

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.
	<p>Develop a Wildland Urban Interface Code</p>	<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.
	<p>Require or Encourage Fire-Resistant Construction Techniques</p>	<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.
<p>Structure and Infrastructure Projects</p>	<p>Retrofit At-Risk Structures with Ignition-Resistant Materials</p>	<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);

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		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).

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		<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.

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		<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.

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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
Colorado River Fire Rescue	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
	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 low 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

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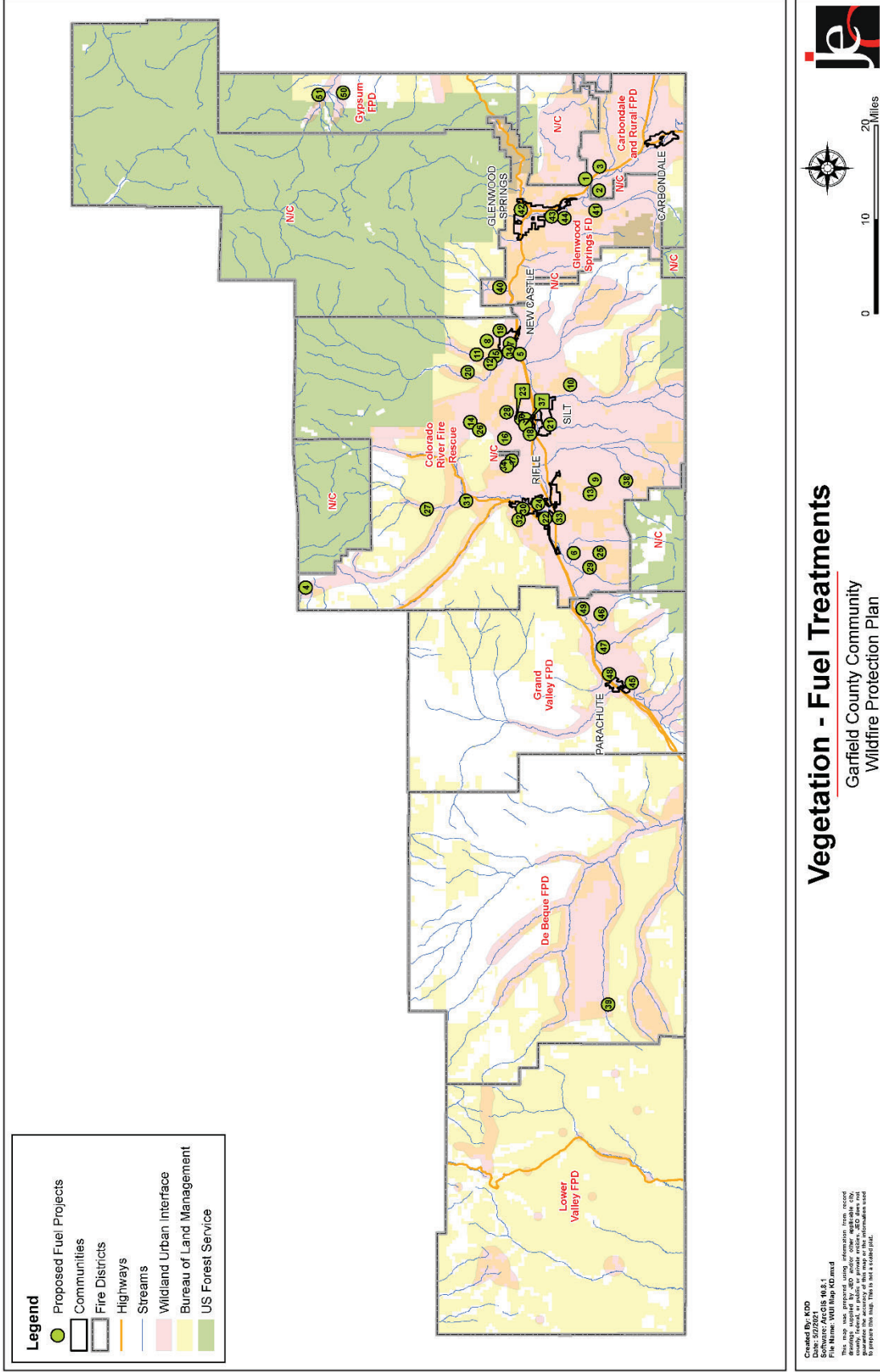
FPDs	#	Fuel Treatments (Priority)	Lead Organization
Lower Valley	-	Continue wildland fire for resource benefit practice (high)	BLM and private landowner
	-	Mow vegetation along roads (moderate)	State, county, private landowner
Glenwood Springs	40	Canyon Creek fuel reduction north of subdivision, fuelbreak 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
Grand Valley	-	Mow vegetation along roads (moderate)	State, county, private landowner
	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.

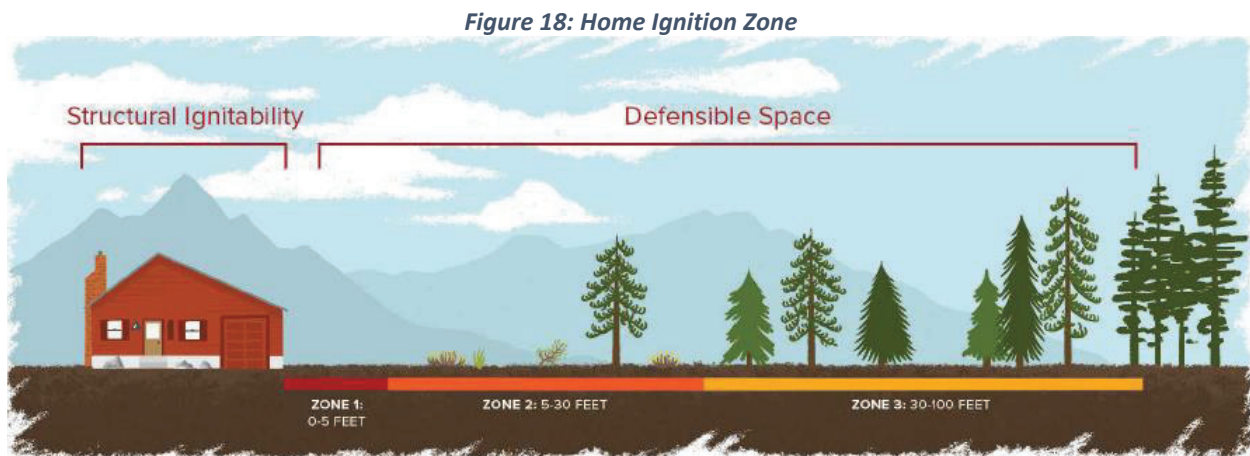
Establishing a Defensible Space

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

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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).



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;

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- 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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