 required to conduct prescribed fires and can be 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.

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. 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. 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.

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 called wind-throw. 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. 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. 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 100 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 the CSFS Home Ignition Zone Guide.

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, designated safety zones (for areas with limited 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.

While reducing hazardous fuels around a structure, it is very important to prevent fire loss. Recent studies indicate that, to a great extent, the structure hardening attributes determine ignitability. A report from the National Fire Protection Association in 2017 noted that home ignition during extreme wildfire is primarily determined by the condition of the home in relation to its immediate surroundings (National Fire Protection Association, 2017). 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).

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).

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5. Planning Process and Community Collaboration

The CWPP Planning 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 3: 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

Core Planning Team

The initial step in the development of the CWPP is to organize a core planning team that serves as the decision-making committee (Table 3). The Garfield County CWPP core planning team consisted of representatives from local governments, local fire authorities, BLM, USFS, and the CSFS.

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 stakeholders as the plan is implemented. Active collaboration between agencies and communities is an important CWPP component to promote sharing of perspectives, plans, priorities, and other information useful in fuels and land management activities.

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

Collaborative planning team meetings were convened throughout the course of the CWPP development. The purpose of each meeting focused on a specific aspect of the CWPP planning process. Meetings were convened on March 1st, 2021; July 16, 2021; and October 18, 2021, virtually and in-person at the Rifle Sheriff's Annex.

Table 4: Garfield County CWPP Core Planning Team Members

Name	Agency/Jurisdiction
Chad Whiting	Garfield County Emergency Management
Levi Burris	Garfield County Sheriff's Department
Chris Bornholdt	Garfield County Emergency Management
Orrin Moon	Colorado River Fire Rescue
Greg Bak	Glenwood Springs Fire Department
Gary Tillotson	Glenwood Springs Fire Department
Chris Jackson	Grand Valley Fire Protection District
Bill Gavette	Carbondale & Rural Fire Protection District
Dan Nielsen	Upper Colorado River Fire Management
Patrick Kieran	Upper Colorado River Fire Management
Ron Rousineau	Colorado Forest Service
Stefan Brune	Colorado Forest Service
Kamie Long	Colorado Forest Service
Louisa Morrissey	Mountain Springs Ranch

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 core 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 core planning team representatives may, but are not required to, assist in the implementation of

the CWPP action plan. Continued public meetings and online engagement are recommended as means to generate additional support and maintain momentum.

CWPP vegetation-fuel treatment recommendations were prioritized through an open and collaborative effort with the planning team. Prioritized treatments target wildfire hazard reduction in the WUI, 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, and defensible space recommendations.

Fire Authority Meetings

Fire authorities in Garfield County include the FPDs, Upper Colorado River Interagency Fire, Colorado Interagency Fire Management Unit, and Colorado Division of Fire Prevention and Control. These agencies coordinate and collaborate to provide protection to human welfare, infrastructure, and other values from wildfire loss. Meetings were held with each of the fire authorities to identify current resource capacity, potential vegetation-fuel projects, and resource needs to improve response capabilities.

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;
- Social Media;
- Radio;
- Virtual open house;
- 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 development 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.

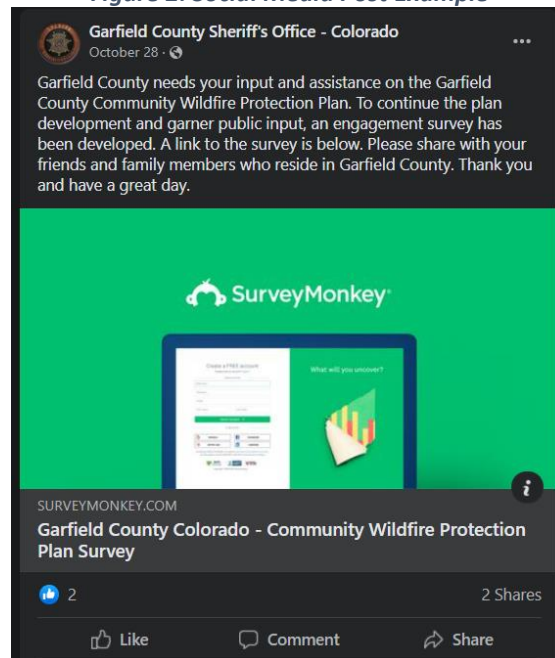
Public Survey

As a method to engage the general public and receive more local input on wildfire risks and concerns in the county, a public survey was developed by Garfield County. The goal was to capture local concerns, priorities, and ideas.

As noted by the local planning team and fire officials, finding effective ways to engage the public and gain feedback can be challenging CWPPs are complex planning tools. The plan addresses issues that community members may be unaware of and identifies potential impacts that people may not have dealt with. In addition, the CWPP showcases numerous solutions to local wildfire concerns or problem areas which emphasis the need to successfully engage the public.

Social media posts were created and shared by Garfield County and local fire officials which linked to the project survey. The survey was also sent directly to all planning officials engaged throughout the CWPP process who were also encouraged to share the survey with their teams, departments, and local stakeholders.

Figure 2: Social Media Post Example



Questions about prior knowledge of the Wildland Urban Interface, evacuation protocols, communication types, and what community members would like to see done locally were asked through the survey. In total, 42 survey responses were collected. Specific areas represented in the survey are listed in the table below.

Table 5: Areas Represented in CWPP Survey

Represented Area	Number of Responses	Percentage
Battlement Mesa	3	8%
Carbondale	2	5%
Glenwood Springs	9	23%
Missouri Heights	1	3%
New Castle	3	8%
Other	4	10%
Rifle	7	18%
Silt	8	20%
Unincorporated County	3	8%

The first questions in the survey asked residents about the WUI – both if they were familiar with the term and, if so, did they live in the WUI or other fire prone areas. In response, only half of respondents were familiar with the WUI and of those 40% noted they lived within the WUI. These responses indicate a need for additional education outreach from local fire officials to residents to help identify where WUI zones or fire prone areas are.

Table 6: Survey Responses – WUI Questions

Do you know what the Wildland Urban Interface (WUI) is?	
Response	Percentage
Yes	50%
No	50%
Do you currently live in a Wildland Urban Interface (WUI) zone or fire prone area?	
Yes	40%
No	18%
Unknown	43%

Wildfires are becoming a more common and severe local event in the county with several contributing factors affecting frequency and magnitude of each fire. Respondents were asked, *“To the best of your knowledge, what are the greatest contributing factors to wildfires starting or spreading in your area?”* with answers ranked high to low listed below:

1. Weather conditions (temperature, wind speed, lightning strikes)
2. Human-started fires
3. Climate conditions (periods of drought or extreme heat)
4. Dead vegetation buildup
5. Tree density
6. Housing density and/or building materials types
7. Dilapidated structures
8. Other: powerlines and new home construction amongst non-mitigated areas with dense fuel loads; burning coal seam fires

An additional key component and goal of the survey was to ask about evacuation experiences and barriers for residents. Due to the unique geographic footprint of the County, evacuation protocols are a challenge to develop. Each wildfire event spreads in a unique matter and may block various transportation corridors at different periods of time, thus limiting the ability of local emergency managers and fire responders from pre-identifying specific evacuation corridors. The following table summarizes evacuation related questions.

Table 7: Survey Responses – Evacuation Questions

Are you prepared to evacuate if provided information on where and how to evacuate?	
Response	Percentage
Yes	85%
No	13%
Unknown	3%
What would be your most serious obstacle if you needed to evacuate?	
Blocked roads from debris	5%

Are you prepared to evacuate if provided information on where and how to evacuate?	
Flames interrupting evacuation route	22%
Inability to evacuate (no vehicle, funds to evacuate, pets)	7%
Lack of information on where to evacuate to	24%
Smoke	2%
Not enough egress routes	2%
Traffic	37%

Lack of information about evacuation routes or instructions was noted as a primary barrier to local residents. The majority of respondents indicated the best way to share information about preparing for a disaster is through emergency text alerts (36 votes), County/Community website posts (14 votes), social media posts (13 votes), and then local news stations (6 votes). Other unique communication methods which may be used to share information can include: sharing information at social events, public meetings, flyers/brochures from schools, email, local nonprofits and community groups, and YouTube videos.

Oftentimes implementing household mitigation actions can be a challenge for homeowners due to a variety of factors. To best tailor outreach strategies in the future, the survey asked what these primary challenges were.

Table 8: Household Wildfire Mitigation Question

What measures have you taken to protect your home or property from wildfire?				
	Have Done	Plan to Do	Not Done	Unable to Do
Built structures or home with fire resistant materials	18%	0%	41%	41%
Retrofitted home with fire-resistant building or roofing materials	31%	0%	38%	31%
Cleared litter/debris/vegetation/combustible materials from around your home	78%	8%	8%	8%
Signed up for emergency notifications system through county dispatch	85%	8%	5%	3%
Install sprinklers/fire suppression resources	18%	0%	56%	26%
Identified possible evacuation options from your neighborhood	79%	15%	5%	0%
Made preparations to evacuate from your home if needed	64%	33%	3%	0%
Built structures or home with fire resistant materials	18%	0%	41%	41%
Retrofitted home with fire-resistant building or roofing materials	31%	0%	38%	31%
Cleared litter/debris/vegetation/combustible materials from around your home	78%	8%	8%	8%
Signed up for emergency notifications system through county dispatch	85%	8%	5%	3%

For survey respondents who noted they had not taken measures to protect their homes or properties from wildfire, the following reasons were ranked from greatest to least hinderance:

1. Cost or lack of financial resources
2. Lack of direction/knowledge
3. Lack of home ownership/rent properties
4. Surrounding areas/neighbors pose greater risk
5. Age of home
6. Limited opportunity for mitigation projects

One of the most common and effective strategies to address wildfire risk at the local level is through adopting and enforcing building codes. Respondents were asked how they felt about the current building codes established in Garfield County. The majority of responses indicated *Codes should be stronger (36% of responses)* or that the current codes were *Unknown (38% of responses)*. The following table lists responses provided as to why they chose their responses.

Table 9: Survey Responses – Building Code Questions

How do you feel about current building codes and wildfire prevention ordinances in place?	
Response	Percentage
Codes are too strong	3%
Codes are strong enough	13%
Codes should be stronger	36%
Indifferent	10%
Unknown	38%

Why did you make this selection?	Number of Votes
Need for healthy balance between development and restrictive codes	1
Local leaders should be doing more to address and enforce codes.	3
There is a lack of accountability	2
Lack of knowledge of current codes/residents don't know what codes are in place	8

Lastly, respondents were asked what they would like to see the County and local fire districts do in the future to protect people and infrastructure from future wildfires. Specific suggestions and common themes are listed below.

- Increase local fire department funds to adequate staff departments and pursue projects
- Provide financial assistance for hazardous fuels mitigation/removal
- Remove hazardous fuels from public spaces and roadways
- Improve evacuation or other transportation routes
- Increase local education and encourage residents to identify evacuation routes, pursue household mitigation, and utilize emergency alert systems
 - Utilize local school districts for education to youth
- Assist with home wildfire risk assessments
- Implement and enforce fire ban ordinances and fire-resistant building codes
- Ban the sale of or use of fireworks during wildfire season
- Check vulnerable areas for safe fire practices (campers, campgrounds, national forests, etc)
- Establish a regional/community WildFire Council to coordinate local resources and identify community risk areas

6. Garfield County Profile

County Overview

Garfield County is located on the “West Slope” in the scenic plateau and canyon country of west-central Colorado. The City of 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.

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

A key arterial transportation route for the State of Colorado, Interstate 70, bisects the county from east to southcentral Garfield County. Other major transportation routes include 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 U.S. Census Bureau, Garfield County’s population in 2010 was 56,389, 57,076 in 2015, and 59,605 in 2020.

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. Agriculture and forestry sectors will experience an increase in droughts, an increase in grass and wildfire events, changes in the growth cycle as winters warm, an influx of new and damaging agricultural diseases or pests, and changes in the timing and magnitude of rainfall. The Plant Hardiness Zone map available for the United States has shifted over the past decade and changed the annual growing season and expected agricultural production conditions. Colorado and Garfield County are particularly vulnerable to increased pest pressures on agricultural and forested lands. These added stressors could have devastating economic effects if new forest management practices are not adopted. 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 play 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.

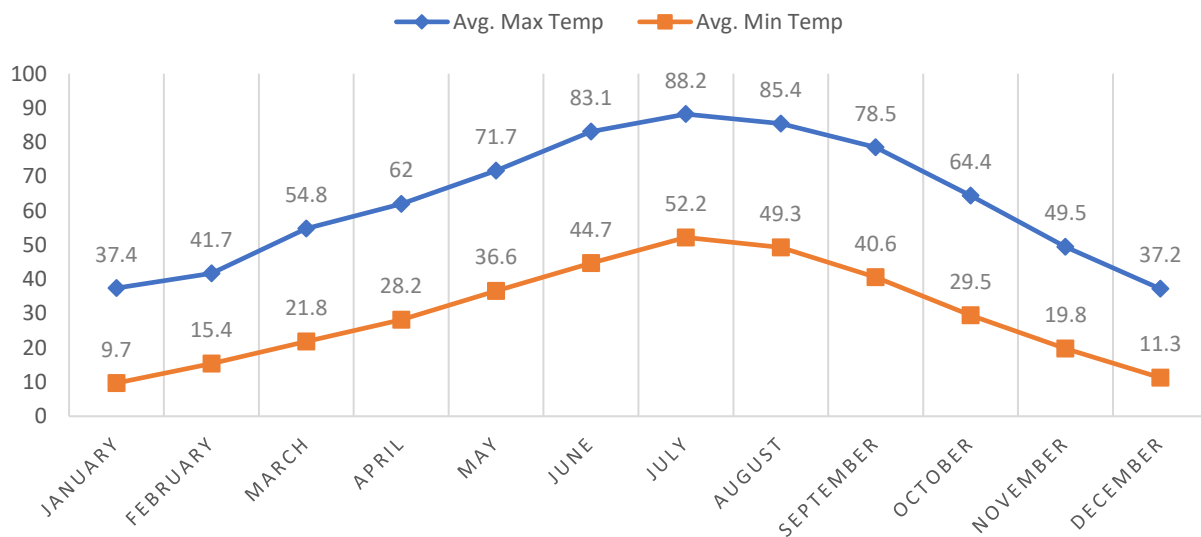
Garfield County is a desirable place to live because of diverse ecosystems, recreational opportunities, and aesthetics. However, the County is characterized by factors that promote catastrophic wildfires that

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.

Climate

The climate of Garfield County is generally semi-arid with hot summers and cold winters. Average monthly precipitation varies from a low during the winter months to high during the fall months. However, all months do receive precipitation. Gusty and sustained winds are also common throughout the County. The average wind speed reported in the county for severe wind is 58 mph.

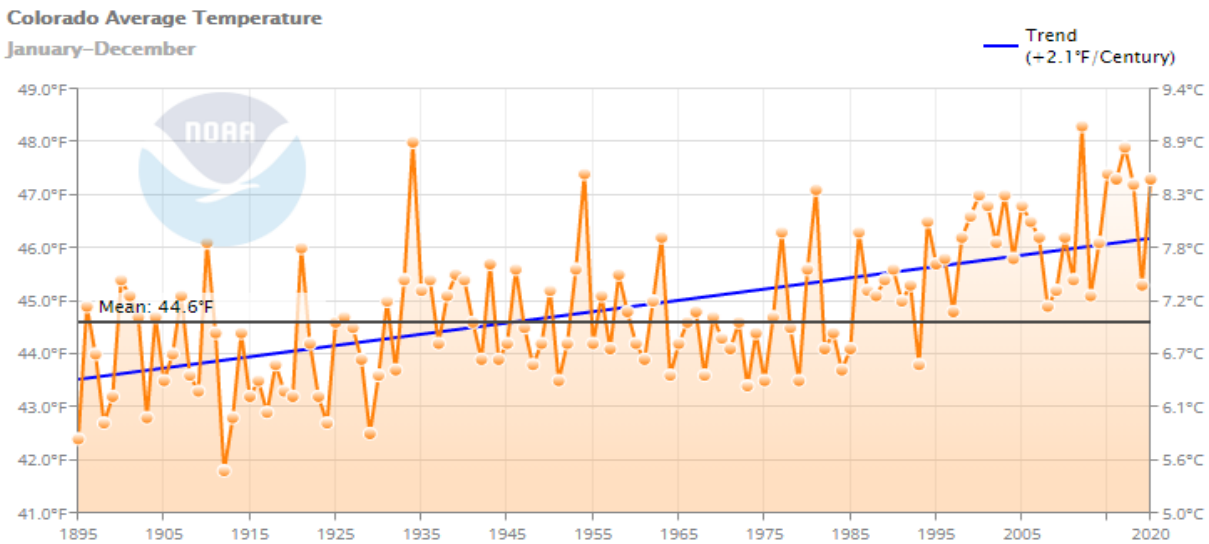
Figure 3: Monthly Average Temperature in Garfield County



Source: Monthly Climate Normals - High Plains Regional Climate Center, 2021

Since 1895 Colorado's overall average temperature has increased by 2.1°F. While overall temperature shifts have not been consistent, the trend for increasing temperatures is apparent. Climate modeling suggests warmer temperature conditions will continue in the coming decades and rise steadily into mid-century. This trend will likely contribute to an increase in the frequency and intensity of wildfire events, due to reduced snowpack, drought conditions, and higher temperatures. Temperature increased across the southwest region with the greatest increases in southern California and western Colorado.

Figure 4: Colorado Average Temperature (1895-2020)



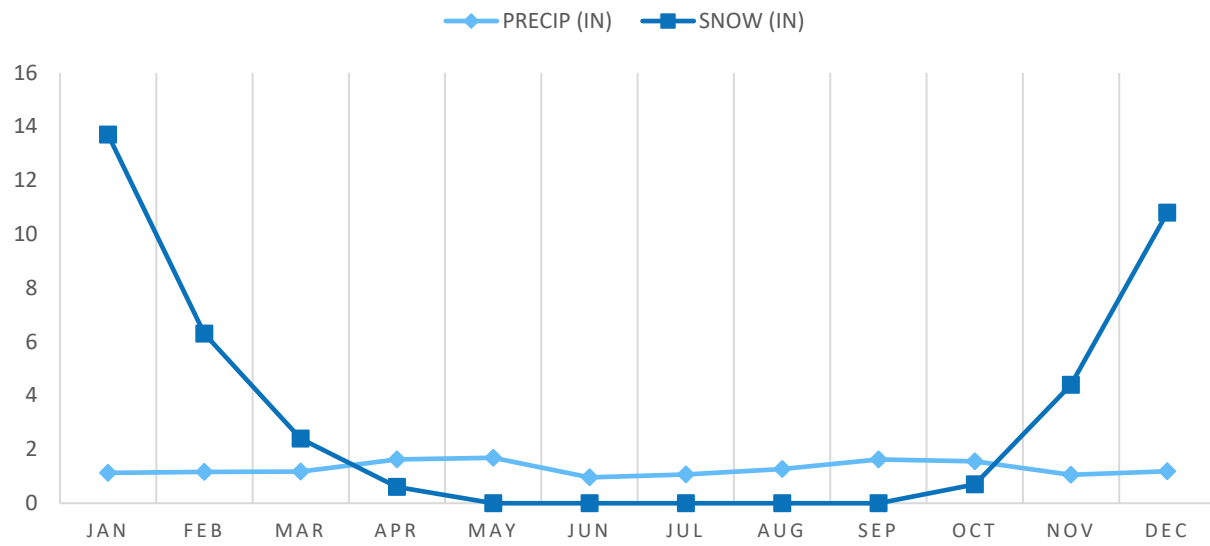
Source: National Oceanic and Atmospheric Administration (NOAA), 2020¹

Additionally, the length of the frost-free season has been increasing nationally since the 1980s. While a longer warm season may provide some additional recreational opportunities in western Colorado, concurrent changes in temperature, water availability, pest pressures, and tree mortality may exacerbate wildfire event conditions.

Since 1895, yearly annual precipitation for Colorado has decreased slightly (decline by 1.8" per century). Snow droughts can arise from a lack of precipitation (dry snow drought), temperatures that are too warm for snow (warm snow drought), or a combination of the two. Rivers and reservoir water sources are increasingly important to communities and residents in the planning area to meet water needs during periods of shortage.

¹ NOAA. 2020. "Climate at a Glance: Statewide Time Series." Accessed October 2021. https://www.ncdc.noaa.gov/cag/statewide/time-series/25/tavg/12/12/1895-2020?base_prd=true&begbaseyear=1901&endbaseyear=2000&trend=true&trend_base=100&begtrendyear=1895&endtrendyear=2020

Figure 5: Average Monthly Precipitation



Source: NCEI, 1991-2020

Table 10: Garfield County Average Monthly and Annual Temperatures and Precipitation

Climate Attribute	Month												
	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Overall Monthly Average
Glenwood Springs (2006-2020)													
Avg. Max Temp (F)	36.0	41.5	53.4	60.2	69.9	83.9	89.4	86.6	79.2	64.1	51.0	36.6	62.7
Avg. Min Temp (F)	12.4	18.6	26.8	32.8	39.9	48.1	54.7	52.3	44.4	33.4	23.8	15.0	33.5
Average Total Precip (in.)	1.08	1.07	1.18	1.64	1.69	0.75	1.35	1.38	1.51	1.65	0.88	1.1	1.3
Rifle (2006-2020)													
Avg. Max Temp (F)	35.9	43.0	55.7	63.3	73.6	87.8	92.4	89.4	81.1	64.9	51.8	36.6	64.6
Avg. Min Temp (F)	12.1	19.2	27.5	32.9	40.5	49.3	56.8	54.3	45.9	33.9	24.0	14.4	34.2
Average Total Precip (in.)	0.68	0.56	0.7	1.0	1.09	0.5	0.96	1.02	1.17	1.22	0.54	0.62	0.8

Source: NOAA NCEI Climate Normals, 2006-2020

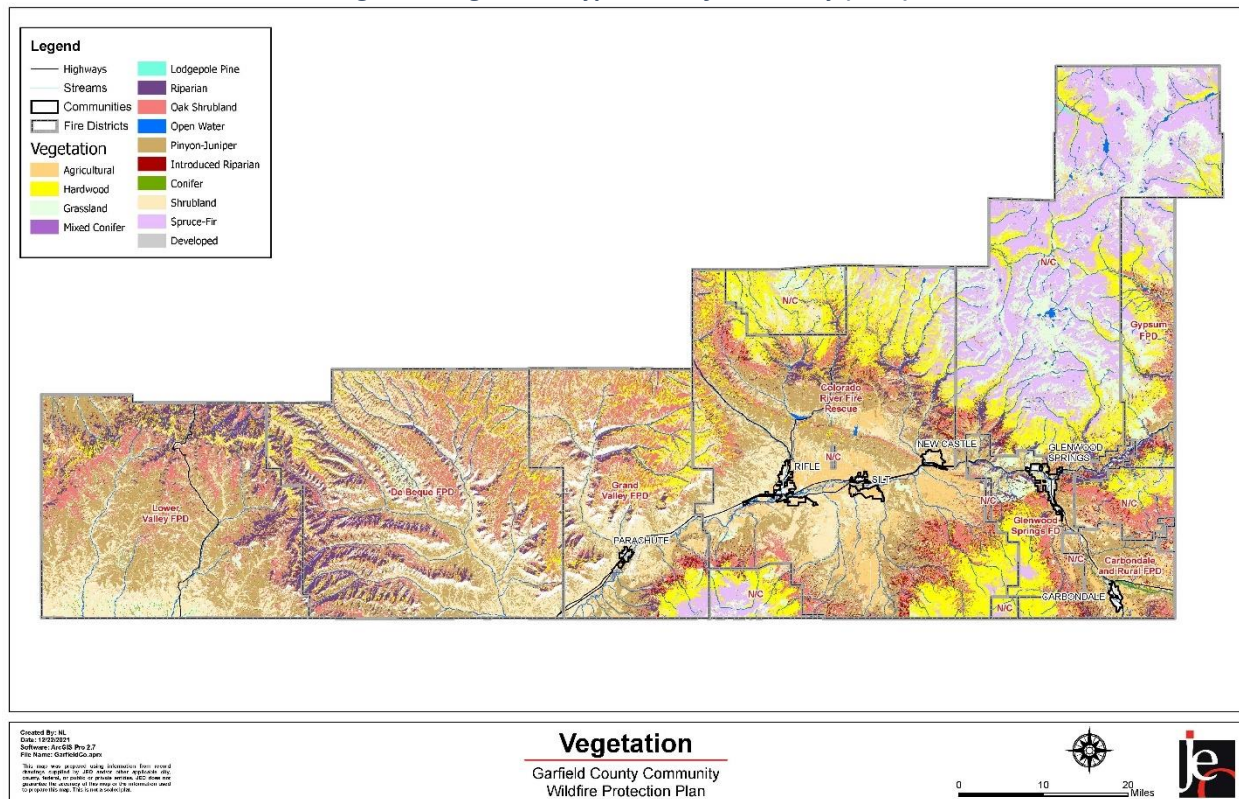
Topography

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 4,941 feet along the Colorado River and other streams, such as Parachute Creek, to the high peak at Flat Top Mountain at 12,354 feet.

Wildland Vegetation

Garfield County is home to a variety of vegetation types ranging from lodgepole pine forest (~0.1%) to shrubland (18.6%). The four largest vegetation types in the county include shrubland, pinyon-juniper forest, oak shrubland, and spruce-fir. The following figure shows vegetation types in the county.

Figure 6: Vegetation Types in Garfield County (CSFS)



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 account for approximately 2.5% of lands in Garfield County and occur primarily around

communities and include irrigated and non-irrigated pastures, alfalfa fields, and orchards. Structures in the WUI are also a fuel source.

Existing vegetation contribute to fuel sources for wildland fire and have a direct effect on fire behavior. 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.

Wildfire Protection Authorities

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

Table 11: Wildfire Protection Authorities Response Capabilities in Garfield County

Fire Protection Authority	Apparatus
Colorado River Fire Rescue	4 type 1 engines 2 type 3 engines 5 type 6 engines 3 type 1 tactical tenders 2 type 2 tenders 1 mod seasonal
Carbondale & Rural FPD	2 type 6 engines 5 type 3 engines 2 1800-g tactical tenders
De Beque FPD	3 brush trucks 2 4,000-g tenders 1 3,500-g tender 2 drop tanks 1 structure engine
Glenwood Springs FD	4 type 1 engines 2 type 3 tenders 2 type 6 engines
Grand Valley FPD	3 type 6 brush trucks 4 all-terrain vehicles 2 type 1 engines 1 class S2 tender 1 class S3 tender
Gypsum FPD	1 type 3 brush truck 2 tenders
Lower Valley FPD	2 type 6 engines 1 4500-g tactical tender 1 2600-g class A tender 2 class A structural engines
Upper Colorado River Interagency Fire Management Unit	2 type 6 engines 1 type 4 engine

Fire Protection Authority	Apparatus
	1 type 3 helicopter from June 1-Aug 30
Northern Colorado Interagency Fire Management Unit	1 type 6 engine 1 enhance type 6 engine
Division of Fire Protection and Control	4 single engine air tankers available upon request

Source: FPDs

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 solely 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 OP.

Values at Risk

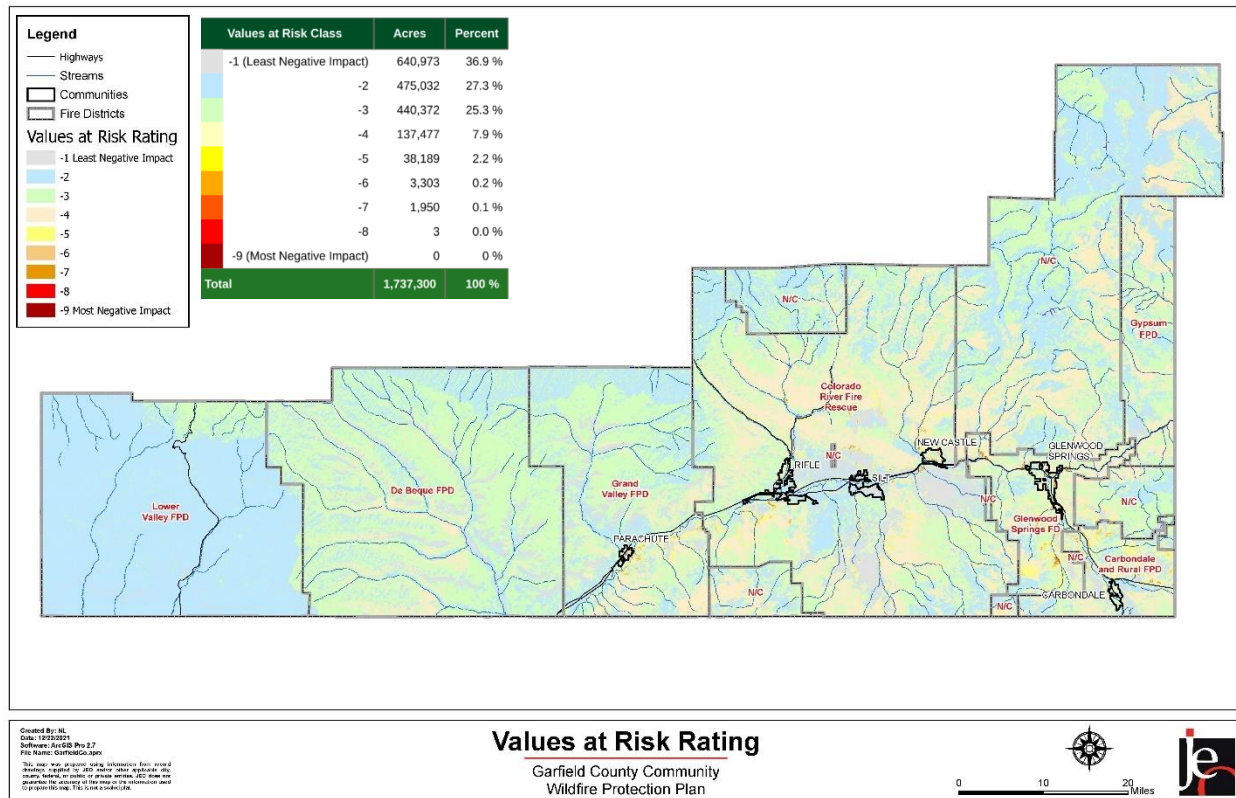
Human welfare receives priority protection in the event of a wildfire. Economic and ecological values are secondary to human welfare, and they receive proper protection through collaborative planning as presented in this CWPP. Economic and ecological values are intermixed in Garfield County because of the economic base from the O&G industry, agriculture, tourism, and recreation. Oil and gas 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. The Colorado State Forest Service evaluated Values at Risk Ratings across the entire state. For Garfield

County, many of the higher at-risk classes are located near the most densely populated portions of the county exacerbating potential risks for residents.

Figure 7: Values at Risk Rating for Garfield County



Oil and Gas Industry

Extensive 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 both positive and negative challenges to wildfire management including:

- O&G equipment or infrastructure can spark wildfire events in remote areas.
- 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.

Conservation Districts

The three conservation districts in Garfield County are Mount Sopris, South Side, and Bookcliff. 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.

Figure 8: Mount Sopris Conservation District

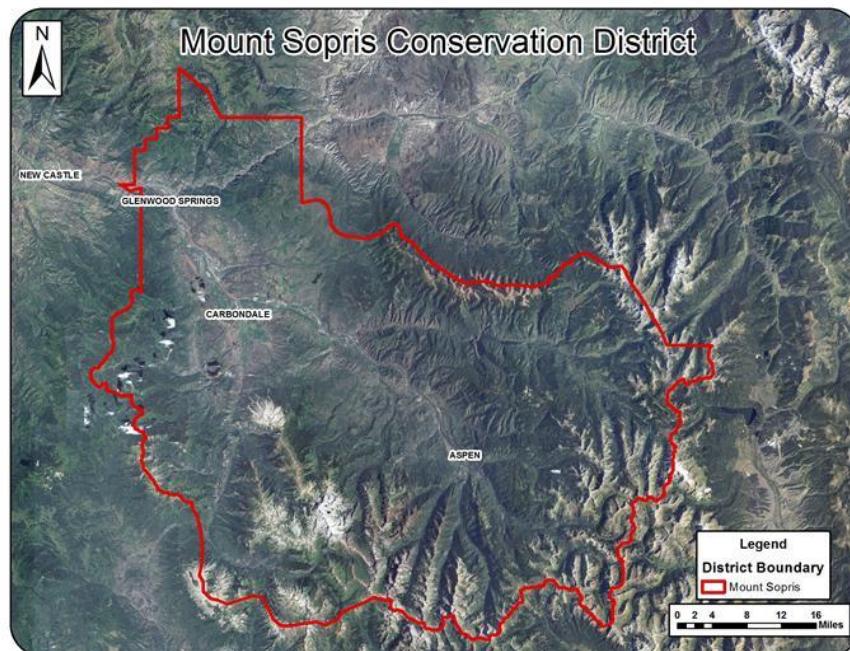
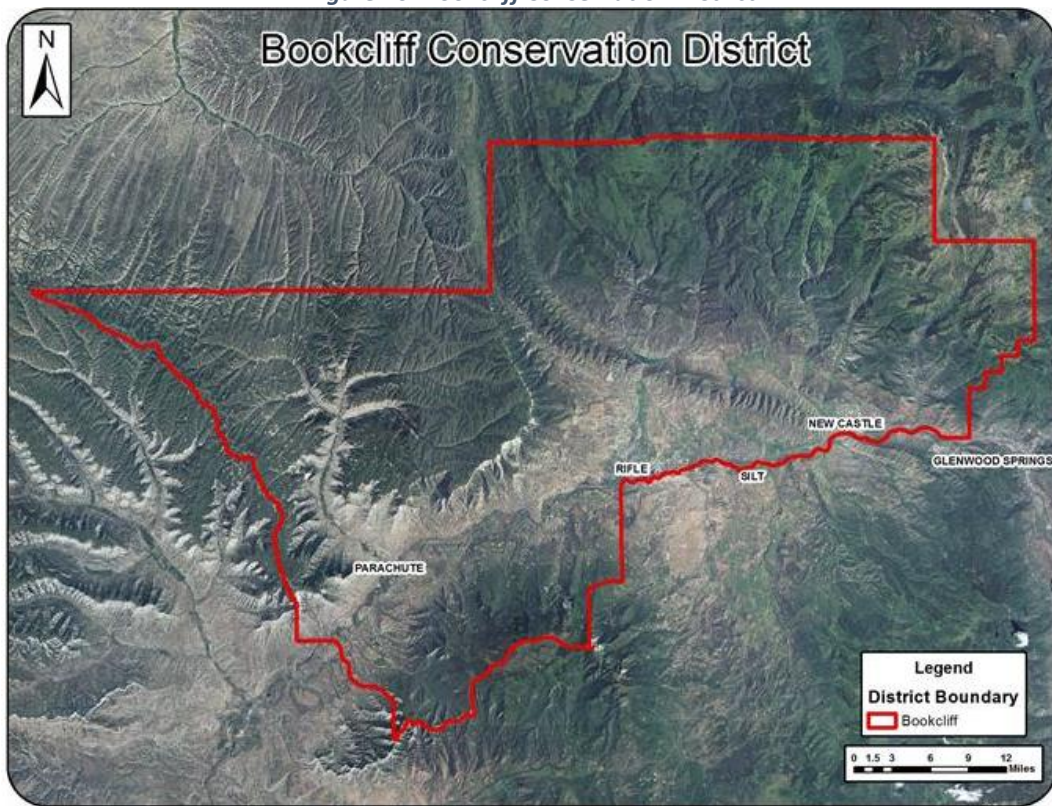


Figure 9: South Side Conservation District



Figure 10: Bookcliff Conservation District



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 within Garfield County range from 3 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 12: Garfield County ISO Ratings

Fire Protection District	ISO Rating
Colorado River Fire Rescue	3 within 5 miles of fire station; 5-7 miles is a 10-W; 10 elsewhere
Carbondale & Rural	5 in hydrant areas; 10 elsewhere
De Beque	6
Glenwood Springs	2 within 5 miles of fire station; 10 elsewhere
Grand Valley	3 and 3Y
Gypsum FPD	5 in hydrant areas; 8 elsewhere
Lower Valley FPD	6

Source: Garfield County FPDs

7. Risk Assessment

Vegetative conditions vary widely throughout the County, ranging from semi-desert grass and shrubland to sub-alpine forests. Much of the development in the County is located in the lower elevation zones of sagebrush, Gambel oak, and pinyon-juniper woodlands. The combination of steep terrain, highly flammable vegetation, and hot, dry summers creates a high-risk situation for wildland fire.

People living in or near wildland settings in Garfield County are vulnerable to the threat of wildfire. The development of homes and other structures is encroaching into the forest wildland and natural areas and is expanding the Wildland-Urban Interface. Interface neighborhoods are characterized by a diverse mixture of varying housing structures, development patterns, ornamental and natural vegetation, and natural fuels. Problems can arise if this new development increases the amount of fuel without coordinated thinning of the forests and the creation of defensible space around homes.

In the event of a wildfire, vegetation, structures, and other flammables can combine to create unwieldy and unpredictable events. Factors relevant to the fighting of such fires include access, firebreaks, proximity of water sources, distance from fire stations, and available firefighting personnel and equipment. The vulnerability of structures and homes in the interface area is increased by: combustible roofing and construction material; no/insufficient defensible space; poor access to structures; heavy natural fuel types; steep slopes; limited water supply; and winds over 30 miles per hour.

Much of the land in Garfield County is publicly owned and managed under federal regulations. While this land may have higher fire risk, the risk incurred by people, economic factors, or physical infrastructure in these areas is minimal.

Wildfire History

Wildfire occurrence throughout Garfield County is a common and prevalent hazard event. The major fire season in Garfield County primarily runs from April through October; however, wildfires can occur throughout the year and many fire officials have stated fire season lasts all year long in Colorado. Fires occur in all FPDs with lightning strikes being the primary cause.

Garfield County is a fire-prone area. Data from the Upper Colorado River Interagency Fire Management Unit shows that between the years of 1980 to 2016, Garfield County experienced 2,288 events and averaged 64 fires per year. There are undoubtedly more fires occurring that are unaccounted for through the federal/state reporting system.

While most fires are relatively insignificant in terms of size and fire intensity, several high-intensity fires have not only burned thousands of acres but also posed significant threats to structures or other human developments. Large, catastrophic fires have occurred 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. Large fires have also occurred in the conifer forests in the north-eastern portion of the County on USFS lands. Most large fires in the County quickly cross ownership lines and require a multi-jurisdictional response.

Historically notable fires include: the Battlement Creek Fire (1976: 3 firefighter fatalities and 1 pilot fatality); Battlement Mesa Fire (1987); the South Canyon Fire (1994: 14 firefighter fatalities); the Coal

Seam Fire (2002) that burned into the town limits of Glenwood Springs and covered over 12,000 acres; Pine Gulch Fire (2020) which burned 139,007 acres (101,714 BLM acres and 35,791 private acres); and the Grizzly Creek Fire (2020) which burned 32,631 acres.

Specifically, the Battlement Creek Fire (1976) had four fatalities – three fire fighters, one pilot fatality the day prior, and one fire fighter with severe injuries - while the South Canyon Fire (1994) had 14 firefighter fatalities associated with them. The Coal Seam Fire (2002) burned into the town limits of Glenwood Springs and covered over 11,000 acres. The 2020 fire season was particularly devastating for Garfield County. While full comprehensive data for the season is not yet available, two major fires, Pine Gulch Fire and Grizzly Creek led to considerable resource expenditure and effort for local fire districts. Summaries from these events are listed below:

- **Pine Gulch:** The Pine Gulch Fire was started by a lightning strike on July 31, 2020, approximately 18 miles north of Grand Junction, Colorado. Initial Attack resources were unable to corral this remote wildfire as it spread rapidly through grass, sage, pinyon juniper and fir. The combination of drought-stressed vegetation, unseasonably hot weather and steep terrain led to weeks of active burning. Smoke columns were often visible from Grand Junction and the surrounding area as the wildfire exhibited extreme fire behavior. During the night of August 18, the fire grew quickly due to thunderstorm winds up to 40 mph for a three to four hour period. As a result, the fire increased by more than 30,000 acres that night. Firefighters worked to protect homes and outbuildings using a combination of bulldozers and handcrews to build firelines. Road systems were used as control lines where crews initiated firing operations to slow the fire spread. On August 27, 2020, the Pine Gulch Fire became the largest wildfire in Colorado State history at the time, surpassing the Hayman Fire that burned near Colorado Springs in the summer of 2002.
- **Grizzly Creek:** The Grizzly Creek fire was a human caused wildfire event which originated on Monday, August 10th approximately one mile east of Glenwood Springs. The fire expanded to consume over 32,631 acres and was officially announced as 100 percent contained due to snow conditions in Grizzly Creek drainage basin. This fire event prompted a 13-day closure of Interstate 70 through Garfield County.

Wildland Urban Interface Definition

The WUI should be flexible in its definition to be able to accommodate local areas of concern and priority landscapes. For the purpose of this plan, the core planning team defined the WUI as the areas adjacent and within development which meet landscapes at risk to wildland fire. This definition allows areas to be included in the WUI such as within a set radius of a community; those that have specific geographic features which influence fire behavior; areas surrounding key transportation corridors for evacuation; remote residential lots; or where tree mortality has significantly impacted available fuel loads. Specific areas of concern identified by members of the planning team were included in the WUI boundaries. The WUI boundaries were presented at a planning team meeting for discussion and approval.

Study Area Analysis

To assist in the evaluation of wildfire risk in the planning area, available GIS data was evaluated between three study areas: Forest, Resource Lands, and Urban Interface. Available development and infrastructure data from Garfield County GIS was overlaid with wildfire hazard data from the Colorado

Forest Service to evaluate assets at risk. The following maps and tables show the wildfire hazard areas and summarize the percentage of assets at risk (high or highest risk) within each study area.

Figure 11: Wildland Urban Interface

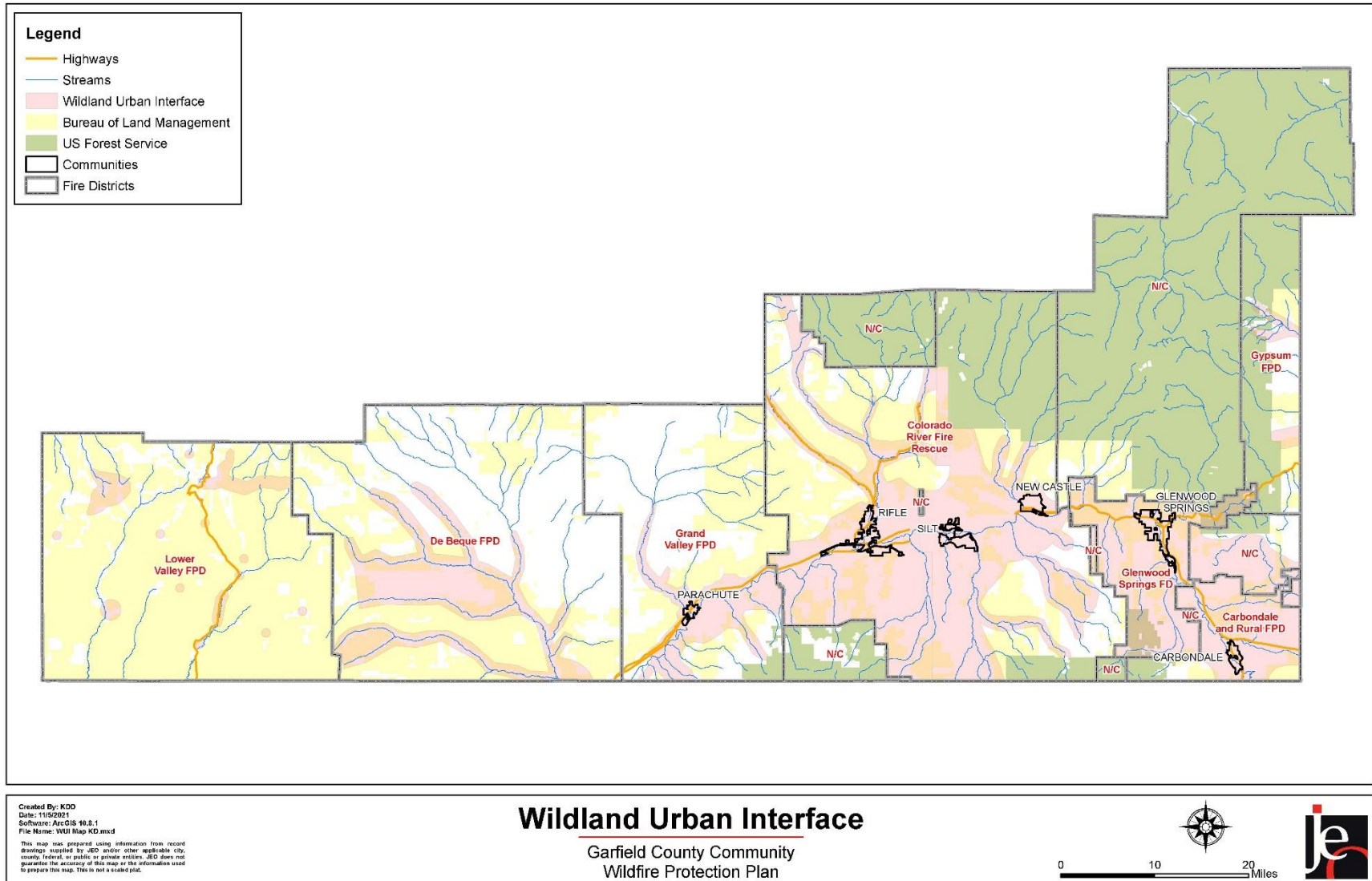


Table 13: Forest Study Area Assets Vulnerable to Wildfire

Infrastructure	Total Sites	Percentage of Sites Vulnerable to Wildfire	Structures	Total Sites	Percentage of Sites Vulnerable to Wildfire
Right of Way (Miles)	25.30 mi	64.3%	Residential	15	8.9%
Public Airport	N/A	N/A	Commercial	N/A	N/A
Highway Bridges	1	2.3%	Public Structures	N/A	N/A
Communication Facilities	0	0%	Agricultural	N/A	N/A
Electric Utilities Lines (Miles)	19.38 mi	100%	Church	N/A	N/A
Railroad (Miles)	21.6 mi	100%	Schools	N/A	N/A
Railroad Bridges	1	12.5%	Hospital	N/A	N/A
Road - Asphalt High Traffic (Miles)	0 mi	0%	Other	1	5%
Road - Chip seal Moderate Traffic (Miles)	6.17 mi	36.6%	Number of Improvements	Improvements Value	
Road - Gravel Low Traffic (Miles)	29.04 mi	22.1%	60	\$30,597,640	
Gas Wells	0	0%			
Pipeline (Miles)	22.34 mi	61.5%			
Ag and Natural Resource Lands (Square Miles)	58.95 sq mi	94.5%			

Source: Garfield County GIS, Colorado Forest Service, JEO Consulting Group

Figure 12: Forest Study Area Wildfire Hazard Area

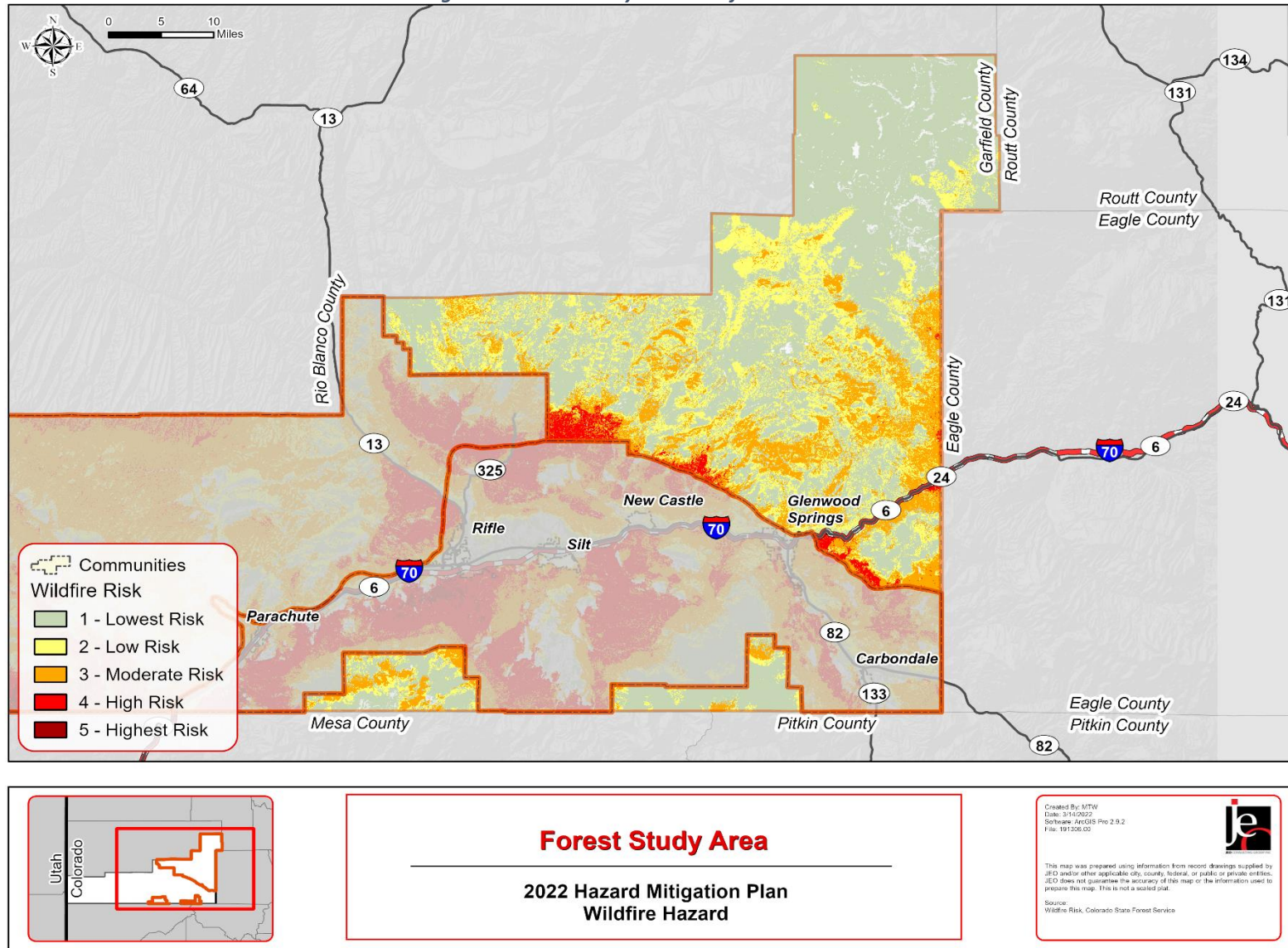


Table 14: Resource Lands Study Area Assets Vulnerable to Wildfire

Infrastructure	Total Sites	Percentage of Sites Vulnerable to Wildfire	Structures	Total Sites	Percentage of Sites Vulnerable to Wildfire
Right of Way (Miles)	7.86 miles	9.8%	Residential	15	13.4%
Public Airport	N/A	N/A	Commercial	0	0%
Highway Bridges	4	28.6%	Public Structures	0	0%
Communication Facilities	0	0%	Agricultural	0	0%
Electric Utilities Lines (Miles)	6.32 miles	55.2%	Church	N/A	N/A
Railroad (Miles)	N/A	N/A	Schools	N/A	N/A
Railroad Bridges	N/A	N/A	Hospital	N/A	N/A
Road - Asphalt High Traffic (Miles)	7.65 miles	31.1%	Other	0	0%
Road - Chip seal Moderate Traffic (Miles)	7.62 miles	85.7%	Number of Improvements	Improvements Value	
Road - Gravel Low Traffic (Miles)	80.55 miles	47.5%	114	\$38,162,950	
Gas Wells	342	4.2%			
Pipeline (Miles)	613.22 miles	42.0%			
Ag and Natural Resource Lands (Square Miles)	85.41 sq mi	97.4%			

Source: Garfield County GIS, Colorado Forest Service, JEO Consulting Group

Figure 13: Resource Lands Study Area Wildfire Hazard Areas

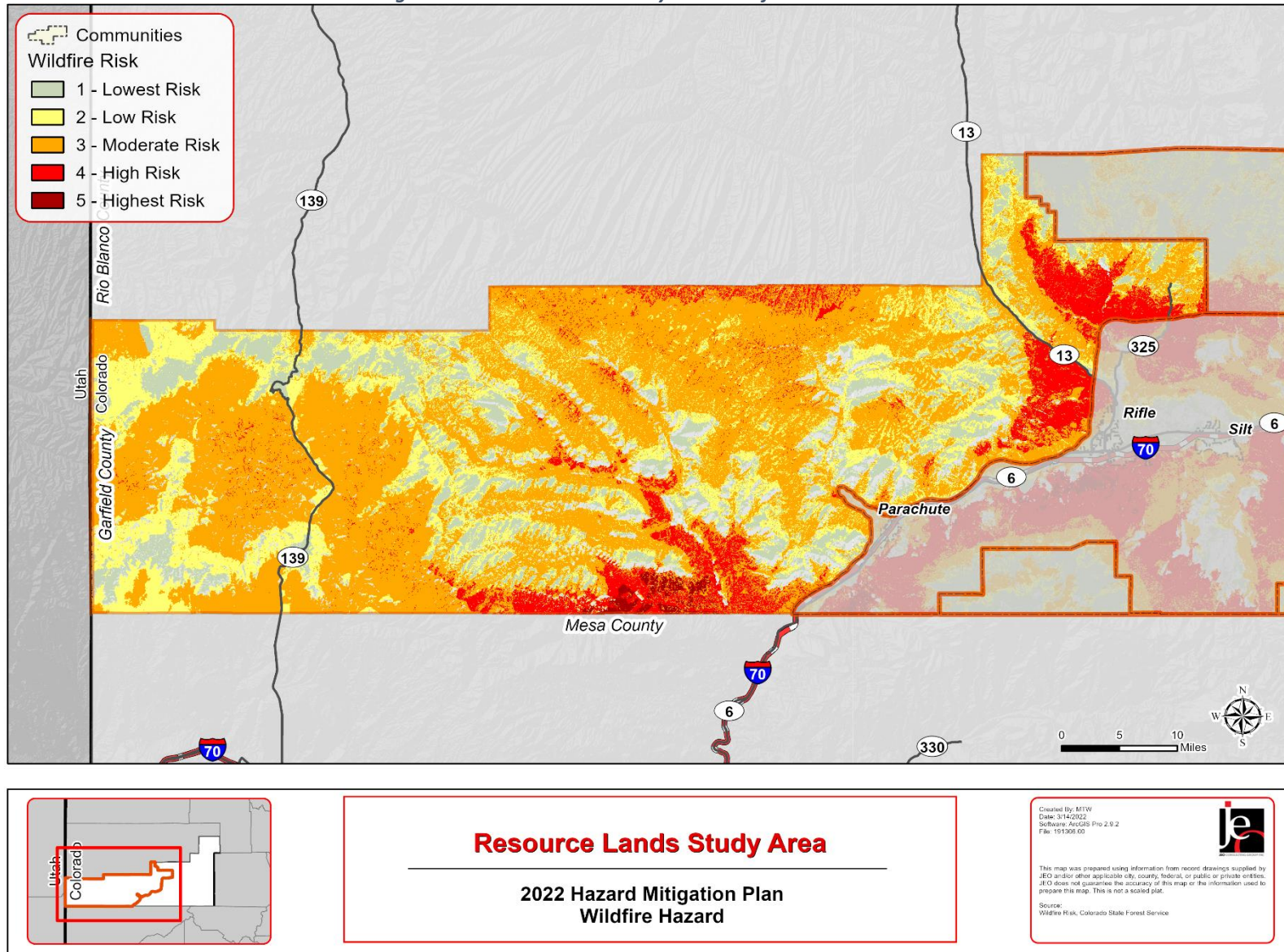
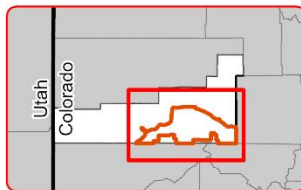
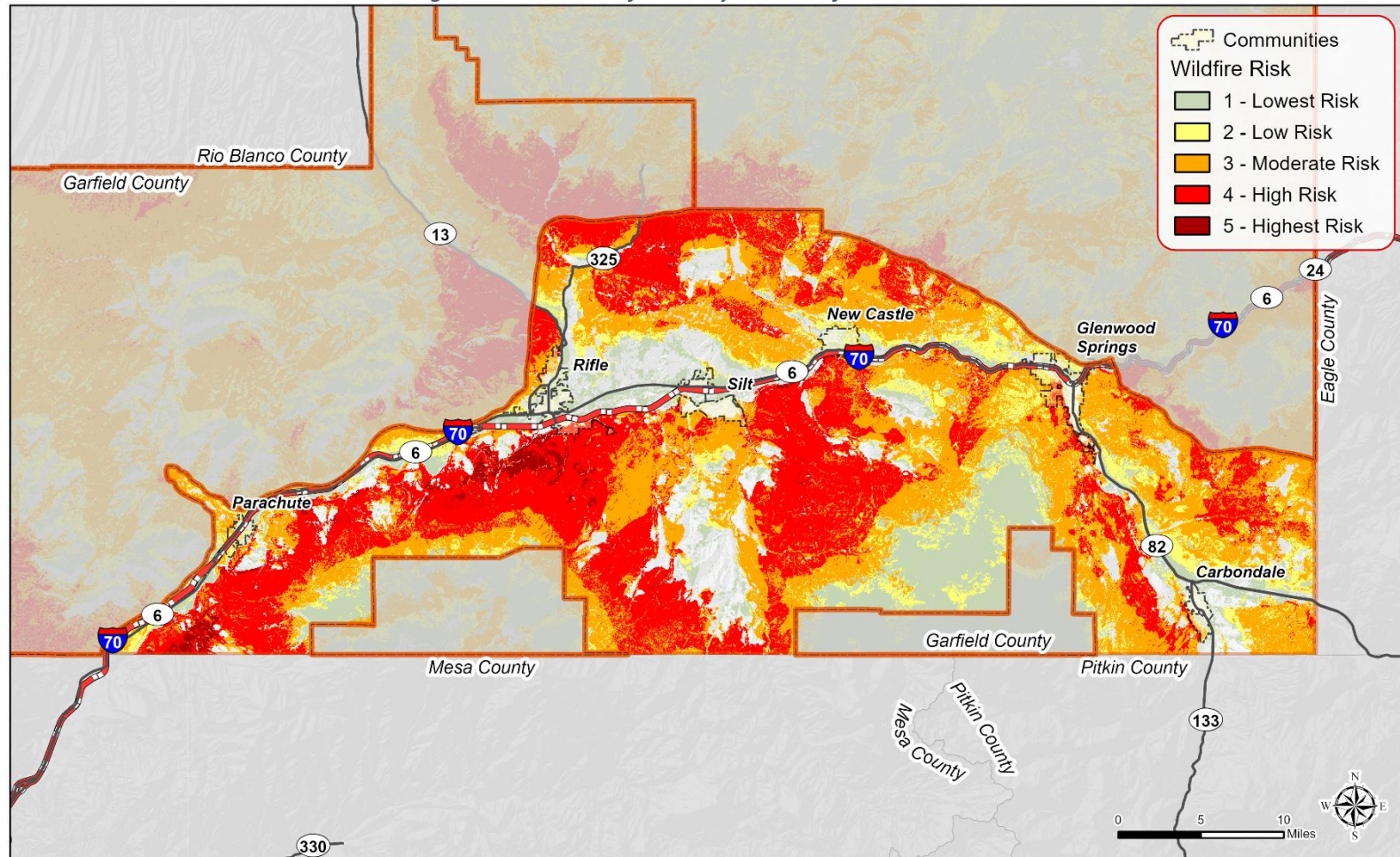


Table 15: Urban Interface Lands Study Area Assets Vulnerable to Wildfire

Infrastructure	Total Sites	Percentage of Sites Vulnerable to Wildfire	Structures	Total Sites	Percentage of Sites Vulnerable to Wildfire
Right of Way (Miles)	530.08 miles	53.9%	Residential	1,100	7.5%
Public Airport	1	50%	Commercial	15	1.8%
Highway Bridges	6	4.1%	Public Structures	5	16.7%
Communication Facilities	31	31.3%	Agricultural	5	17.2%
Electric Utilities Lines (Miles)	109.62 miles	62.4%	Church	0	0%
Railroad (Miles)	39.18 miles	56.8%	Schools	0	0%
Railroad Bridges	1	2.8%	Hospital	0	0%
Road - Asphalt High Traffic (Miles)	86.1 miles	59.6%	Other	46	7.2%
Road - Chip seal Moderate Traffic (Miles)	107.35 miles	57.4%	Number of Improvements	Improvements Value	
Road - Gravel Low Traffic (Miles)	98.41 miles	65.6%	4,208	\$1,509,530,850	
Gas Wells	3,760	42.5%			
Pipeline (Miles)	582.32 miles	59.6%			
Ag and Natural Resource Lands (Square Miles)	65.46 sq mi	97.5%			

Source: Garfield County GIS, Colorado Forest Service, JEO Consulting Group

Figure 14: Urban Interface Study Area Wildfire Hazard Areas



Urban Interface Study Area

2022 Hazard Mitigation Plan Wildfire Hazard

Created By: MTW
Date: 3/14/2022
Software: ArcGIS Pro 2.0.2
File: 191306.00



This map was prepared using information from record drawings supplied by JEO and/or other applicable city, county, federal, or public or private entities. JEO does not guarantee the accuracy of this map or the information used to prepare this map. This is not a scaled plot.

Source:
Wildfire Risk, Colorado State Forest Service

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 wild-fire 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.

The FPDs analyzed communities within their district based on their knowledge of fire occurrence and community risk. The FPDs identified factors that affect wildfire risk within each of these areas and summarized them below.

Table 16: Community Hazard Contributing Factors

FPD	Community	Contributing Factors
Colorado River Fire Rescue	New Castle	(+) More than one way in and out (+) All season paved roads with turnarounds (+) Reflective street signs (+) Defensible space 30-71 feet (+) Generally fire resistant roofs and construction (+) Excellent wildfire response capability and hydrants (-) Moderate to heavy fuels in proximity to homes (-) 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
Colorado River Fire Rescue	Silt	(+) 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 (+) Excellent wildfire response capability and hydrants (-) 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
Colorado River Fire Rescue	Rifle	(+) More than one way in and out (+) All season paved roads with turnarounds (+) Reflective street signs (+) Light fuels in proximity to homes (+) Defensible space 71-100 feet (+) Fire resistant roofs and construction (+) Excellent wildfire response capability and hydrants (-) Above ground gas and electrical utilities (-) Steep slopes in proximity to homes

FPD	Community	Contributing Factors
		(-) Terrain and weather conditions conducive to extreme fire behavior (-) Area with fire history
Carbondale & Rural	Carbondale	(+) 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 (+) Excellent wildfire response capability and hydrants (-) Above ground electrical utilities (-) Terrain and weather conditions conducive to extreme fire behavior
Carbondale & Rural	Missouri Heights	Assessment results based on Carbondale & Rural Fire Protection District CWPP
De Beque	Dispersed	(+/-) Fire resistant roofs with non-resistant siding and decks (-) Generally one way in and out (-) 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 (-) 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	Assessment results based on Glenwood Springs Fire Protection District CWPP
Grand Valley	Battlement Mesa	(+) 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 (+) Excellent wildfire response capability and hydrants (-) Steep slopes in proximity to community with heavy fuels (-) Area with fire history (-) Terrain and weather conditions conducive to extreme fire behavior
Grand Valley	Parachute	(+) More than one way in and out (+) All season paved roads with turnarounds (+) Reflective street signs (+) Moderate fuels in proximity to homes

FPD	Community	Contributing Factors
		(+) Defensible space 30-71 feet (+) Excellent wildfire response capability and hydrants (-) 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 (-) Above ground gas and electrical utilities
Grand Valley	Rulison	(+) More than one way in and out (+) All season paved roads with turnarounds (+) Reflective street signs (+) Defensible space 30-71 feet (+) 10,000 gallon storage tank and storage ponds (-) Houses with combustible roofs and siding (-) Heavy fuels in proximity to homes (-) 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 (-) No hydrants
Gypsum	Dispersed	(-/+) Fire resistant roofs with nonresistant siding and decks (-) 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 (-) Water is hauled by fire department (-) Above ground gas & electrical utilities (-) Fire department > 5 miles from structures
Lower Valley	Dispersed	(+) Defensible space 30-71 feet (+/-) Fire resistant roofs with nonresistant siding and decks (-) 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 (-) Steep slopes in proximity to structures (-) Terrain and weather conditions conducive to extreme fire behavior (-) Water is hauled by fire department (-) Area with fire history (-) Fire department >5 miles from structures

FPD	Community	Contributing Factors
		(-) Above ground gas and electrical utilities

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 17). 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 17. The majority of Garfield County wildland vegetation can be classified as FRCC II or FRCC III with 824,177 and 178,434 acres, respectively.

Table 17: 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 vegetation and fuel are highly altered. Uncharacteristic conditions range from moderate to high. Risk of loss of key ecosystem components is high.	Extreme	178,434

Source: www.landfire.gov

8. Wildland Fire Emergency Operations and Capabilities

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 Operating Plan (OP) 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 seven FPDs who have signed the Operation Plan, as well as the 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. 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. Several of the FPDs have signed onto the Mountain Aid Mutual Agreement to help provide immediate fire response to other districts in Colorado to support wildland fire suppression.

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.

While the Garfield County Sheriff's Office serves as a support agency rather than in direct suppression of wildfires, the district may assist with fire suppression on federal lands, provide equipment and personnel, or suppress wildfires outside of their district boundaries which allows the county to participate in the EFF.

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 19 fires declared eligible for EFF funding, including such notable fires as Battlement Mesa (1987), South Canyon (1994), Coal Seam Fire (2002), New Castle (2007), Pine Gulch (2020), and Grizzley Creek (2020). Garfield County is second only to Larimer County in total number of Colorado EFF incidents to date.

Reciprocal (Mutual Aid) Fire Assistance: *As identified in the 2022 Garfield County Wildland Fire Operating Plan mutual aid is considered county-wide. The period for mutual aid is defined as the time of initial dispatch and ends at either midnight of the first operational period or midnight of the second. All ground and aviation resources are considered mutual aid resources.*

The Mountain Area Mutual Aid establishes mutual aid between local fire and EMS agencies within Eagle, Garfield, Grand, Lake, Pitkin, Rio Blanco, Routt, and Summit Counties.

Use and Reimbursement of Interagency Fire Resources - *Aviation resources for wildland fire should be ordered through Grand Junction Interagency Dispatch. When aircraft are ordered, the request should include the following: type and kind of aviation resource being requested; latitude/longitudinal coordinates in degrees decimal minutes; ground contact for who will work with the aircraft on the incident; and aerial hazards in the area. Air attack will be ordered automatically under certain circumstances per the Interagency Aerial Supervision Guide.*

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:

- Fire Name
- Incident Commander Name
- Location - Lat/Long and Ownership
- Estimated Size
- Fire Behavior/Threats
- Resources Needed

State and Federal Resources

DFPC Resources

Emergency Operations

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.

Garfield County Resources

Wildfire Response Capacity

Improving FPD response time and capacity in the county is an effective way to protect economic and ecological values from wildfire. 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 18: Recommended Fire Protection District Resources and Training Needs

Fire Authority	Resources Needs	Training Needs
Colorado River Fire Rescue	<ul style="list-style-type: none"> 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 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 Determine the need to identify more water sources 	<ul style="list-style-type: none"> Maintain current NWCG certifications Fire mitigation specialist certifications Community Firewise training
Carbondale	<ul style="list-style-type: none"> County Road 112 needs 10,000 g buried water tank Develop and alternative evacuation route for West Bank Mesa Obtain a 1800-g tactical tender for Station 85 Obtain a Type 3 engine for Station 81 Firewise community outreach 	<ul style="list-style-type: none"> Annual NWCG wildfire training Maintain current NWCG certifications Increase number of certified and trained responders
De Beque FPD	<ul style="list-style-type: none"> Cell phone tower at the end of Kimball Mountain Road Maintain good communication with oil companies Firewise public outreach Develop FPD specific CWPP 	<ul style="list-style-type: none"> Annual wildfire training Maintain current NWCG certifications Encourage FFT2 to certify at FFT1
Glenwood Springs	<ul style="list-style-type: none"> Identify and test water sources such as drafting sites 	<ul style="list-style-type: none"> Annual NWCG wildfire training

Fire Authority	Resources Needs	Training Needs
	<ul style="list-style-type: none"> Continue to participate with responsible parties to develop alternative evacuation routes for those areas with only one way in and out Firewise community outreach Collaborate with other response agencies with fuel treatments in and around our WUI 	<ul style="list-style-type: none"> Maintain current NWCG certifications WUI wildland firefighting and incident command training
Grand Valley FPD	<ul style="list-style-type: none"> Repair roads as needed to improve response times Water tanks and cisterns located in eastern part of district Post weight limit signs on bridges and culverts where needed Improve addressing to actual locations Pre-plan WUI response areas Develop automatic aid agreements for certain response areas for all sides of District –upgrading radios, working with dispatch centers to make systems work together Firewise public outreach – Have a summer mitigation program and do radio ads Develop FPD specific CWPP 	<ul style="list-style-type: none"> Annual NWCG wildfire training Maintain current NWCG certifications Require part-time (ALL members) employees to be at least NWCG FFT2 certified Require full and part time operational employees to be red-carded Encourage volunteers to be red-carded
Gypsum	<ul style="list-style-type: none"> Develop strategic water sources County Roads 150 and 151 Road improvements as appropriate Develop backup evacuation route for Sweetwater residents Firewise community outreach 	<ul style="list-style-type: none"> Annual NWCG wildfire training Maintain current NWCG certifications Encourage FFT2 to certify at FFT1
Lower Valley FPD	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Annual NWCG wildfire training Maintain current NWCG certifications
Countywide–All FPDs	<ul style="list-style-type: none"> Continue participation in wildfire specific wildfire crews and staff them during the fire season Pursue and encourage county wide WUI building standards and adaptation of the International Wildland Urban Interface Code Encourage inclusion of all areas of the county to be within in a FPD 	Not applicable

Fire Authority	Resources Needs	Training Needs
	<ul style="list-style-type: none">• 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	

Source: FPDs

Garfield County Wildland Fire Operating Plan

The Garfield County Wildland Fire Operating Plan sets the standards for operating procedures, agreed policies, and responsibilities to implement cooperative wildfire protection on lands within Garfield County. The plan operates hand-in-hand with the Garfield County Emergency Operations Plan (EOP), last updated in 2020. The LEOP 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 Wildland Fire Operating Plan 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 (DHS).

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.

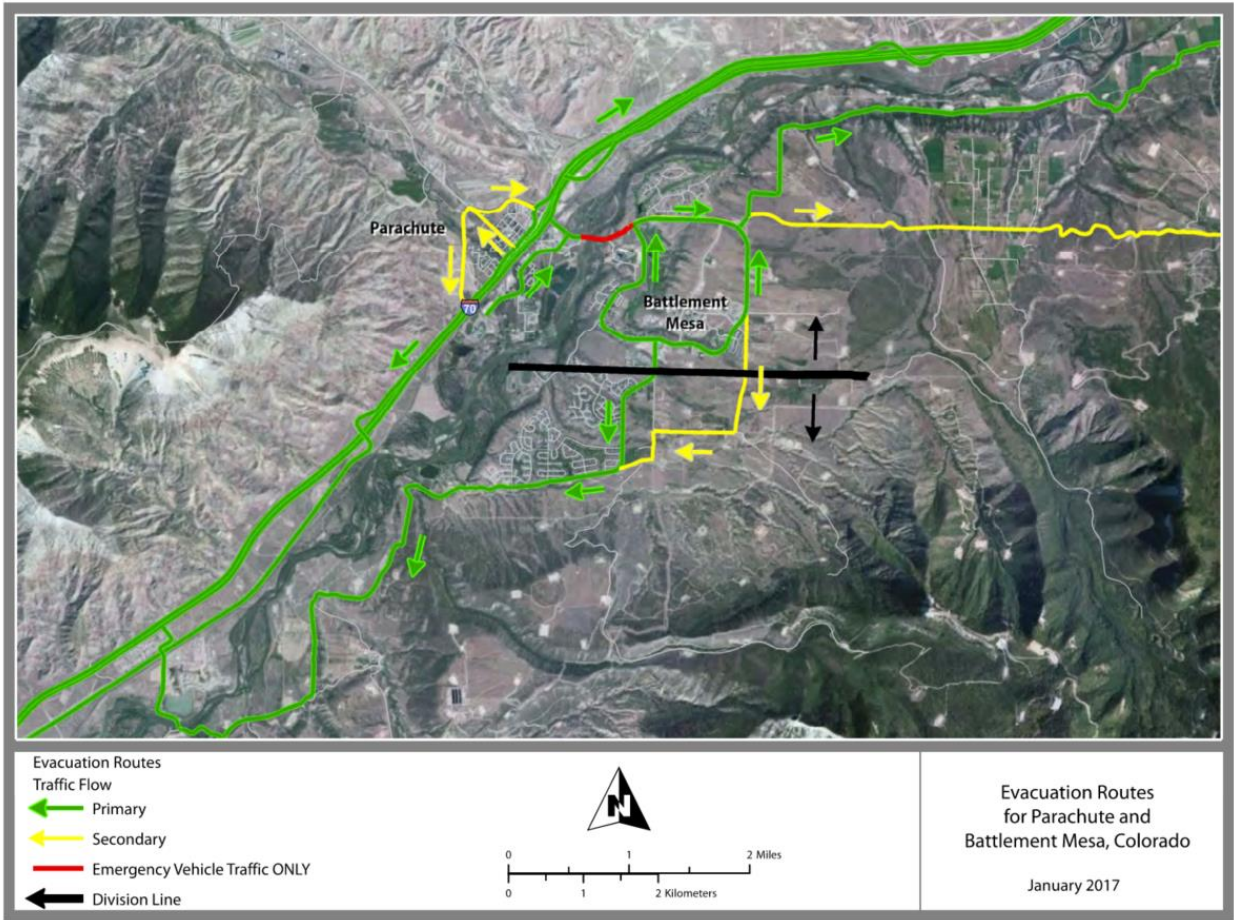
Road improvements to primary or secondary evacuation routes may be as straight forward as seasonal grading, constructing or improving turnarounds at dead ends, widening a particularly tight switchback, or improving a section of road that would not support fire access.

However, it is important to note that evacuation planning in mountainous areas has significant limitations. Often there are very few transportation corridors into or out of a community. Effective evacuation planning would require numerous avenues of egress. Therefore, Garfield County Emergency Management emphasizes the role of social media and broadcasts to notify residents how to evacuate from hazardous conditions. All FPDs within Garfield County have begun analyzing areas for opportunities to improve access within their district boundaries. Below are examples of these discussions from Carbondale & Rural FPD, Glenwood Springs FPD, and Grand Valley FPD.

Grand Valley FPD

Evacuation plans have been developed for both Parachute and Battlement Mesa through the local Parachute/Battlement Mesa Emergency Operations Plan. A division line has been established approximately along Highway 302. Primary evacuation routes are to use I-70, Stone Quarry Road, E and W Battlement Pkwy, and Highway 309.

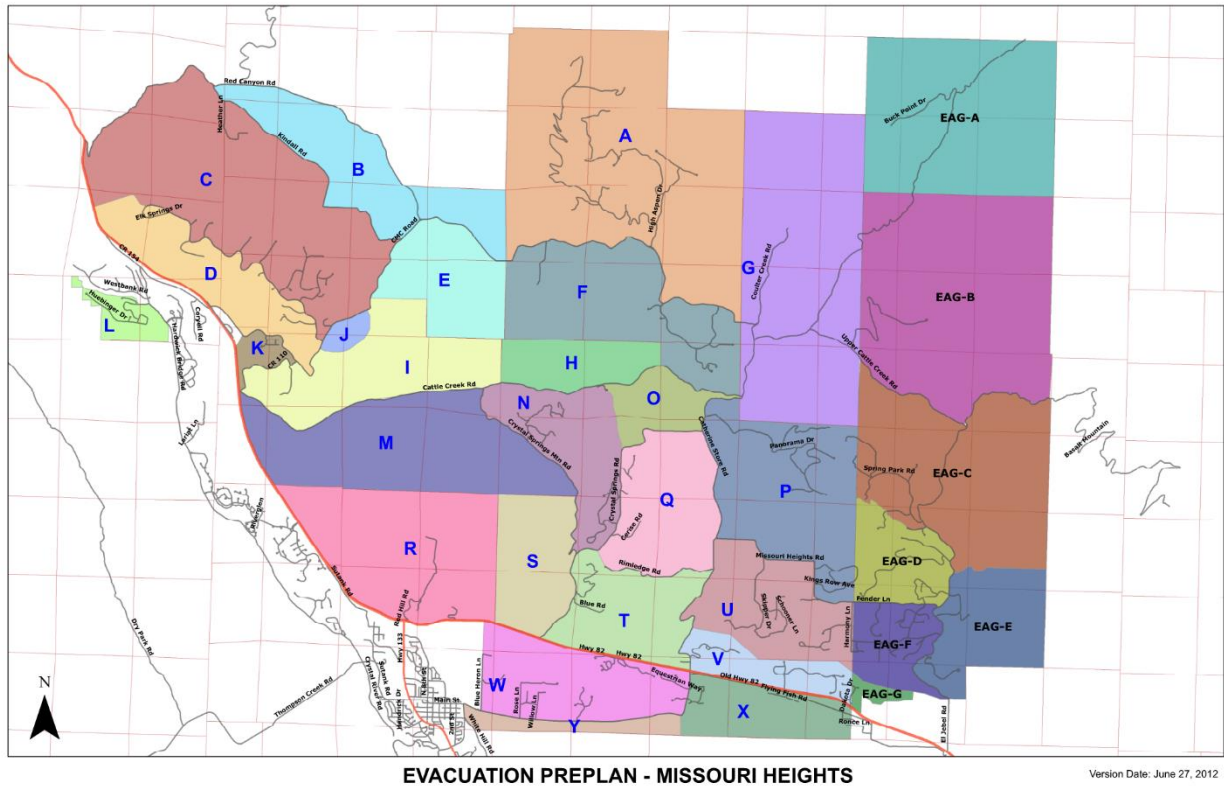
Figure 15: Parachute and Battlement Mesa Evacuation Corridors



Carbondale & Rural FPD

Evacuation planning and maps have been developed for the Missouri Heights subdivision within the Carbondale FPD. The subdivision has been broken down into specific quadrants to assist emergency responders and evacuees coordinate relocation efforts. Transportation corridors in the district can be challenging to traverse for responders unfamiliar with the area.

Figure 16: Missouri Heights Evacuation Zones



Glenwood Springs FPD

Evacuation planning is ongoing and evolving. Current efforts to establish evacuation plans/ routes in West Glenwood Springs are in process and may even include direct access to I-70 near the 114 and 116 interchanges. The ability to evacuate the southern Glenwood, Midland Ave, and Four-Mile neighborhoods is one piece of critical emphasis in the City's attempt to get a bypass built along Midland Avenue to the south and connecting with HWY 82. Other efforts specific to evacuation planning have focused on fuels reduction along access/egress routes, especially in high-risk neighborhoods with limited access roads.

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9. Wildfire Mitigation Strategy

WUI Mitigation Opportunities

Mitigation objectives ultimately support the overarching goals of enhancing the safety and welfare of the County's residents and emergency responders and protecting assets of economic and ecological value. 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. Collaborative planning among stakeholder groups, the core planning team, and community members is necessary for effective wildfire mitigation to occur. The mitigation recommendations presented in the following sections were identified through the community hazard and risk assessment process and interviews with the fire authorities.

Mitigation Project Types

There are several methods of wildfire mitigation strategy in order to reduce overall risk and increase local capabilities. The Federal Emergency Management Agency and local planning teams have laid out numerous mitigation strategies to address wildfire risk. The following table summarizes some of these strategies.

Table 19: Wildland Fire Mitigation Project Types

Mitigation Action Type	Project Description	Specific Actions
Local Planning and Regulations	Map and Assess Vulnerability to Wildfire	<ul style="list-style-type: none"> • Use GIS mapping of wildfire hazard areas to facility analysis and planning decisions through comparison with zoning, development, infrastructure, etc. • Develop and maintain a database to track community vulnerability to wildfire. • Create a wildfire scenario to estimate potential loss of life and injuries, the types of potential damage, and existing vulnerabilities within a community to develop wildfire mitigation priorities
	Incorporate Wildfire Mitigation in the Comprehensive Plan	<ul style="list-style-type: none"> • Recognize wildfire hazards and identify areas of risk based on a wildfire vulnerability assessment. • Describe policies and recommendation for addressing wildfire risk and discourage expansion in the wildland-urban interface. • Include considerations of wildfire hazards in land use, public safety, and other elements of the comprehensive plan.
	Reduce Risk through Land Use Planning	<ul style="list-style-type: none"> • Using zoning and/or a special wildfire overlay district to designate high-risk areas and specify the conditions for the use and development of specific areas.

Mitigation Action Type	Project Description	Specific Actions
		<ul style="list-style-type: none"> Addressing density and quantity of development, as well emergency access, landscaping and water supply. Promoting conservation of open space or wildland-urban boundary zones to separate developed areas from high-hazard areas. Setting guidelines for annexation and service extensions in high-risk areas.
	Develop a Wildland Urban Interface Code	<ul style="list-style-type: none"> Developing specific design guidelines and development review procedures for new construction, replacement, relocation, and substantial improvement in wildfire hazard areas. Addressing fire mitigation through access, signage, fire hydrants, water availability, vegetation management, and special building construction standards. Involving fire protection agencies in determining guidelines and standards and in development and site plan review procedures. Establishing wildfire mitigation planning requirements for large scale developments or planned unit developments.
	Require or Encourage Fire-Resistant Construction Techniques	<ul style="list-style-type: none"> Encouraging the use of non-combustible materials (i.e., stone, brick, and stucco) for new construction in wildfire hazard areas. Using fire resistant roofing and building materials in remodels, upgrades, and new construction. Enclosing the foundations of homes and other buildings in wildfire-prone areas, rather than leaving them open and potentially exposing undersides to blown embers or other materials. Prohibiting wooden shingles/wood shake roofs on any new development in areas prone to wildfires. Encouraging the use of functional shutters on windows.
Structure and Infrastructure Projects	Retrofit At-Risk Structures with Ignition-Resistant Materials	<ul style="list-style-type: none"> Installing roof coverings, sheathing, flashing, skylights, roof and attic vents, eaves, and gutters that conform to ignition-resistant construction standards. Installing wall components that conform to ignition-resistant construction standards. Protecting propane tanks or other external fuel sources. Purchasing and installing external, structure-specific water hydration systems (sprinklers);

Mitigation Action Type	Project Description	Specific Actions
		dedicated power sources; and dedicated cisterns if no water source (e.g., lake, river, or swimming pool) is available.
	Create Defensible Space Around Structures and Infrastructure	<ul style="list-style-type: none"> • Creating buffers around residential and non-residential structures through the removal or reduction of flammable vegetation, including vertical clearance of tree branches. • Replacing flammable vegetation with less flammable species. • Creating defensible zones around power lines, oil and gas lines, and other infrastructure systems.
	Conduct Maintenance to Reduce Risk	<ul style="list-style-type: none"> • Performing arson prevention cleanup activities in areas of abandoned or collapsed structures, accumulated trash or debris, and with a history of storing flammable materials where spills or dumping may have occurred. • Preventing or alleviating wildfires by proper maintenance and separation of power lines as well as efficient response to fallen power lines. • Routinely inspecting the functionality of fire hydrants. • Requiring and maintaining safe access for fire apparatus to wildland-urban interface neighborhoods and properties.
Natural Systems Protection	Implement a Fuels Management Program	<ul style="list-style-type: none"> • Performing maintenance including fuel management techniques such as pruning and clearing dead vegetation, selective logging, cutting high grass, planting fire-resistant vegetation, and creating fuel/fire breaks (i.e., areas where the spread of wildfires will be slowed or stopped by the removal of fuels). • Using prescribed burning to reduce fuel loads that threaten public safety and property. <ul style="list-style-type: none"> ▪ Identifying and clearing fuel loads created by downed trees. • Cutting firebreaks into public wooded areas in the wildland-urban interface. • Sponsoring local “slash and clean-up days” to reduce fuel loads along the wildland-urban interface. • Linking wildfire safety with environmental protection strategies (i.e., improving forest ecology, wildlife habitat, etc.). • Developing a vegetation management plan.
Education and Awareness Programs	Participate in Firewise Program	<ul style="list-style-type: none"> • Joining the “Firewise USA” recognition program sponsored by the National Fire Protection Association (firewise.org).

Mitigation Action Type	Project Description	Specific Actions
		<ul style="list-style-type: none"> • Sponsoring Firewise workshops for local officials, developers, civic groups, and neighborhood/homeowners' associations. • Consulting Firewise guidance and encouraging or requiring best practices in your community.
	Increase Wildfire Risk Awareness	<ul style="list-style-type: none"> • Offering GIS hazard mapping online for residents, developers, and design professionals. • Organizing a local fire department tour to show local elected officials and planners the most vulnerable areas of the community's wildland-urban interface and increase their understanding of risks. • Working with insurance companies, utility providers, and others to include wildfire safety information in materials provided to area residents. • Developing partnerships with neighborhood groups, homeowners' associations, and others to conduct outreach activities. • Using local fire departments to conduct education programs in schools. • Informing the public about proper evacuation procedures. • Forming a citizen plan implementation steering committee to monitor progress of local mitigation actions. Include a mix of representatives from neighborhoods, local businesses, and local government • Perform Wildland Fire Risk Assessment for individual home owners upon request.
	Educate Property Owners about Wildfire Mitigation Techniques	<ul style="list-style-type: none"> • Installing fire mitigation systems such as interior and exterior sprinkler systems. • Performing safe disposal of yard and household waste rather than open burning. • Removing dead or dry leaves, needles, twigs, and combustibles from roofs, decks, eaves, porches, and yards. • Creating a defensible space or buffer zone cleared of combustible materials around property. • Installing and maintaining smoke detectors and fire extinguishers on each floor of their homes or other buildings. • Safely using and storing necessary flammable materials, including machine fuels. Approved safety cans should be used for storing gasoline, oily rags, and other flammable materials.

Mitigation Strategy

Mitigation Action Type	Project Description	Specific Actions
		<p>Firewood should be stacked at least 100 feet away and uphill from homes.</p> <ul style="list-style-type: none"> • Keeping flammables, such as curtains, secured away from windows or using heavy fire-resistant drapes. • Provide home assessments for individual homeowners to understand risks and identify mitigation needs. May use Realfire App to document individual defensive strategies.

Source: FEMA Mitigation Ideas Guide

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 due to budget constraints from national to 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.

The following tables include several key pieces of information. These include:

- **Lead Organization:** The lead organization is the responsible party to initiate and organize efforts to carry out the fuel treatment.
- **Priority:** 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. For example, 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.

Table 20: Proposed Vegetation-Fuel Projects

FPDs	#	Fuel Treatments (Priority)	Lead Organization
Carbondale & Rural	-	Defensible space around homes, outbuildings and structures (high)	Landowner
	-	Road vegetation mowing (moderate)	State, county, private landowner
	1	Fuels reduction near Elk Springs (high)	FPD, BLM, Landowner
	2	Huebinger Drive fuelbreak (moderate)	FPD
	3	Fuels Reduction near Pinion Mesa (high)	FPD, BLM, Landowner
Colorado River Fire Rescue	4	Areas of concern around 17764 Co Rd 252 (low)	FPD, Landowner
	5	Areas of concern around Apple Tree Park (low)	FPD
	6	Fuelbreak for Beaver Creek Manor (high)	FPD
	7	Fuelbreak for C Avenue (low)	FPD
	8	Fuelbreak at tow slope east of schools and water tank on USFS land near Castle Valley Ranch Road (high)	FPD
	9	Fuelbreak for Cedar Springs (high)	FPD
	10	Fuelbreaks along Divide Creek Road (high)	FPD
	11	Fuelbreak and tree thinning Elk Creek Campground (high)	FPD
	12	Tree thinning on Elk Creek Road near 1700 area (high)	FPD
	13	Fuel management Grass Mesa area (high)	FPD
	14	Tree thinning and fuelbreaks near 3724-3768 on Harvey Gap Road (high)	FPD
	15	Fuelbreaks Hidden Valley and Elk Run area (high)	FPD
	16	Tree thinning along Odin Drive (high)	FPD
	17	Fuelbreak for Jewell Lane (high)	FPD
	18	K&K Lumberyard and Harness Lane (low/med area of concern)	FPD, property owners
	19	Fuelbreak Lakota areas, east side of Faas Ranch Road (high)	FPD
	20	Fuelbreaks along Middle Elk Creek Road (high)	FPD

FPDs	#	Fuel Treatments (Priority)	Lead Organization
	21	Fuelbreaks in Mineota estates area (high)	FPD
	22	Fuelbreaks along Moki Road (moderate)	FPD
	23	Fuel reduction at Morning Star Drive (med-high)	FPD
	24	Fuel reduction at Morrow Drive (high)	FPD
	25	Fuelbreak for Porcupine Creek Subdivision (high)	FPD
	26	Firewise developing for subdivision off of Harvey Gap Road (moderate)	FPD
	27	Fuel reduction at Puma Paw Rd (low)	FPD
	28	Tree thinning and fuelbreaks in Ram Lane area (moderate)	FPD
	29	Fuelbreak for Red Apple area (low)	FPD
	30	Fuel reduction along Rifle Creek in Rifle (moderate)	FPD
	31	Fuel treatments around Rifle Estates and Upper Rifle Creek drainage (high)	FPD
	32	Fuelbreaks around multiple subdivision north, west, and east of Rifle (moderate)	FPD
	33	Fuelbreak for Rifle Village South (moderate)	FPD
	34	Fuelbreak for Rollie Gordon Park (high)	FPD
	35	Fuelbreaks at Scutter Lane (moderate)	FPD
	36	Defensible space around water tanks north of Silt (moderate)	FPD
	37	Fuel reduction at Stony Ridge Rd (moderate)	FPD
	38	Fuelbreak for Teepee Bible Camp (moderate)	FPD
	-	Defensible space around homes and outbuildings (high)	Landowner
	-	Mowing vegetation along roads (moderate)	State, county, and private landowner
De Beque	39	Kimball Mountain fuelbreak (high)	BLM, FPD
	-	Defensible space around homes and outbuildings (high)	Landowner
	-	Mow vegetation along roads (moderate)	State, county, private landowner
	-	Defensible space around homes and outbuildings (high)	Landowner

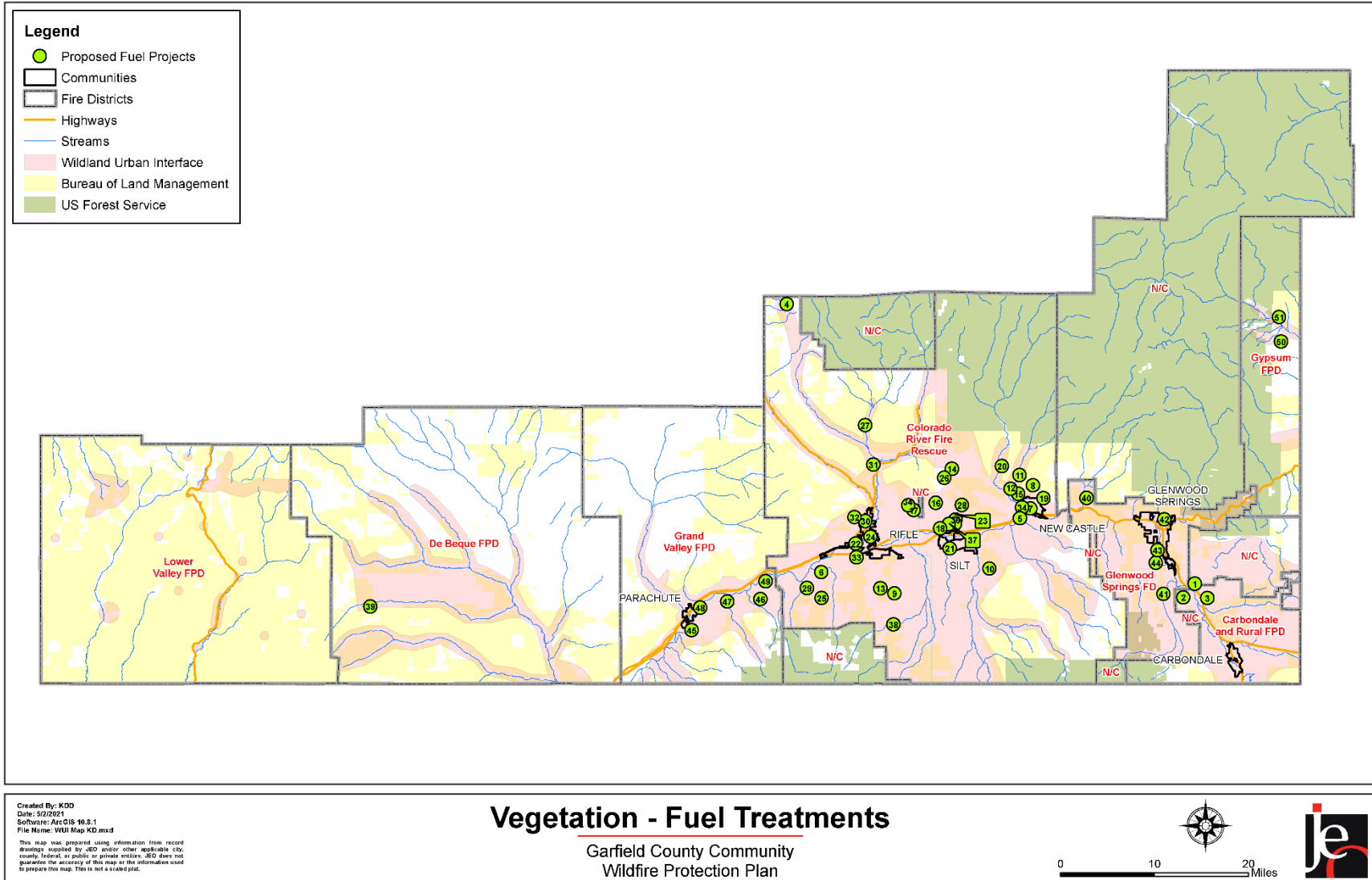
FPDs	#	Fuel Treatments (Priority)	Lead Organization
Lower Valley	-	Continue wildland fire for resource benefit practice (high)	BLM and private landowner
	-	Mow vegetation along roads (moderate)	State, county, private landowner
Glenwood Springs	40	Canyon Creek fuel reduction north of subdivision, fuelbreak along irrigation ditch southwest of subdivision (high)	FPD
	41	Four Mile fuels reduction as described in Glenwood Springs FPD CWPP (high)	FPD
	42	Complete the Glenwood Adventure Park 40-acre fuel reduction project as described in Glenwood Springs FPD (high)	FPD
	43	Midland fuels reduction as described in Glenwood Springs FPD CWPP is being reviewed by the UCRIFMU (high)	FPD
	44	Mountain Springs/Three Mile fuels reduction as described in Glenwood Springs FPD CWPP 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)	FPD
	-	Defensible space around homes and outbuildings (high)	Landowner
	-	Mow vegetation along roads (moderate)	State, county, private landowner
Grand Valley	45, 46, 47	Fuelbreaks on slopes below communities such as Morrisania Mesa, Holmes Mesa, and Battlement Mesa (high)	Landowner, FPD
	48	Defensible space around Parachute Water Treatment Facility (moderate)	Town of Parachute, FPD
	49	Fuelbreak on hill slopes south of Rulison (high)	Landowner, FPD
	-	Defensible space around homes and outbuildings (high)	Landowner
	-	Mowing vegetation along roads (moderate)	State, county, and

FPDs	#	Fuel Treatments (Priority)	Lead Organization
			private landowner
Gypsum	-	Defensible space around homes and outbuildings (high)	Landowner
	50, 51	Shaded fuelbreaks along County Roads 150 and 151 (moderate)	FPD
Areas Outside of FPDs	-	Defensible space around homes and outbuildings (high)	Landowner
	-	Mow vegetation along roads (moderate)	State, county, and private landowner

Source: FPDs

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.

Figure 17: Proposed Vegetation - Fuel Projects



Other Potential 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.

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 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, homeowners associations (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. Local FPDs and the county may be able to utilize grant funding to help cover chipping programs in each community as well.

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, OP and EOP review and updates, pre-suppression planning, resource mapping updates, and ongoing collaboration and planning with neighboring agencies and jurisdictions.

Fuelbreaks and Defensible Space

A fuelbreak occurs where trees and shrub density has been reduced to break-up horizontal and vertical fuel loads. 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 near 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.

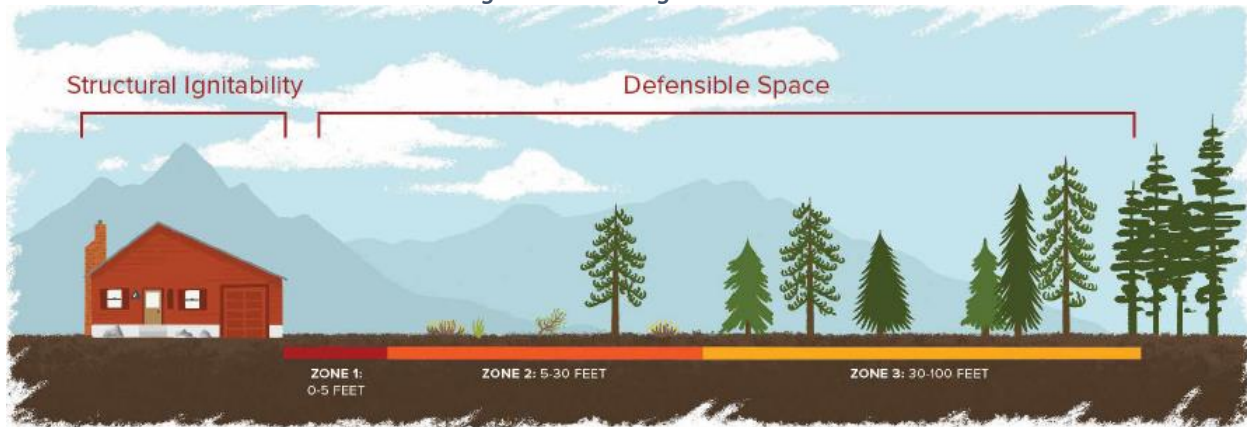
Establishing a Defensible Space

The purpose of the defensible space is to reduce the amount of fuel near the home and provide a space for firefighters to protect the home (Appendix F). 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.

The Home Ignition Zone Guide developed by the Colorado Forest Service provides guidelines for creating a defensible space. To develop the most effective defensible space plan possible, the property is evaluated and divided into 3 Zones (Figure 18).

Figure 18: Home Ignition Zone



Source: Bonnie Palmatory, Colorado State University, Home Ignition Zone Guide

Zone 1 is the area nearest the home (0-5 feet). This zone requires the most vigilant work in order to reduce or eliminate ember ignition and direct flame contact with your home. Use nonflammable, hard surface materials in this zone, such as rock, gravel, sand, cement, bare earth or stone/concrete pavers.

Zone 2 is the area transitioning away from the home where fuels should be reduced (5-30 feet). This zone is designed to minimize a fire's intensity and its ability to spread while significantly reducing the likelihood a structure ignites because of radiant heat.

Zone 3 is the area farthest from the home (30-100 feet). It extends 100 feet from the home on relatively flat ground. Efforts in this zone are focused on ways to keep fire on the ground and to get fire that may be active in tree crowns to move to the ground where it will be less intense.

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>.

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.

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. 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.

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.

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 placed 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.

Vegetation-Fuel Treatment Costs

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;

Mitigation Strategy

- Steepness of slope;
- Density of fuels;
- Disposal of slash;
- Proximity to structures;
- Access; and
- Transportation costs.

Table 21: 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.

Source: BLM & CSFS

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.

Project Support and Funding Opportunities

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:
 - **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.
 - **CWPP Implementation (DFPC)** – Application period is January or May, for grants awarded that year; grants usually must be completed by September 30th of the awarded year.
 - **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.
 - **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.

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10. 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.

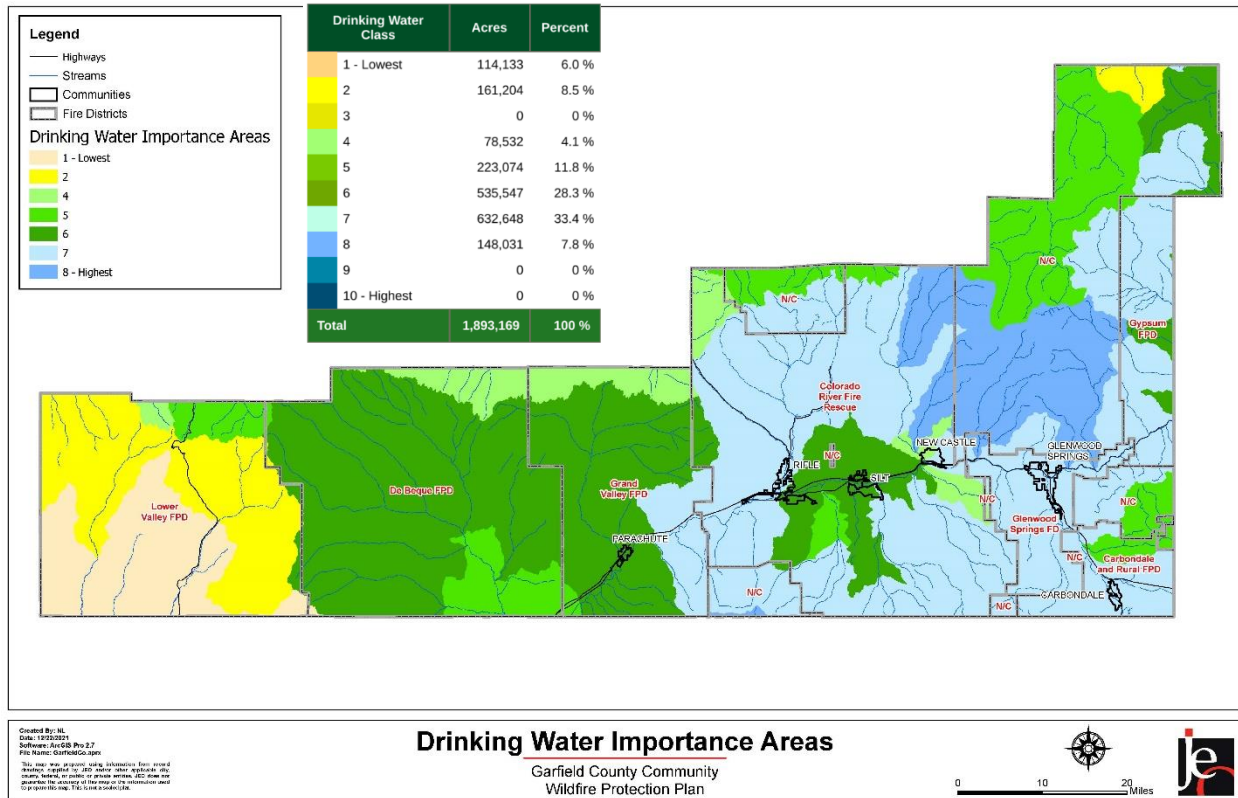
Several actions can occur to reduce the risks of source water contamination from wildland fire activities. BLM and the USFS would need to follow their fire management plans and resource management plan stipulations with regards to vegetation-fuel management, fire suppression, and post-fire stabilization. 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 site-specific erosion control device around source water intake may be necessary during and after any wildland fire management activities.

An important step in the SWPP process is the delineation of Source Water Protection Areas (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 encompass both public and private lands.

Drinking Water Importance Areas include the measure of quality and quantity of public surface drinking water categorized by watershed. Garfield County falls within the Middle Colorado River Watershed. The

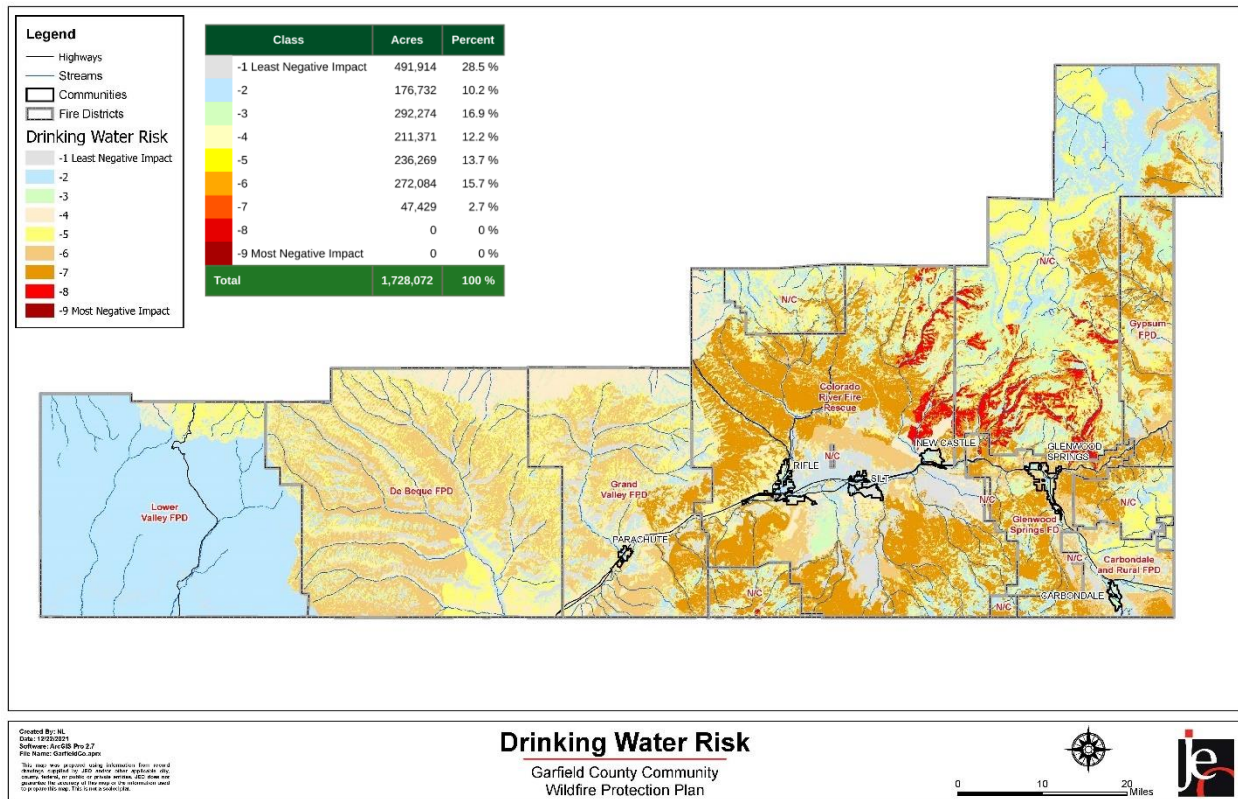
U.S. Forest Service Forests to Faucets project provides a wide array of drinking water data. Watersheds are ranked from 1 to 100 regarding relative importance to overall drinking water quality (100 being most important, 1 being least important). High important rankings highlight specific risks in Garfield County when implementing wildfire management activities. According to the Forests to Faucets Program, the majority of Garfield County falls within the low to medium ranked categories.

Figure 19: Drinking Water Importance Areas in Garfield County



The state also developed an overall Drinking Water Risk Index to provide a measurement of risk to Drinking Water Important Areas based on the potential negative impacts from wildfire. In areas which experience low-severity burns, fire events can serve to eliminate competition, rejuvenate growth, and improve watershed conditions. But in landscapes subjected to high or moderate-burn severity, the post fire threats to public safety and natural resources can be extreme. Critical surface vegetation loss leaves forested slopes vulnerable to large-scale soil erosion and flooding during subsequent storms. These impacts threaten overall health, safety, and integrity of communities and natural resources downstream. The index for Garfield County lists the majority of the county in the “least Negative Impact” class, with the highest risk rating of seven applies to 2.7% of total areas in the county.

Figure 20: Drinking Water Risk Index in Garfield County



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 when ranking Garfield County watersheds for source water protection. The 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.

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11. Monitoring and Evaluation

Community Wildfire Protection Plan Adoption

The Garfield County CWPP is a strategic planning document that is developed and approved by the core 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 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 core 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 area-specific CWPP, which would tier to the countywide CWPP.

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.

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. The following table provides a summary of monitoring tasks for each of these functional areas. Evaluations are to be conducted on an annual basis.

Table 22: Monitoring Tasks per Objective in Garfield County

Objective	Tasks
Risk Assessment	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Maintain compliance with the county EOP and Wildland Fire Operating Plan processes. • Track progress on water supply improvements and mapping. • Track progress of resource improvements.

Objective	Tasks
	<ul style="list-style-type: none"> • Review mutual aid resources and agreements.
Public Outreach	<ul style="list-style-type: none"> • 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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13. 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	(a.k.a. ten-hour fuels) Dead fuels consisting of roundwood ¼ to 1 inch (0.6 to 2.5 cm)

Glossary

Timelag Fuels	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	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 Resource Benefit	The application of the appropriate management response to naturally-ignited wildland fires to accomplish specific resource management objectives in pre-defined designated areas outlined in Fire Management Plans.