

Upper Chama Community Wildfire Protection Plan

Walsh Project Number: 7935-010
June 1, 2008

UPPER CHAMA COMMUNITY WILDFIRE PROTECTION PLAN

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UPPER CHAMA COMMUNITY WILDFIRE PROTECTION PLAN


We the undersigned approve and support the Upper Chama Community Wildfire Protection Plan:


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New Mexico State Forestry Division Date


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Mayor, Village of Chama 5-6-2008
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List of Acronyms and Abbreviations

BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BTUs	British Thermal Units
CWPP	Community Wildfire Protection Plan
EA	Extended Attack
F	Fahrenheit
FBFM	Fire Behavior Fuel Model
FD	Fire District
FEMA	Federal Emergency Management Agency
FRCC	Fire Regime Condition Class
g	gallon
GIS	Geographical Information System
HFRA	Healthy Forests Restoration Act
IA	Initial Attack
IJPA	Interagency Joint Powers Agreement
IRP	Ignition Risk Potential
IWUIC	International Wildland-Urban Interface Code
JMSD	Jemez Mountain School District
LANDFIRE	Landscape Fire and Resource Management Planning Tools Project
MAP	Mineral Assessment Program
MFD	Municipal fire District
NEPA	National Environmental Policy Act
NFDRS	National Fire Danger Rating System
NFPA	National Fire Protection Association
NMDOT	New Mexico Department of Transportation
NMED	New Mexico Environment Department
NMRC	New Mexico Recycling Coalition
NMSFD	New Mexico State Forestry Division
NRAWUIC	Northern Rio Arriba Wildland-Urban Interface Corporation
NWCG	National Wildfire Coordination Group
USFS	U.S. Forest Service
VFD	Volunteer Fire Department
WALSH	Walsh Environmental Scientists and Engineers, LLC
WFU	Wildland Fire Use
WUI	Wildland-Urban Interface

List of Fire Behavior Terms

Aerial Fuels	All live and dead vegetation in the forest canopy or above surface fuels, including tree branches, twigs, cones, snags, moss, and high brush.
Aspect	Direction a slope faces.
Direct Attack	A method of fire suppression where actions are taken directly along the fire's edge. In a direct attack, burning fuel is treated directly, such as by wetting, smothering, or chemically quenching the fire or by physically separating burning from unburned fuel.
Chain	A unit of linear measurement equal to 66 feet.
Crown Fire	The movement of fire through the crowns of trees or shrubs more or less independently of the surface fire.
Dead Fuels	Fuels with no living tissue in which moisture content is governed almost entirely by atmospheric moisture (relative humidity and precipitation), dry-bulb temperature, and solar radiation.
Defensible Space	An area either natural or manmade where material capable of causing a fire to spread has been treated, cleared, reduced, or changed to act as a barrier between an advancing wildland fire and the loss to 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 by building and maintaining fire-safe communities compatible with the natural surroundings.
Firewise	Firewise is a national interagency program that serves as a resource for agencies, tribes, organizations, communities, fire departments, and private landowners who are working to provide information to reduce the loss of lives, property, and resources to wildfire risks and hazards to structures and communities.
Fire Behavior	The manner in which a fire reacts to the influences of fuel, weather, and topography.
Fire Danger	The broad-scale condition of fuels as influenced by environmental factors.
Fire Front	The part of a fire which continuous flaming combustion is taking place. Unless otherwise specified, the fire front is assumed to be the leading edge of the fire perimeter. In ground fires, the fire front may be mainly smoldering combustion.

Fire Hazard	The presence of ignitable fuel coupled with the influences of terrain and weather.
Fire Intensity	A general term relating to the heat energy released by a fire.
Fire Return Interval	The historic frequency that fire burns in a particular area or fuel type without human intervention.
Fire Regime	The characterization of fire's role in a particular ecosystem, usually characteristic of a particular vegetation and climatic regime, and typically a combination of fire return interval and fire intensity (i.e., high frequency low intensity/low frequency high intensity). A historic fire regime is the kind of fires that occurred before European settlement.
Fire Weather	Weather conditions that influence fire ignition, behavior, and suppression.
Flame Length	The distance from the base to the tip of the flaming front. Flame length is directly correlated with fire intensity.
Flaming Front	The zone of a moving fire where combustion is primarily flaming. Behind this flaming zone combustion is primarily glowing. Light fuels typically have a shallow flaming front, whereas heavy fuels have a deeper front.
Fuels	Combustible material; 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	An area of land where fuel continuity and load is reduced to reduce wildfire rate of spread and severity and to improve control opportunities.
Fuel Loading	The amount of fuel present expressed quantitatively in terms of weight of fuel per unit area.
Fuel Model	Simulated fuel complex (or combination of vegetation types) for which all fuel descriptors required for the solution of a mathematical rate of spread model have been specified.
Fuel Type	An identifiable association of fuel elements of a distinctive plant species, form, size, arrangement, or other characteristics that will

cause a predictable rate of fire spread or difficulty of control under specified weather conditions.

Ground Fuel	All combustible materials below the surface litter, including duff, tree or shrub roots, punchy wood, peat, and sawdust that normally support a glowing combustion without flame.
Hazard	Vegetation-fuel attributes that may be conducive to propagate and carry a fire.
Indirect Attack	A method of fire suppression where actions are taken some distance from the active edge of the fire due to intensity, terrain, or other factors that make direct attack difficult or undesirable.
Intensity	The level of heat radiated from the active flaming front of a fire, measured in British thermal units (BTUs) per foot.
Ladder Fuels	Fuels that provide vertical continuity between strata, thereby allowing fire to carry from surface fuels into the crowns of trees or shrubs with relative ease. Ladder fuels help initiate and ensure the continuation of crowning.
Live Fuels	Living plants, such as trees, grasses, and shrubs, in which the seasonal moisture content cycle is controlled largely by internal physiological mechanisms, rather than by external weather influences.
National Fire Danger Rating System (NFDRS)	A uniform fire danger rating system that focuses on the environmental factors that control the moisture content of fuels.
Prescribed Fire	Any fire ignited by management actions under certain predetermined conditions to meet specific objectives related to hazardous fuels or habitat improvement. A written, approved prescribed fire plan must exist, and National Environmental Policy Act (NEPA) requirements must be met prior to ignition.
Rate of Spread	The relative activity of a fire in extending its horizontal dimensions. It is expressed as a rate of increase of the total perimeter of the fire, rate of forward spread of the fire front, or rate of increase in an area, depending on the intended use of the information. Usually it is expressed in chains or acres per hour for a specific period in the fire's history. Sometimes it is expressed as feet per minute; one chain per hour is equal to 1.1 feet per minute.
Risk	The probability that a fire will start from natural or human-caused ignition.

- Surface Fuels** Loose surface litter on the soil surface, normally consisting of fallen leaves or needles, twigs, bark, cones, and small branches that have not yet decayed enough to lose their identity; also grasses, forbs, low and medium shrubs, tree seedlings, heavier branchwood, downed logs, and stumps interspersed with or partially replacing the litter.
- Topography** Referred to as “terrain.” The term also refers to parameters of the “lay of the land” that influence fire behavior and spread. Key elements are slope (in percent), aspect (the direction a slope faces), elevation, and specific terrain features such as canyons, saddles, “chimneys,” and chutes.
- Wildfire** A wildland fire that is unwanted and unplanned.
- Wildland Fire** Any fire burning in wildland fuels, including prescribed fire, fire use, and wildfire.
- Wildland Fire Use** The management of naturally ignited wildland fires to accomplish specific pre-stated resource management objectives in predefined geographic areas outlined in Fire Management Plans.

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 allows a community to evaluate its current situation with regard to wildfire risks and hazards, and devise ways to protect human welfare and important economic or ecological values. The CWPP may address issues such as community wildfire risk, fuel hazard, structure flammability, fuel treatments, non-fuel mitigation, community preparedness, and emergency procedures. A Core Team provides oversight to the development of the CWPP.

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

The Upper Chama CWPP assessment area extends from the eastern boundary of the Jicarilla Apache Reservation and the Rio Chama Wild and Scenic River Corridor to the western boundary of the Carson National Forest, and from the Colorado/New Mexico border south to the communities of Cebolla and Canjilon. The assessment area encompasses approximately 558,680 acres. Emphasis is on the protection of communities and other economic and ecological values. Historic fire occurrence was a major ecological influence in shaping the natural vegetation. The threat of wildfire continues today. However, wildfire risk to human welfare and economic and ecological values is more serious today than in the past because of the buildup of hazardous fuels, communities, other infrastructure in proximity to forests and rangelands, and a lack of public appreciation of wildfire. Human-caused ignitions account for approximately 50 percent of wildfires and their frequency will likely become more numerous as the area's population grows and outdoor recreation increases.

The accumulation of hazardous fuels may set the stage for catastrophic wildfire occurrence, resulting in the loss of economic and ecological values. There are varieties of fuels around communities, ranches, structures, and on public lands that create problems for fire protection. Fuels include grassland weedy fields, shrublands, piñon-juniper woodlands, ponderosa pine stands, and mixed conifer forests. Fuels, such as dried grass and weeds, are highly flammable, burn rapidly, and resist control. A coordinated effort among all fire authorities and private landowners is needed to manage hazardous fuels and reduce the risk of wildfire. The CWPP provides the means to identify wildfire risks and hazards, and prioritize mitigation projects.

Several sources of information were gathered and synthesized to formulate an understanding of wildfire risks and hazards. Sources of information included interview with residents of the wildland-urban interface (WUI)/community and vegetation-fuels surveys using a standardized procedure, various maps obtained from state and federal databases, interviews with fire chiefs and federal and state fire management officers, and public questionnaire participation.

As part of the assessment, a concerted effort was made to solicit information from the public and local experts on fire and natural resource issues. Core Team meetings were held on August 29 and September 17, 2007, and January 11 and March 12, 2008 to discuss CWPP development, findings, and recommendations. Two community meetings were convened on March 11 and 12, 2008 in Chama and Tierra Amarilla, respectively. The draft CWPP was made available on New Mexico State Forestry Division (NMSFD) website for a public review. Questionnaires were available at the local grocery store and distributed at public meetings to obtain information concerning the perceived level of wildfire risk in the assessment area and assess tolerance for mitigation practices that may be recommended to reduce risk.

The National Fire Protection Association (NFPA) Form 1144, *Standard for Protection of Life and Property from Wildfire 2002 Edition*, was used to assess the level of risk and hazard to communities and individual houses. The evaluation consisted of rating attributes such as means of access, surrounding vegetation (fuels), presence of defensible space, topography, roofing and other construction materials, available fire protection, and placement of utilities. Scores were assigned to each element and then totaled to determine the level of risk. A community was labeled as having low, moderate, high, or extreme risk based on the total score (Table ES 1). Community surveys were conducted during October 2007.

Table ES 1. Community Hazard Information

Community	NFPA 1144 Hazard Rating	Contributing Factors to NFPA 1144 Rating
Canjilon	High	<ul style="list-style-type: none"> ▪ Street or house signs not present ▪ Medium shrub vegetation ▪ Defensible space less than 30 feet ▪ Terrain adversely affect wildfire behavior ▪ Combustible decks ▪ Utilities above ground
Cebolla	Moderate	<ul style="list-style-type: none"> ▪ Street or house signs not present ▪ Light brush and herbaceous fuels ▪ Defensible space less than 30 feet ▪ Combustible decks ▪ Utilities above ground
Brazos Canyon	High	<ul style="list-style-type: none"> ▪ One road in/out ▪ Road width less than 20 feet ▪ Non-surface roads, grades greater than 5% ▪ Heavy, dense forest vegetation ▪ Defensible space less than 30 feet ▪ Combustible siding and decks ▪ Terrain adversely affect wildfire behavior
Buckman Road	Extreme	<ul style="list-style-type: none"> ▪ One road in/out

Community	NFPA 1144 Hazard Rating	Contributing Factors to NFPA 1144 Rating
		<ul style="list-style-type: none"> ▪ Road width less than 20 feet ▪ Non-surface roads, grades greater than 5% ▪ Heavy, dense forest vegetation ▪ Defensible space less than 30 feet ▪ Terrain adversely affect wildfire behavior ▪ Lack of water ▪ Fire station greater than 5 miles distance
Ponderosa Estates	Extreme	<ul style="list-style-type: none"> ▪ One road in/out ▪ Road width less than 20 feet ▪ Non-surface roads, grades greater than 5% ▪ Heavy, dense forest vegetation ▪ Defensible space less than 30 feet ▪ Combustible siding and decks ▪ Terrain adversely affect wildfire behavior ▪ Lack of water ▪ Fire station greater than 5 miles distance
Ensenada	Moderate	<ul style="list-style-type: none"> ▪ One road in/out ▪ Street or house signs not present ▪ Medium woodland vegetation ▪ Defensible space less than 30 feet ▪ Combustible decks ▪ Utilities above ground
Tierra Amarilla	Moderate	<ul style="list-style-type: none"> ▪ Street or house signs not present ▪ Light brush and herbaceous fuels ▪ Defensible space greater than 70 feet ▪ Combustible decks ▪ Utilities above ground
Los Ojos	Low	<ul style="list-style-type: none"> ▪ Street or house signs not present ▪ Light brush and herbaceous fuels ▪ Defensible space less than 70 feet ▪ Combustible decks ▪ Utilities above ground
La Puente	High	<ul style="list-style-type: none"> ▪ One road in/out ▪ Road width less than 20 feet ▪ Non-surfaced roads less than 5% grade ▪ Limited fire service access ▪ Street or house signs not present ▪ Medium to heavy forest vegetation ▪ Defensible space less than 30 feet ▪ Terrain adversely affect wildfire behavior ▪ Combustible decks ▪ Limited water availability ▪ Utilities above ground ▪ Fire station greater than 5 miles distance
Plaza Blanca	Moderate	<ul style="list-style-type: none"> ▪ One road in/out ▪ Street or house signs not present ▪ Defensible space greater than 30 feet ▪ Combustible decks ▪ Limited water availability ▪ Utilities above ground
Rutheron	Moderate	<ul style="list-style-type: none"> ▪ Street or house signs not present ▪ Defensible space greater than 30 feet ▪ Combustible decks ▪ Limited water availability ▪ Utilities above ground
Fort Heron	High	<ul style="list-style-type: none"> ▪ One road in/out

Community	NFPA 1144 Hazard Rating	Contributing Factors to NFPA 1144 Rating
		<ul style="list-style-type: none"> ▪ Road width less than 20 feet ▪ Non-surfaced roads greater than 5% grade ▪ Limited fire service access ▪ Street or house signs not present ▪ Medium woodland vegetation ▪ Defensible space less than 30 feet ▪ Combustible decks ▪ Limited water availability ▪ Utilities above ground ▪ Fire station greater than 5 miles distance
Laguna Vista Estates	High	<ul style="list-style-type: none"> ▪ One road in/out ▪ Road width less than 20 feet ▪ Non-surfaced roads greater than 5% grade ▪ Limited fire service access ▪ Street or house signs not present ▪ Medium to heavy forest vegetation ▪ Defensible space less than 30 feet ▪ Terrain adversely affect wildfire behavior ▪ Combustible decks
Piñon Ridge	High	<ul style="list-style-type: none"> ▪ One road in/out ▪ Road width less than 20 feet ▪ Non-surfaced roads greater than 5% grade ▪ Limited fire service access ▪ Street or house signs not present ▪ Medium woodland vegetation ▪ Defensible space less than 30 feet ▪ Terrain adversely affect wildfire behavior ▪ Combustible decks ▪ Limited water availability ▪ Utilities above ground ▪ Fire station greater than 5 miles distance
Chama	Low	<ul style="list-style-type: none"> ▪ Light brush and herbaceous fuels ▪ Defensible space less than 70 feet ▪ Combustible decks ▪ Utilities above ground
Cumbres & Toltec Scenic Railroad	High	<ul style="list-style-type: none"> ▪ Limited and narrow road access in/out ▪ Moderate to heavy fuels along route ▪ Terrain adversely affect wildfire behavior ▪ Limited water availability
Chama West	Moderate	<ul style="list-style-type: none"> ▪ Non-surface roads greater than 5% ▪ Street or house signs not present ▪ Combustible decks ▪ Limited water availability ▪ Fire station greater than 5 miles ▪ Utilities above ground
Biggs	High	<ul style="list-style-type: none"> ▪ Road width less than 20 feet ▪ Non-surfaced roads less than 5% grade ▪ Limited fire service access ▪ Street or house signs not present ▪ Light brush and herbaceous fuels ▪ Defensible space less than 30 feet ▪ Combustible decks ▪ Limited water availability ▪ Utilities above ground ▪ Fire station greater than 5 miles distance
Lumberton	Moderate	<ul style="list-style-type: none"> ▪ Limited fire service access

Community	NFPA 1144 Hazard Rating	Contributing Factors to NFPA 1144 Rating
		<ul style="list-style-type: none"> ▪ Street or house signs not present ▪ Medium shrub vegetation ▪ Terrain adversely affect wildfire behavior ▪ Combustible decks ▪ Limited water availability ▪ Utilities above ground
Diamante	High	<ul style="list-style-type: none"> ▪ Non-surfaced roads greater than 5% grade ▪ Limited fire service access ▪ Street or house signs not present ▪ Light brush and herbaceous fuels ▪ Defensible space 30 to 70 feet ▪ Combustible decks ▪ Limited water availability ▪ Utilities above ground ▪ Fire station greater than 5 miles distance

The following actions are proposed to reduce wildfire risks and hazards. Project recommendations are based on interviews with county fire chiefs, municipal fire chiefs, federal and state fire management officers, field observations, and questionnaire responses. Proposed mitigation projects were also presented and discussed at two public meetings.

- Encourage the development of defensible space around structures, utilities stations, communication towers, and other structures at risk to wildfire.
- Grass and weed abatement needs to occur throughout the assessment area. Native and non-native weedy grasses and forbs become flashy fuels as they dry in the late summer and fall. These fine fuels ignite easily and burn rapidly. Herbaceous fuels are common and widespread in the WUIs.
- Mowing along highways and roads will create fuelbreaks. Highways and roads are linear features that provide a break to fuel continuity. Mowing to a minimum distance of 6 feet along each side of highways and roads will enhance their usefulness as fuelbreaks, and reduce the chance of fire ignitions from vehicles or discarded smoking materials.
- Fuelbreaks are recommended for roads in piñon-juniper and forested areas where trees and shrubs grow next to roads. Such roads include Buckman, Ponderosa (County Road 341), Brazos Canyon (County Road 512), Crown Point (County Road 328), Shroyer Drive, Andrews, and possible others. Fuelbreaks along these roads are necessary for evacuation routes.
- Fuelbreaks along the south and northwest boundaries of the Jicarilla Apache Indian Reservation would provide protection to the Cumbres-Toltec Scenic Railroad, Brazos Canyon – Laguna Vista and Chama WUI communities. A fuelbreak is also recommended between Laguna Vista Estates and Heron Lake State Park along the hiking trail.

- Salt cedar control around Heron Lake and El Vado Lake is recommended. Abatement is warranted because of its fuel load, high water use, and limited wildlife habitat value.
- Improve forest and rangeland health. Fire regime condition class (FRCC) is a measure of forest and rangeland health. Forests and rangelands classified as FRCC 2 or 3 are considered unhealthy because there have been changes in plant community attributes and/or the fire regime in comparison with conditions prior to European settlement. Sixty-eight percent of the assessment area is classified as FRCC 2 or 3. Vegetation-fuels management plans should consider ways to improve forest and rangeland health, thus reducing vegetation-fuel hazards.
- Community education and public outreach is an effective means to initiate local action to reduce wildfire risks and hazards. Community outreach could occur through each WUI to achieve improved awareness of wildfire issues such as creation of defensible space around structures.
- A recommendation is for the Rio Arriba County and Village of Chama to consider adopting the International Wildland-Urban Interface Code (IWUIC). The IWUIC provides a set of codes that if implemented by communities may reduce wildfire risks and hazards. Improving the fire-resistant characteristics of structures in the assessment area goes hand-in-hand with the development of defensible space.
- A recommendation is to develop, map, and maintain strategically located water sources throughout each WUI. Dry hydrants, permanent surface water, stock ponds, or irrigation systems may be suitable water sources. Agreements with private landowners need to be negotiated annually for property and water access.
- Training volunteer firefighters is an ongoing need. Nearly all fire districts have wildfire fighters trained at the Firefighter 2 level but there is a need for training at the Firefighter 1 level. Because volunteer firefighters work during the week, training should occur on weekends.
- A VFD is needed in the West Chama–Lumberton WUI to reduce response time to wildfire and structure incidents. The Rio Arriba County Fire Marshal needs to evaluate this critical situation.
- The fire protection authorities in the assessment area need to collaborate to maintain, and in some cases improve wildfire fighting equipment, engines, and firefighter training.

Implementing and sustaining the CWPP is the key to success. This is the responsibility of the Core 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 involved stakeholders. 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.

UPPER CHAMA COMMUNITY WILDFIRE PROTECTION PLAN

1 INTRODUCTION

1.1 Community Wildfire Protection Plan (CWPP) Purpose

The CWPP is a strategic plan that identifies specific wildland fire risks and hazards facing communities. The CWPP also provides prioritized mitigation recommendations that are designed to reduce wildfire risks and hazards. Once the CWPP is approved, it is Northern Rio Arriba Wildland-Urban Interface Corporation's (NRAWUIC) responsibility to move forward and implement the recommended action items. This may require further planning at the project level, acquisition of funds, or motivating individual homeowners.

Decades of aggressive wildfire suppression practices in fire-adapted ecosystems have removed a critical natural cleansing mechanism from plant community dynamics. Fire exclusion has reduced forest and rangeland health through an unprecedented buildup of wildland flammable fuels. Such management tactics have also led to an alteration of the plant composition in vegetation communities through the invasion of aggressive and highly flammable weeds and grasses.

At the same time, demographic trends have shifted as families moved into forest and rangeland settings away from traditional urban and suburban communities. Areas where structures and communities intermix with forest and rangeland ecosystems are known as the wildland-urban interface (WUI). Because of the accumulation of flammable fuels in many forests and rangelands, the potential for catastrophic wildfire and loss of human values is great. Appropriate action is needed to reduce wildfire risks and hazards in the WUI through fuels management and improved community awareness. Recent large-scale WUI wildfires in the western United States, which have resulted in devastating losses of structures, business, communities, and human life, have received U.S. Congressional attention in the pursuit of effective solutions.

Precipitated by over a decade of increasing WUI wildfires, related losses, and spiraling suppression costs, the National Fire Plan was developed by the federal government in 2000. The Healthy Forests Restoration Act (HFRA) of 2003 implements the core components of the National Fire Plan. HFRA provides the impetus for wildfire risk and hazard assessments and strategic mitigation planning at the county and community level. HFRA refers to this level of planning as the CWPP process. A CWPP empowers a community to take advantage of wildland fire and hazardous fuel management opportunities offered under HFRA. A CWPP provides prioritized access to federal grant funding to support identified risk and hazard reduction projects, and a basis for collaboration with local, state, and federal land management agencies.

1.2 Need for a CWPP

A WUI plan was developed for Rio Arriba County to provide the County Fire Marshal with a program-based wildland fire protection plan for private lands within the county (SEC, Inc. 2003). Its purpose was to direct the management of forest-fuels to protect human life and welfare, promote forest restoration, secure funding for program implementation, market post-harvest wood products to sustain landscape fuel treatments, and adopt an emergency evacuation plan.

Subsequently, a Rio Arriba County CWPP was developed based on the WUI plan (SEC, Inc. not dated). The county-wide CWPP was at a landscape scale; wildfire risks, hazards, and mitigation recommendations were general in nature.

This Upper Chama CWPP will tier to the Rio Arriba County CWPP. The intent of the Upper Chama CWPP is to provide detailed information on wildfire risks and hazards, and present mitigation opportunities specific to the Upper Chama area.

The assessment areas encompass approximately 550,680 acres. Stakeholders include Bureau of Land Management (BLM) Taos Field Office, U.S. Forest Service (USFS) Canjilon Ranger District, Bureau of Indian Affairs (BIA) Jicarilla Agency, New Mexico State Forestry Division (NMSFD) Chama District, and private landowners. The assessment area is characterized by small rural communities nested within agricultural lands, piñon-juniper woodlands, and coniferous forest lands. Several communities are situated near terrain conducive to severe wildfire behavior and an accumulation of wildland fuels. The potential for large-scale wildfire is great throughout the assessment area because of fuel continuity and load.

Historically, grasslands, piñon-juniper woodlands, and coniferous forests experienced wildfire as a natural occurrence. Today, lightning strikes account for approximately 50 percent of wildfire starts in the assessment area. Additionally, potential sources of human-caused ignitions include such things as escaped fire from burn barrels or agriculture burns, ditch fires, fireworks, children playing with matches, and arson. State Highways 84, 17, and 64 are major public transportation routes and vehicles are potential sources of fire ignitions. The Cumbres & Toltec Scenic Railroad runs along Highway 17 and is a significant ignition risk in the assessment area.

The CWPP provides a coordinated assessment of wildfire risks and hazards, and recommends specific mitigation treatments designed to make the assessment area a safer place to live, work, and play. Collaboration among federal, state, and county agencies and private landowners is essential to reduce wildfire risks and hazards. This CWPP provides the framework for collaboration. All information was gathered, analyzed, and prepared in the CWPP format by Walsh Environmental Scientists and Engineers, LLC (WALSH).

1.3 Policy Framework

This Upper Chama CWPP is not a legal document. There are no legal requirements to implement the recommendations presented herein. Actions on public lands will be subject to federal, state, and county policies and procedures such as adherence to the HFRA, National Environmental Protection Act (NEPA), and New Mexico's smoke

management and open burn polices. Action on private land may require compliance with county land use codes.

Federal legislative acts that set policy and provide guidance to the development of the CWPP include:

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

The NMSFD is a valuable resource that provides education and guidance to communities and individual landowners concerned with the threat of wildfire, as well as forest resource management in the WUI (<http://www.emnrd.state.nm.us/fd/index.htm>).

1.4 CWPP Process and Core Team

The HFRA designed the CWPP to be a flexible process that can accommodate a wide variety of community needs. The Upper Chama CWPP follows the standardized steps as outlined in *Preparing a Community Wildfire Protection Plan: A Handbook for Wildland-Urban Interface Communities* (Table 1).

Table 1. CWPP Development Process

Step	Task	Explanation
One	Convene Decision Makers	Form a Core Team made up of representatives from local governments, fire authorities, NMSFD, and interested stakeholders.
Two	Involve Federal Agencies	Engage local representatives from the USFS, BIA, and BLM.
Three	Engage Interested Parties	Contact and encourage participation from a broad range of interested organizations and stakeholders.
Four	Establish a Community Base Map	Develop a base map of the district that provides a better understanding of communities, critical infrastructure, and forest/open space at risk.
Five	Develop a Community Risk Assessment	Develop a risk assessment that considers fuel hazards, community and commercial infrastructure, resources, and preparedness capability. Rate the level of risk and incorporate into the base map as appropriate.
Six	Establish Community Priorities and Recommendations	Use the risk assessment and base map to facilitate a collaborative public discussion that prioritizes fuel treatments and non-

Step	Task	Explanation
		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 Upper Chama CWPP and communicate the results to interested parties and stakeholders.

Source: Society of American Foresters (2004)

The initial step in developing the Upper Chama CWPP was to organize an operating group that serves as the core decision-making team (Table 2). The Core Team was formed by NRAWUIC. The NRAWUIC is composed of volunteers from communities in the assessment area with the objectives of reducing wildfire risks and hazards through collaboration with NMSFD, federal agencies, and private landowners.

The Core Team consists of representatives from local government, local fire authorities, and the NMSFD (Table 2). In addition, the Core Team includes relevant land management agencies and community stakeholders. Collaboration among agencies and communities is an important CWPP component because it promotes sharing perspectives, plans, priorities, and other information that is useful to the planning process. Together these entities guide the development of the CWPP and must mutually agree on the plan's final content.

Table 2. Upper Chama CWPP Core Team Members

Team Member	Organization	Phone Number	E-mail
Ron Stafford – Co-Chair	Northern Rio Arriba Wildland-Urban Interface Corporation	505-588-0158	staffordshire@zianet.com
Rosemary O'Neill – Co-Chair	Northern Rio Arriba Wildland-Urban Interface Corporation	505-588-7835	roneill@zianet.com
B.J. Samora	City of Chama and Chama Fire Department	505-756-8569	billyjoe.samora@state.nm.us
Jerome Sanchez	Rio Arriba County Fire Marshal	505-747-6367	jsanchez@rio_arriba.org
Mateo Devargas	Rio Arriba County Fire Marshal	505-747-6367	mdevargas@rio_arriba.org
Dwayne Merritt	Rio Arriba County Emergency Response	505-753-1418	Dmerritt@rio_arriba.org
Kit Taylor	Laguna Vista Volunteer Fire Department	505-588-7076	kit23@zianet.com
Mike Kerrigan	USFS Carson National Forest	505-758-6240	mkerrigan@fs.fed.us
Pat Pacheco	BLM Taos Field Office	505-751-8851	pat_pacheco@blm.gov

Team Member	Organization	Phone Number	E-mail
Carl Romnes	BIA Jicarilla Agency	505-759-3963	carlromnes@wildblue.net
Craig Daugherty	New Mexico State Forestry Division	505-588-7831	craig.daugherty@state.nm.us
Anthony Marquez	Herron State Park	505-588-7470	Anthony.marquez@state.nm.us

As a strategic plan, the CWPP success hinges on effective and long-term implementation of the identified objectives. The CWPP planning and development process must include efforts to build a Core Team that will oversee the execution of prioritized recommendations and maintain the plan as the characteristics of WUIs change over time. Specific projects may be undertaken by individual communities, while large-scale fuel treatments will require collaboration among local government and public land management agencies. The Core Team will assist NRAWUIC in the implementation of the CWPP action plan in cooperating with communities and private landowners. Continued public meetings are recommended as a means to generate additional support and maintain momentum.

CWPP fuel treatment recommendations derived from this analysis are prioritized through an open and collaborative effort with the Core Team and stakeholders. Prioritized treatments target wildfire hazard reduction in the WUI communities. An action plan guides treatment implementation for high-priority projects.

The finalized CWPP represents a strategic plan with Core Team consensus that provides prioritized vegetation-fuels treatment projects, non-fuels mitigation recommendations, maps of the assessment area, defensible space recommendations, and other information relevant to the scope of the project.

1.5 Upper Chama CWPP Goals and Objectives

Table 3 provides the goals and objectives for the Upper Chama CWPP goals and objectives.

Table 3. Upper Chama CWPP Goals and Objectives

Goal	Objective
Facilitate and develop a CWPP for the Upper Chama assessment area	<ul style="list-style-type: none"> ▪ Provide oversight for all activities related to the CWPP. ▪ Ensure representation and coordination among agencies and stakeholders. ▪ Develop a long-term framework for sustaining CWPP efforts.
Conduct wildfire risk and hazard assessments	<ul style="list-style-type: none"> ▪ Identify communities at wildfire risk and contributing factors. ▪ Identify hazardous fuel loads and locations. ▪ Determine the level of risk to communities that wildfires and contributing factors pose. ▪ Identify areas at risk to large-scale fire.
Develop a mitigation	<ul style="list-style-type: none"> ▪ Identify and prioritize vegetation-fuels treatment projects.

Goal	Objective
plan	<ul style="list-style-type: none"><li data-bbox="553 256 1084 285">▪ Identify and prioritize non-fuel mitigation needs.
Manage hazardous fuels	<ul style="list-style-type: none"><li data-bbox="553 304 1328 333">▪ Identify community hazards and prioritize hazard reduction treatments.<li data-bbox="553 340 1084 369">▪ Develop sustainable initiatives for communities.<li data-bbox="553 384 1112 413">▪ Secure funding and assist project implementation.
Facilitate emergency planning	<ul style="list-style-type: none"><li data-bbox="553 436 1365 495">▪ Develop strategies to strengthen emergency management, response, and evacuation capabilities for wildfire.<li data-bbox="553 510 1312 569">▪ Build relationships among federal, state, and county government; fire authorities; and communities.
Facilitate public outreach	<ul style="list-style-type: none"><li data-bbox="553 569 1295 636">▪ Develop strategies to increase citizen awareness and action toward Firewise landscaping and construction practices.<li data-bbox="553 651 1323 709">▪ Promote public outreach and cooperation for fuel reduction projects to solicit community involvement and private landowner cooperation.

2 WILDLAND FIRE MANAGEMENT PRIMER

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

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

2.1 Wildland Fire Behavior

Fire behavior is a description of the manner in which a fire reacts to the influences of fuel, weather, and topography. Fire behavior is assessed at the flaming front of the fire and described most simply in terms of fire intensity (flame length) and in rate of forward spread (Table 4). The implications of observed or expected fire behavior are important components of suppression strategies, particularly in terms of determining the difficulty of control and effectiveness of various suppression resources. Fire risk is the probability that wildfire will start from natural or human-caused ignitions. Fire hazard is the amount of ignitable fuel coupled with the influences of topography and weather, and is directly related to fire behavior. Fire severity refers to the immediate effect a fire has on vegetation and soil.

Table 4. Fire Behavior Ratings

Rating	Flame Length (feet)	Implication
Low	0 - 1	Fire will burn and spread; however, it presents very little resistance to control and direct attack by firefighters is possible.
Moderate	1 - 3	Fire spreads rapidly presenting moderate resistance to control but can be countered with direct attack by firefighters.
Active	3 - 7	Fire spreads very rapidly presenting substantial resistance to control. Direct attack by firefighters must be supplemented with equipment and/or air support.

Rating	Flame Length (feet)	Implication
Very Active	7 - 15	Fire spreads rapidly presenting extreme resistance to control. Indirect attack may be effective. Safety of firefighters in the area is a concern.
Extreme	15 +	Fire spreads rapidly presenting extreme resistance to control. Any form of attack will not likely be effective. Safety of firefighters in the area is of critical concern.

Source: Stubbs (2005)

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

For fire to spread, potential fuels 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 combustion conditions, it will not ignite. This explains why some trees, vegetation patches, or structures may survive a wildfire, while others in the near vicinity are completely burned.

Weather conditions such as high ambient temperatures, low relative humidity, and windy conditions favor fire ignition and high-intensity fire behavior. Under no-wind conditions fire burns more rapidly and intensely upslope than on level terrain. However, wind tends to be the driving force in the behavior of most WUI fires.

2.2 History of Wildfire

Lightning-induced fire is a natural component of forest and rangeland ecosystems in the assessment area. Its occurrence is important to maintaining forest and rangeland health. Native Americans used fire as a tool for hunting, improving wildlife habitat, and clearing land. As such, many of the plant species and communities are adapted to recurring fire through phenological, physiological, or anatomical attributes. Some plants, such as ponderosa pine and western wheatgrass, are fire adapted and may require reoccurring fire to persist and regenerate.

European settlers, land use policy, and changing ecosystems have altered fire behavior and fuels accumulation from their historic setting. Euro-American settlers in northern Rio Arriba County changed the natural fire regime in several interrelated ways. The nature of vegetation-fuel changed because of land use practices such as homesteading, livestock grazing, agriculture, water development, and road construction. Livestock grazing reduced the amount of fine fuels such as grasses and forbs, which carried low-intensity fire across the landscape. Continuous stretches of forest and rangeland vegetation-fuels were broken up by land-clearing activities. The removal of the natural vegetation facilitated the invasion of non-native grasses and forbs, some of which create more flammable fuel beds than their native predecessors.

2.3 Prescribed Fire

Prescribed fire may be used as a resource management tool under carefully controlled conditions. This includes pre-treatment of the fuel load and close monitoring of weather and other factors. Prescribed fire ultimately improves wildlife habitat, helps abate invasive vegetation, reduces excess fuel loads, and lowers the risk of future, severe wildfires. 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, enacted only under favorable weather conditions, and must meet smoke management requirements of the New Mexico Environment Department, Air Quality Bureau (www.nmenv.state.nm.us/aqb/Wildfire-PM.html).

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 and fuel loads, and with expert supervision. Burn piles are utilized to dispose of excess woody material after thinning if other means of disposal are not available or cost-prohibitive. Prescribed fire must be conducted in accordance with Rio Arriba County policy, which consists of a burn permit issued by the County Fire Marshal.

2.4 Wildland-Urban Interface

A WUI involves areas where communities and a wildland fuel intermix. Fire season after fire season, catastrophic losses occur as a result of wildfire in WUI areas throughout the western United States. Homes are lost, businesses are destroyed, community infrastructure is damaged, and most tragically, lives are lost. Precautionary action taken before a wildfire strikes often makes the difference between saving and losing a home. Creating a defensible space around homes, businesses, and other structures is an important component in wildfire hazard reduction. Providing an effective defensible space can be as basic as pruning trees, planting low-flammability native vegetation, and cleaning up surface fuels and other hazards near a home. These efforts are typically concentrated within 30 feet of a home to increase the chance for structure survival and to create an area for firefighters to work.

WUI studies suggest that the intense radiant heat of a wildfire is unlikely to ignite a structure that is more than 30 feet away as long as there is no direct flame impingement. Studies of home survivability indicate that homes with noncombustible roofs (Class A roofing material) and a minimum of 30 feet of defensible space have an 85-percent survival rate (Cohen 2000). Conversely, homes with wood shake roofs and less than 30 feet of defensible space have a 15-percent survival rate.

2.5 Hazardous Fuels Mitigation

Wildfire behavior and severity are dictated by fuel type, weather conditions, and topography. Because fuel is the only variable of these three that can be practically managed, it is the focus of many mitigation efforts. The objectives of fuels management may include reducing surface fire intensity, reducing the likelihood of crown fire initiation, reducing the likelihood of crown fire propagation, and improving forest and rangeland health. These objectives may be accomplished by reducing surface fuels,

limbing branches to raise canopy base height, thinning trees to decrease crown density, and/or retaining larger, fire-resistant trees.

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

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

3 UPPER CHAMA CWPP ASSESSMENT AREA PROFILE

3.1 County and District Setting

Rio Arriba County is located in north central New Mexico with Taos, San Juan, and Sandoval Counties to the east, west and south, respectively; and Conejos County, Colorado at its northern boundary. Rio Arriba County has a land area of 5,990 square miles and population of 41,190 (2000 census).

The Upper Chama CWPP assessment area extends from the eastern boundary of the Jicarilla Apache Reservation and the Rio Chama Wild and Scenic River Corridor to the western boundary of the Carson National Forest; and from the Colorado/New Mexico border south to the communities of Cebolla and Canjilon (Map 1). The assessment area encompasses approximately 558,680 acres. Land ownership within the assessment area is divided among federal, state, and private at 95,087, 50,834, and 399,259 acres, respectively. The assessment area is characterized by small rural communities surrounded by agricultural lands, grasslands, piñon-juniper woodlands, or coniferous forests (Map 2).

Major economic and ecological values in the assessment area at risk to wildfire include 20 communities, Cumbres & Toltec Rail Road, U.S. Highways 84, 64, and State Highway 17, El Vado Lake State Park, Heron Lake State Park, Bill Humphries State Wildlife Area, Edward Sargent State Wildlife Area, and communication towers on Rabbit Peak (Map 3).

All communities and the railroad corridor were assessed as to their wildfire risks and hazards. Fifteen communities and the rail road received an extreme- or high-risk rating primarily because of their proximity to hazardous wildland fuels. Four of the communities have limited ingress/egress with one primary access, which compounds their vulnerability to wildfire. Water availability for wildland fire suppression is limited in some communities.

Wildland fire protection occurs from several fire authorities including the Brazos Canyon VFD, Canjilon VFD, Laguna Vista VFD, Tierra Amarilla VFD, Chama Municipal Fire Department, Cumbres & Toltec Scenic Railroad, NMSFD Chama District, BLM Taos Field Office, BIA Jicarilla Agency, and USFS Canjilon Ranger District. The BLM Taos Field Office manages land but they do not station engines or a fire crew in the assessment.

The Chama Fire Department and VFDs have responsibility for structure and wildfire suppression within their respective districts. The Cumbres & Toltec Scenic Railroad has responsibility for fuels management and fire suppression along its track corridor. NMSFD has authority for wildfire suppression and fuels management on New Mexico State and private lands. Fire protection and fuel management on federal lands is under the auspices of the BLM, BIA, or USFS.

3.2 Wildland-Urban Interface

The assessment area is divided into four WUIs: Canjilon – Cebolla WUI, Brazos Canyon – Laguna Vista WUI, Chama WUI, and Chama West – Lumberton WUI (Map 4). The WUI were designated based on fuels management and wildfire suppression issues. The Core Team approved the WUI boundaries.

3.3 Climate

The climate of the area consists of four distinct seasons (Table 5). Warm summers and cold winters are normal. Summertime average temperatures range in the 70s to 80s Fahrenheit (F°) with high temperatures reaching the 90s F° and lows in the 40s F°. Winter average temperatures vary from highs in the upper 30s to lows in the 10s F°. The assessment area has 300 days of sunshine per year. Average annual precipitation is 21 inches and is somewhat evenly distributed throughout the year. The average snowfall is 103 inches.

**Table 5. Village of Chama Monthly Climate Summary
(January 1914–December 2005)**

Climate Attribute	Month												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
High Temperature (F°)	37	41	46	56	66	77	81	78	72	62	48	39	59
Low Temperature (F°)	6	10	16	24	32	39	46	46	38	28	17	10	26
Mean Temperature (F°)	22	26	31	40	49	58	64	62	55	45	33	25	43
Average Total Precipitation (inches)	1.9	1.8	1.8	1.4	1.3	1.0	2.2	2.7	2.0	1.7	1.4	1.8	21.0

Source: www.wrcc.dri.edu

3.4 Terrain

Terrain and elevation play an important role in determining vegetation-fuels and wildland fire behaviors. Terrain also dictates community infrastructure design that influences overall wildfire hazards and risks. The terrain varies from tablelands with moderate relief on the western portion of the assessment area to the steep mountains of Brazos Canyon on the eastern border (Map 1). A broad montane valley occurs in the middle of the assessment area. A distinct river corridor along the southwestern border of the planning area contains Rio Chama. Elevations vary from approximately 6,500 feet on the west to 10,000 feet in the east. The elevation of Chama is 7,800 feet.

3.5 Wildland Vegetation and Fuels

Wildland vegetation-fuels include grass, leaves, ground litter, shrubs, and trees. Structures in the WUI are also a fuel source. Vegetation-fuels in the assessment area are diverse and vary from grasslands and shrublands at low elevations to mixed-conifer and sub-alpine fir forests at high elevations (Map 2). Grasslands and agriculture occur in the valley between shrublands in the northwest and coniferous forests on the east. Bosques (riparian vegetation) of cottonwood trees and willows occur along the Rio Chama, Brazos River, and other streams.

Vegetation-fuels can be categorized into grass, shrub, timber, and slash fuel groups (Anderson 1982). These groups are called fire behavior fuel models (FBFMs) because fire rate of spread and flame length depends many times on fuel type. Anderson describes 13 different FBFMs divided among the four fuel groups. The differences in fire behavior among the 13 FBFMs are related to fuel load and the size-range of the fuels. Understanding the fire behavior characteristics of different vegetation-fuels types facilitates effective fuel-management and wildfire suppression strategies. Seven of the 13 FBFMs occur in the assessment area (Table 6, Map 6). The shrub and timber group account for 35 and 39 percent of the assessment area, respectively.

Table 6. Fire Behavior Fuel Models in the Assessment Area

Fire Behavior Fuel Model	Percent of Assessment Area	Description
FBFM 1	6	Grass Group – Fire spread is determined by the fine, very porous, and continuous herbaceous fuels that have cured or are nearly cured. These surface fires move rapidly through the cured grass and associated material. Very little shrub or timber is present, generally less than one-third of the cover of the area. Annual and perennial grasses occur in this model. Fire rate of spread is fast at 5,148 feet per hour with flame lengths greater than 4 feet.
FBFM 2	10	Grass Group – Fire spread occurs through cured dead herbaceous fuels. These are surface fires where downed woody debris from the shrub and tree component adds to fire intensity. Open shrublands, ponderosa pine stands, or Gambel oak stands that cover from one-third to two-thirds of the area generally fit this model. Fire rate of spread may exceed 2,318 feet per hour with flame lengths greater than 6 feet.
FBFM 5	34	Shrub Group – Fire is carried in the surface fuels that are made up of litter cast by the shrubs and the grasses and forbs in the understory. Fires are generally not very intense because surface fuel loads are light, the shrubs are young with little dead material, and the foliage contains little volatile material. Usually shrubs are short and almost totally cover the area. Young, green stands with no dead wood would qualify such as Gambel oak. Fire rate of spread is 11,188 feet per hour with flame lengths of 4 feet.
FBFM 6	5	Shrub Group – Fire spreads though the shrub layer with flammable foliage but requires moderate winds to maintain the foliage fire. Fire will drop to the ground in low-wind situations. Shrubs are mature with heights less than 6 feet. These stands include Gambel oak and mountain mahogany less than 6 feet tall. Fire rate of spread is approximately 2,112 feet per hour with flame lengths of 6 feet.
FBFM 8	20	Timber Group – These are slow-burning ground fires with low flame lengths. The fire may encounter an occasional “jackpot” or heavy fuel concentration that can flare up. Only under severe weather conditions

Fire Behavior Fuel Model	Percent of Assessment Area	Description
		involving high temperatures, low humidity, and high winds do the fuels pose fire hazards. Closed canopy stands of short-needle conifers support fire in the compact litter layer. This layer is mainly needles, leaves, and occasionally twigs because little undergrowth is present in the stand. Representative conifer types are white pine, Douglas-fir, spruce, and fir. Aspen stands also qualify. Fire rate of spread is approximately 132 feet per hours with a flame length of 1 foot.
FBFM 9	7	Timber Group – Fires run through the surface litter faster than in FBFM 8 and have longer flame lengths. These are semi-closed to closed canopy stands of long-needle conifers, such as ponderosa pine. The compact litter layer is mainly needles and occasional twigs. Concentrations of dead-down woody material contribute to tree torching, spotting, and crowning. Fire rate of spread is up to 528 feet per hour with flame lengths of 3 feet.
FBFM 10	8	Timber Group – Fires burn surface and ground fuels. Dead-down fuels include large quantities of 3-inch (7.6-cm) or limb wood resulting from over-maturity or natural events that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees are more frequent in this fuel situation, leading to potential fire control difficulties. All forest type may be considered if heavy down material is present (examples are insect- or disease-ridden stands, wind thrown stands, over-mature situations with deadfall, and aged light thinning or partial-cut slash). Fire rate of spread is 528 feet per hours with a flame length of 5 feet.

Source: Anderson (1982)

3.6 Water Resources

Surface water in the assessment area includes Heron Lake, El Vado Lake, Rio Chama, Brazos River, and other small streams. Tender (specialist fire apparatus for transporting large amounts of water) access for water drafting and helicopter dipping (fill a large bucket of water to transport to a fire) are available at Heron and El Vado lakes. Tender access to draft water is available at the Brazos River.

The Villages of Chama and Tierra Amarilla have hydrant systems. Dry hydrant (system not under constant pressure) systems are available for the communities of Brazos Canyon - Laguna Vista WUI. A tender shuttle system to transport water is necessary in most parts of the assessment area.

3.7 Wildfire Protection Authorities

Fire protection authorities in the assessment area include Canjilon VFD, Laguna Vista VFD, Brazos Canyon VFD, Tierra Amarilla VFD, Chama Municipal Fire District, Cumbres & Toltec Scenic Railroad, USFS, BIA, and NMSFD (Table 7). The Brazos Canyon VFD station was destroyed on February 19, 2008. The plan is to rebuild and re-equip the station within one year.

Table 7. Wildfire Protection Authorities' Suppression Capacities

Authority	Engines	Trained Wildland Firefighters
Brazos Canyon VFD	One pumper, 2000 gallon (g) One 4x4 truck, 200 g slip-in unit One brush truck, 500 g	15-man wildfire crew
Canjilon VFD	One pumper, 1,000 g One pumper, 750 g One Type 6 engine, 250 g	10-man wildfire crew
Laguna Vista VFD	One pumper, 750 g One tanker, 1800 g One Type 6 engine, 250 g One Type 7 engine, 250 g	8-man wildfire crew
Chama Municipal FD	One Type 6 engine, 200 g Two Class A pumpers, 1,000 g Two Class A pumpers, 500 g	4-man wildfire crew
Tierra Amarilla VFD	One Type 6 engine, 200 g One Class A pumper, 1,000 g	6-man wildfire crew
Cumbres & Toltec Scenic Railroad	On-track fire patrol One pumper, 300 g One Type 6 engine	2-man wildfire crew
BIA Jicarilla Agency	Two Type 6 engines, 200 g Three Type 6 engines, 300 g One Type 2 dozer One Type 3 water tender, 1,200 g	3-man permanent crew 3-man seasonal crew 20- to 30-man Timber Stand Improvement crew 20-man Southwest Fire Crew 3 smoke lookout towers
NMSFD, Chama District	Two Type 6 engines	5-man initial attack crew Airplane smoke diction flights
USFS, Canjilon Ranger District	One Type 6 engine, 200 g	3-man permanent crew 3-man seasonal crew

3.8 Values at Risk

Human welfare receives priority protection in the event of a wildfire. Wildfire risks and hazards reduction planning must consider human safety as top priority. Economic and ecological values are secondary to human welfare but they can also receive proper protection through collaborative planning. Economic values are the Cumbres & Toltec Scenic Railroad, big game hunting, agriculture, communities, homes, and businesses. Ecological values include wildlife and aquatic resources, and watersheds for municipal water supplies. The assessment area is a watershed for the City of Albuquerque. Catastrophic wildfire could occur throughout the assessment area and it would have a severe and long-term impact on economic and ecological values. The actions recommended in this CWPP are targeted toward lowering wildfire risks and hazards to economic and ecological resources. Examples of values at risk include:

- Human welfare
- Homes
- Businesses
- Local economies
- Municipal water supply
- Community infrastructure
- Communication towers
- Cumbres & Toltec Rail Road
- Big game hunting
- Agricultural lands
- Wildlife habitats
- Aquatic habitats
- Watershed health
- Bosques (riparian vegetation)
- Forest and rangeland vegetation
- Water quality
- Air quality
- Viewsheds
- Recreation and tourism

4 WILDFIRE RISK AND HAZARD ASSESSMENTS

Wildfire risk is the probability that a wildfire will ignite from lightning or human causes. Wildfire hazard refers to vegetation-fuel attributes that may be conducive to propagate and carry a fire.

4.1 Approach to Wildfire Risk and Hazard Assessments

Several sources of information were gathered and synthesized to formulate an understanding of wildfire risks and hazards in the assessment area. Sources for information included WUI/community and vegetation-fuel surveys, various maps, interviews with VFD fire chiefs and state and federal fire management officers, and public opinion.

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

The CWPP assessment used two main sources of information to generate various maps for the assessment area, which provide crucial information on wildfire risks and hazards. Sources of these data were the NMSFD, the BLM, and the Landscape Fire and Resource Management Planning Tools Project (or more commonly called LANDFIRE). NMSFD provided data on wildfire starts throughout the assessment area for the years 1987 to 2007. Maps 7 and 8 were generated from the NMSFD data. BLM provided information on landownership and infrastructure illustrated in Maps 1, 3, and 4.

Wildfire hazards and risks data were obtained from a national database known as the LANDFIRE (www.landfire.gov). LANDFIRE produces consistent and comprehensive maps and data describing vegetation, fuels, and fire regimes across the United States. Maps for the assessment area illustrating existing vegetation (Map 2), fire behavior fuel model (Map 5), historic reference fire regime (Map 6), and FRCC (Map 7) were obtained from LANDFIRE.

VFD chiefs and state and federal fire management officers were interviewed to obtain information on firefighting engines available for their respective authority, number of trained wildland firefighters, equipment and resource needs, and training needs. This information is important to determine and prioritize non-fuels mitigation needs to improve wildfire fighting capability and capacity.

As part of the assessment, a concerted effort was made to solicit feedback from the public and local experts on fire and natural resource issues. Core Team meetings were held on August 29, 2007, September 17, 2007, January 11, and March 12, 2008 to discuss the

CWPP development, findings, and recommendations. In addition, two community meetings were convened on March 11 and 12, 2008 in Chama and Tierra Amarilla, respectively. The purposes of the community meetings were to introduce the CWPP concept, project goals and objectives, provided an opportunity for the public to participate in the process, and review proposed mitigation possibilities. The draft CWPP was made available on NMSFD website for public review period after the public meetings. Review comments were sent to NRAWUIC or WALSH.

Questionnaires were available at Lowe’s Chama Valley Market and at the public meetings to ascertain the perceived level of wildfire risk in the assessment area and to assess public tolerance for proposed mitigation practices (see Appendix C). Homeowners were asked to return their responses to the grocery store for collection by NRAWUIC or mail them to WALSH (Appendix D). Because the roof of the grocery store collapsed from snow accumulation approximately the same day the questionnaires were due, some may have not been returned.

4.2 Historic Wildfire Regimes

Historic reference wildfire regimes are the kind of fires that occurred in the assessment area prior to European settlement. Lightning and Native Americans were the causes for historic wildfires. The historic fire regime is composed of the average return interval for wildfire and its severity. The average return interval is the number of years between wildfires. Fire severity is the amount of vegetation top-kill. Low-severity, mixed-severity, and stand-replacement fires are those resulting in less than 25, 25 to 75, and greater than 75 percent top-kill, respectively. Understanding the historic fire regime is important to understanding the present risk of fuel hazards and wildfire risks.

There are five different historic reference fire regimes within the assessment area (Map 6 and Table 8). The historic wildfire regimes are complex because different vegetation types may have similar fire regimes. However, general associations between vegetation types and historic fire regimes can be described. Grasslands and ponderosa pine forests have a fire return interval of 0 to 35 years with a low to stand replacement severity. Sagebrush, piñon-junipers, low elevation mixed conifer stands have a fire return interval of 35 to 200 years with low to stand replacement severity. High elevation mixed-conifer and spruce-fir forests, alpine vegetation types, and some piñon-juniper woodlands have a fire return interval greater than 200 years with stand replacement severity.

Table 8. Historic Reference Fire Regime

Fire Regime	Acres of Assessment Area	Percent of Assessment Area
0–35 year return interval; low/mixed severity	136,231	25
0–35 year return interval; stand replacement severity	29,231	5

Fire Regime	Acres of Assessment Area	Percent of Assessment Area
35–200 year return interval; low/mixed severity	91,427	17
0–200 year return interval; stand replacement severity	84,536	16
200+ year return interval; stand replacement severity	201,462	37

Source: landfire.cr.usgs.gov

4.3 Recent Wildfire History

Grasslands, shrublands, piñon-juniper woodlands, ponderosa pines, mixed conifer forests, and sub-alpine fir forests occur in the assessment area (Map 2). These ecosystems are adapted to re-occurring wildfire (Table 8).

Wildfires occurrence in the assessment area is common (Map 7). During the 10-year period of 1997 through 2007, wildfire ignitions occurred frequently in the west and north portions of the assessment area. Some areas were burned more than once during the 10 years. One or more fires have occurred in close proximity to most communities.

During 1997 through 2006, there was an average of 40 fires per year, which were responded to by a VFD, NMSFD, BIA, BLM or USFS. Most fires occur during late summer and fall months. Approximately 70 percent of all wildfires burn less than 0.25 acres regardless of ignition source, while less than 1 percent of all fires burn over 300 acres. Lightning caused 50 percent of wildfires and 50 percent were human-caused. Human-caused wildfire resulted mainly from escaped fire (e.g., trash burning, field burning, land clearing, or slash burning) and campfires. The railroad accounted for 53 fires. Wildfire occurrences in the assessment area varied among the different vegetation types but were more common in grasslands and ponderosa pine forests (Table 10).

Table 9. Wildfire History 1997 to 2006

Fire Size Class (Acres)	Acres Burned	Number of Fires	Fire Ignition Source	
			Lightning	Human
A 0 – 0.25	35	284	164	120
B 0.25 – 9.9	209	110	37	73
C 9.9 – 99.9	286	11	2	9
D 100 – 299.9	240	2	0	2
E 300 – 999.9	0	0	0	0
F 1,000 – 4,999.9	0	0	0	0
G 5,000 – 9,999.9	0	0	0	0

Source: New Mexico State Forestry Division

Table 10. Wildfire Occurrence by Vegetation Type 1997 to 2006

Fire Size Class (Acres)	Grassland	Shrubland	Piñon-Juniper Woodland	Ponderosa Pine	Mixed Conifer	Sub-Alpine Fir
A 0 – 0.25	64	28	16	97	63	7
B 0.25 – 9.9	46	13	10	31	10	1
C 9.9 – 99.9	6	3	0	1	0	0
D 100 – 299.9	1	1	0	0	0	0
E 300 – 999.9	0	0	0	0	0	0
F 1,000 – 4,999.9	0	0	0	0	0	0
G 5,000 – 9,999.9	0	0	0	0	0	0

Source: New Mexico State Forestry Division

4.4 Wildfire Ignition Risk Potential

Wildfire ignition risk potential (IRP) is a measure for the probability of fire occurrence. The IRP is a landscape spatial analysis 1997 to 2006 wildfire data presented in Map 8. IRP illustrates the patterns of fires in the various WUIs and community risk. IRP is defined as the number of fires per 1,000 acres for the 1997 to 2006 time periods. Low-risk areas had no fires. Moderate-risk areas had one fire. High-risk areas had more than one fire. The low-risk areas occupied 51 percent of the assessment area and these lands generally occurred in areas away from communities and roads. The IRP high-risk areas occurred nearby communities, roads, agricultural lands, and the railroad corridor. The moderate risk lands were located in between the low- and high-risk areas. IRP was used to determine the level of wildfire risk to a WUI and community.

4.5 Vegetation-Fuel Hazards

Fire regime condition class (FRCC) is a measure of the degree of departure of the current vegetation composition and fire regime from the historic vegetation composition and fire regime. FRCC is determined by comparing the existing fire regime and vegetation-fuels situation composition with the historic fire regime and natural vegetation composition (Table 11). The degree of departure may result from differences in vegetation composition, or the historical fire regime (i.e., fire return frequency and severity). According to the HFRA, FRCC is the preferred tool for assessing forests and rangelands health. Because, many times, changes in natural vegetation composition (i.e., the presents of invasive weeds or overstocked forest stands) include changes in vegetation-fuels attributes (i.e., fuel continuity and load), FRCC can serve as a surrogate to defining hazardous fuels. FRCC 1, FRCC 2, and FRCC 3 may be viewed as low-, moderate-, and high-hazard fuels, respectively.

All FRCCs occur in the assessment area (Map 9). FRCC 2 is the most common at 67 percent of the assessment area. FRCC 1 and 3 occupy 27 and 1 percent, respectively. FRCC 2 encompasses numerous different vegetation types. FRCC 3 vegetation is mainly located in El Vado Wildlife Refuge and along in the Rio Chama canyon.

Table 11. Fire Regime Condition Class

Fire Regime Condition Class	Percent of Assessment Area	Description
1	27	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.
2	67	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.
3	1	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.

 Source: <http://www.frcc.gov>

4.6 Wildfire Risk to Communities

Community hazard and risk surveys were conducted September 17 through 20, 2007. The Core Team identified 20 communities to be assessed (Table 12). Each community represents a specific response area with unique characteristics, resources, and identifiable hazards and risks. Outlying homes and structures were not evaluated. However, the recommendation presented herein such as defensible space and emergency preparedness are also applicable to these landowners.

Table 12. Assessment Area Summary Information

Community	Values at Risk	Wildfire Risk of Occurrence	NFPA 1144 Hazard Rating	Contributing Factors to NFPA 1144 Rating	Community Firefighting Capability and Preparedness
Cebolla – Canjilon WUI					
Canjilon	<ul style="list-style-type: none"> ▪ Homes ▪ Agricultural land ▪ Recreation ▪ Wildlife habitat ▪ Watershed quality ▪ Aesthetics ▪ Air quality ▪ Soil stability 	High	High	<ul style="list-style-type: none"> ▪ Street or house signs not present ▪ Medium shrub vegetation ▪ Defensible space less than 30 feet ▪ Terrain adversely affect wildfire behavior ▪ Combustible decks ▪ Utilities above ground 	<ul style="list-style-type: none"> ▪ Has VFD ▪ Wildfire trained volunteers
Cebolla	<ul style="list-style-type: none"> ▪ Homes 	High	Moderate	<ul style="list-style-type: none"> ▪ Street or house 	<ul style="list-style-type: none"> ▪ Has VFD

Community	Values at Risk	Wildfire Risk of Occurrence	NFPA 1144 Hazard Rating	Contributing Factors to NFPA 1144 Rating	Community Firefighting Capability and Preparedness
	<ul style="list-style-type: none"> ▪ Agricultural land ▪ Recreation ▪ Wildlife habitat ▪ Watershed quality ▪ Aesthetics ▪ Air quality ▪ Soil stability 			<ul style="list-style-type: none"> ▪ signs not present ▪ Light brush and herbaceous fuels ▪ Defensible space less than 30 feet ▪ Combustible decks ▪ Utilities above ground 	<ul style="list-style-type: none"> ▪ Wildfire trained volunteers
Brazos Canyon – Laguna Vista WUI					
Brazos Canyon	<ul style="list-style-type: none"> ▪ Homes ▪ Recreation ▪ Wildlife habitat ▪ Watershed quality ▪ Aesthetics ▪ Air quality ▪ Soil stability 	High	High	<ul style="list-style-type: none"> ▪ One road in/out ▪ Road width less than 20 feet ▪ Non-surface roads, grades greater than 5% ▪ Heavy, dense forest vegetation ▪ Defensible space less than 30 feet ▪ Combustible siding and decks ▪ Terrain adversely affect wildfire behavior 	<ul style="list-style-type: none"> ▪ VFD¹ ▪ Water is available ▪ Wildfire trained volunteers
Buckman Road	<ul style="list-style-type: none"> ▪ Homes ▪ Recreation ▪ Wildlife habitat ▪ Watershed quality ▪ Aesthetics ▪ Air quality ▪ Soil stability 	High	Extreme	<ul style="list-style-type: none"> ▪ One road in/out ▪ Road width less than 20 feet ▪ Non-surface roads, grades greater than 5% ▪ Heavy, dense forest vegetation ▪ Defensible space less than 30 feet ▪ Terrain adversely affect wildfire behavior ▪ Lack of water ▪ Fire station greater than 5 miles distance 	<ul style="list-style-type: none"> ▪ No VFD ▪ Brazos Canyon VFD will respond but with extended response time
Ponderosa Estates	<ul style="list-style-type: none"> ▪ Homes ▪ Recreation ▪ Wildlife habitat ▪ Watershed quality ▪ Aesthetics ▪ Air quality ▪ Soil stability 	High	Extreme	<ul style="list-style-type: none"> ▪ One road in/out ▪ Road width less than 20 feet ▪ Non-surface roads, grades greater than 5% ▪ Heavy, dense forest vegetation ▪ Defensible space less than 30 feet ▪ Combustible siding and decks ▪ Terrain adversely 	<ul style="list-style-type: none"> ▪ No VFD ▪ Brazos Canyon VFD will respond but with extended response time

Community	Values at Risk	Wildfire Risk of Occurrence	NFPA 1144 Hazard Rating	Contributing Factors to NFPA 1144 Rating	Community Firefighting Capability and Preparedness
				affect wildfire behavior <ul style="list-style-type: none"> ▪ Lack of water ▪ Fire station greater than 5 miles distance 	
Ensenada	<ul style="list-style-type: none"> ▪ Homes ▪ Agricultural land ▪ Recreation ▪ Wildlife habitat ▪ Watershed quality ▪ Aesthetics ▪ Air quality ▪ Soil stability 	High	Moderate	<ul style="list-style-type: none"> ▪ One road in/out ▪ Street or house signs not present ▪ Medium woodland vegetation ▪ Defensible space less than 30 feet ▪ Combustible decks ▪ Utilities above ground 	<ul style="list-style-type: none"> ▪ No VFD ▪ Tierra Amarilla VFD will respond but with extended response time
Tierra Amarilla	<ul style="list-style-type: none"> ▪ Homes ▪ Recreation ▪ Wildlife habitat ▪ Watershed quality ▪ Aesthetics ▪ Air quality ▪ Soil stability 	High	Moderate	<ul style="list-style-type: none"> ▪ Street or house signs not present ▪ Light brush and herbaceous fuels ▪ Defensible space less than 70 feet ▪ Combustible decks ▪ Utilities above ground 	<ul style="list-style-type: none"> ▪ Has VFD ▪ Wildfire trained volunteers
Los Ojos	<ul style="list-style-type: none"> ▪ Homes ▪ Recreation ▪ Wildlife habitat ▪ Watershed quality ▪ Aesthetics ▪ Air quality ▪ Soil stability 	High	Low	<ul style="list-style-type: none"> ▪ Street or house signs not present ▪ Light brush and herbaceous fuels ▪ Defensible space less than 70 feet ▪ Combustible decks ▪ Utilities above ground 	<ul style="list-style-type: none"> ▪ No VFD ▪ Tierra Amarilla VFD will respond but with extended response time
La Puente	<ul style="list-style-type: none"> ▪ Homes ▪ Agricultural land ▪ Recreation ▪ Wildlife habitat ▪ Watershed quality ▪ Aesthetics ▪ Air quality ▪ Soil stability 	High	High	<ul style="list-style-type: none"> ▪ One road in/out ▪ Road width less than 20 feet ▪ Non-surfaced roads greater than 5% grade ▪ Limited fire service access ▪ Street or house signs not present ▪ Medium to heavy forest vegetation ▪ Defensible space less than 30 feet ▪ Terrain adversely affect wildfire behavior ▪ Combustible decks ▪ Limited water availability ▪ Utilities above 	<ul style="list-style-type: none"> ▪ No VFD ▪ Laguna Vista or Tierra Amarilla VFD will respond but with extended response time

Community	Values at Risk	Wildfire Risk of Occurrence	NFPA 1144 Hazard Rating	Contributing Factors to NFPA 1144 Rating	Community Firefighting Capability and Preparedness
				ground <ul style="list-style-type: none"> ▪ Fire station greater 5 miles distance 	
Plaza Blanca	<ul style="list-style-type: none"> ▪ Homes ▪ Recreation ▪ Wildlife habitat ▪ Watershed quality ▪ Aesthetics ▪ Air quality ▪ Soil stability 	High	Moderate	<ul style="list-style-type: none"> ▪ One road in/out ▪ Street or house signs not present ▪ Defensible space less than 30 feet ▪ Combustible decks ▪ Limited water availability ▪ Utilities above ground 	<ul style="list-style-type: none"> ▪ No VFD ▪ Tierra Amarilla VFD will respond but with extended response time
Rutherford	<ul style="list-style-type: none"> ▪ Homes ▪ Agricultural land ▪ Recreation ▪ Wildlife habitat ▪ Watershed quality ▪ Aesthetics ▪ Air quality ▪ Soil stability 	High	Moderate	<ul style="list-style-type: none"> ▪ Street or house signs not present ▪ Defensible space less than 30 feet ▪ Combustible decks ▪ Limited water availability ▪ Utilities above ground 	<ul style="list-style-type: none"> ▪ No VFD ▪ Laguna Vista VFD will respond but with extended response time
Fort Heron	<ul style="list-style-type: none"> ▪ Homes ▪ Recreation ▪ Wildlife habitat ▪ Watershed quality ▪ Aesthetics ▪ Air quality ▪ Soil stability 	High	High	<ul style="list-style-type: none"> ▪ One road in/out ▪ Road width less than 20 feet ▪ Non-surfaced roads greater than 5% grade ▪ Limited fire service access ▪ Street or house signs not present ▪ Medium woodland vegetation ▪ Defensible space less than 30 feet ▪ Combustible decks ▪ Limited water availability ▪ Utilities above ground ▪ Fire station less than 5 miles distance 	<ul style="list-style-type: none"> ▪ No VFD ▪ Laguna Vista VFD will respond but with extended response time
Laguna Vista Estates	<ul style="list-style-type: none"> ▪ Homes ▪ Recreation ▪ Wildlife habitat ▪ Watershed quality ▪ Aesthetics ▪ Air quality ▪ Soil stability 	High	High	<ul style="list-style-type: none"> ▪ One road in/out ▪ Road width less than 20 feet ▪ Non-surfaced roads greater than 5% grade ▪ Limited fire service access ▪ Street or house signs not present 	<ul style="list-style-type: none"> ▪ Has VFD ▪ Wildfire trained volunteers

Community	Values at Risk	Wildfire Risk of Occurrence	NFPA 1144 Hazard Rating	Contributing Factors to NFPA 1144 Rating	Community Firefighting Capability and Preparedness
				<ul style="list-style-type: none"> ▪ Medium to heavy forest vegetation ▪ Defensible space less than 30 feet ▪ Terrain adversely affect wildfire behavior ▪ Combustible decks 	
Piñon Ridge	<ul style="list-style-type: none"> ▪ Homes ▪ Recreation ▪ Wildlife habitat ▪ Watershed quality ▪ Aesthetics ▪ Air quality ▪ Soil stability 	Moderate	High	<ul style="list-style-type: none"> ▪ One road in/out ▪ Road width less than 20 feet ▪ Non-surfaced roads greater than 5% grade ▪ Limited fire service access ▪ Street or house signs not present ▪ Medium woodland vegetation ▪ Defensible space less than 30 feet ▪ Terrain adversely affect wildfire behavior ▪ Combustible decks ▪ Limited water availability ▪ Utilities above ground ▪ Fire station greater than 5 miles distance 	<ul style="list-style-type: none"> ▪ No VFD ▪ Laguna Vista VFD will respond but with extended response time
Chama WUI					
Chama	<ul style="list-style-type: none"> ▪ Homes ▪ Business ▪ Rabbit Mountain communication towers ▪ Recreation ▪ Huntington ▪ Wildlife habitat ▪ Watershed quality ▪ Aesthetics ▪ Air quality ▪ Soil stability 	High	Low	<ul style="list-style-type: none"> ▪ Light brush and herbaceous fuels ▪ Defensible space less than 70 feet ▪ Combustible decks ▪ Utilities above ground 	<ul style="list-style-type: none"> ▪ Municipal Fire Department ▪ Wildfire trained volunteers
Cumbres & Toltec Scenic Railroad	<ul style="list-style-type: none"> ▪ Business ▪ Regional economic base ▪ Recreation ▪ Wildlife habitat 	High	High	<ul style="list-style-type: none"> ▪ Limited and narrow road access in/out ▪ Moderate to heavy fuels along route ▪ Terrain adversely affect wildfire 	<ul style="list-style-type: none"> ▪ Trained wildfire crew ▪ Wildfire management plan ▪ 300-gallon pumper

Community	Values at Risk	Wildfire Risk of Occurrence	NFPA 1144 Hazard Rating	Contributing Factors to NFPA 1144 Rating	Community Firefighting Capability and Preparedness
	<ul style="list-style-type: none"> ▪ Watershed quality ▪ Aesthetics ▪ Air quality ▪ Soil stability 			<ul style="list-style-type: none"> behavior ▪ Limited water availability 	<ul style="list-style-type: none"> follows 4 hours behind train ▪ Type 6 brush truck available as needed
Chama West – Lumberton WUI					
Chama West	<ul style="list-style-type: none"> ▪ Homes ▪ Agricultural land ▪ Recreation ▪ Wildlife habitat ▪ Watershed quality ▪ Aesthetics ▪ Air quality ▪ Soil stability 	Low	Moderate	<ul style="list-style-type: none"> ▪ Non-surface roads greater than 5% ▪ Street or house signs not present ▪ Combustible decks ▪ Limited water availability ▪ Fire station greater than 5 miles ▪ Utilities above ground 	<ul style="list-style-type: none"> ▪ No VFD ▪ No water availability
Biggs	<ul style="list-style-type: none"> ▪ Homes ▪ Recreation ▪ Wildlife habitat ▪ Watershed quality ▪ Aesthetics ▪ Air quality ▪ Soil stability 	High	High	<ul style="list-style-type: none"> ▪ Road width less than 20 feet ▪ Non-surfaced roads greater than 5% grade ▪ Limited fire service access ▪ Street or house signs not present ▪ Light brush and herbaceous fuels ▪ Defensible space less than 30 feet ▪ Combustible decks ▪ Limited water availability ▪ Utilities above ground ▪ Fire station greater than 5 miles distance 	<ul style="list-style-type: none"> ▪ No VFD ▪ No water availability
Lumberton	<ul style="list-style-type: none"> ▪ Homes ▪ Recreation ▪ Wildlife habitat ▪ Watershed quality ▪ Aesthetics ▪ Air quality ▪ Soil stability 	High	Moderate	<ul style="list-style-type: none"> ▪ Limited fire service access ▪ Street or house signs not present ▪ Medium shrub vegetation ▪ Terrain adversely affect wildfire behavior ▪ Combustible decks ▪ Limited water availability ▪ Utilities above ground 	<ul style="list-style-type: none"> ▪ No VFD ▪ No water availability ▪ Dulce VFD may respond but with extended response time
Diamante	<ul style="list-style-type: none"> ▪ Homes 	Low	High	<ul style="list-style-type: none"> ▪ Non-surfaced 	<ul style="list-style-type: none"> ▪ No VFD

Community	Values at Risk	Wildfire Risk of Occurrence	NFPA 1144 Hazard Rating	Contributing Factors to NFPA 1144 Rating	Community Firefighting Capability and Preparedness
	<ul style="list-style-type: none"> ▪ Recreation ▪ Wildlife habitat ▪ Watershed quality ▪ Aesthetics ▪ Air quality ▪ Soil stability 			<ul style="list-style-type: none"> roads greater than 5% grade ▪ Limited fire service access ▪ Street or house signs not present ▪ Light brush and herbaceous fuels ▪ Defensible space 30 to 70 feet ▪ Combustible decks ▪ Limited water availability ▪ Utilities above ground ▪ Fire station greater than 5 miles distance 	<ul style="list-style-type: none"> ▪ No water availability

¹ Brazos Canyon VFD station was destroyed on February 19, 2008. The plan is to rebuild the station.

Buckman Road and Ponderosa Estates received an extreme-hazard rating because of the proximity to forest fuels, lack of defensible space, lack of VFD, and paucity of water. Brazos Canyon received a high-hazard ranking but would have qualified for an extreme ranking if it were not for its VFD. Canjilon, La Puente, Fort Heron, Laguna Vista Estates, Piñon Ridge, Biggs, Diamante, and the railroad corridor also received a high-hazard ranking. The most important and immediate practice that these extreme- and high-hazard communities could do to reduce the level of hazard is the development of defensible space around structures. The need for defensible space is a leading mitigation need identified by respondents to the survey questionnaire (Appendix D).

5 WILDFIRE MITIGATION PLAN

Wildfire mitigation involves actions taken to reduce the likelihood of loss due to wildfire. Mitigation actions include managing wildland vegetation-fuels, creating strategic fuelbreaks, utilizing fire-resistant building materials and defensible space landscaping for homes, improving emergency preparedness and response capabilities, upgrading current infrastructure, and fostering community awareness. Specific mitigation treatment recommendations for the 20 communities were identified through community surveys, interviews with VFD fire chiefs in the assessment area, and federal and state fire management officers.

5.1 Recommended Vegetation-Fuels Mitigation

Priority fuels treatments were identified through community observations, discussions with NMSFD and VFDs, and the questionnaire (Table 13 and Map 10). Fuels reduction actions include defensible space, fuelbreaks, and large-area, fuel-reduction treatments. Projects will require support and coordination with NMSFD, BIA, USFS, and VFDs as appropriate. The potential for reducing wildfire danger is based on community NFPA hazard and IRP ratings (Table 12). It is assumed that those communities with a high or moderate NFPA and/or IRP rating will have excellent potential for reducing wildfire risks and hazards.

Table 13. Recommended Fuels Treatments for Upper Chama WUI Communities

Community	Recommended Fuels Treatments	Responsible Organization
Cebolla – Canjilon WUI		
Canjilon	<ul style="list-style-type: none"> ▪ Defensible space ▪ Weed abatement ▪ Fuelbreak along USFS boundary ▪ Mowing along Highway 84 and other roads ▪ Manage FRCC 2/3 vegetation to FRCC 1 	<ul style="list-style-type: none"> ▪ Homeowner/NMSFD ▪ County/Private landowner ▪ USFS/Private landowner ▪ State/County ▪ USFS/NMSFD/Private landowners
Cebolla	<ul style="list-style-type: none"> ▪ Defensible space ▪ Mowing along Highway 84 and other roads ▪ Weed abatement ▪ Fuelbreak USFS boundary ▪ Mowing along Highway 84 and other roads ▪ Manage FRCC 2/3 vegetation to FRCC 1 	<ul style="list-style-type: none"> ▪ Homeowner/NMSFD ▪ State/County ▪ County/Private landowner ▪ USFS/Private landowner ▪ County ▪ USFS/NMSFD/Private landowner
Brazos Canyon – Laguna Vista WUI		
Brazos Canyon	<ul style="list-style-type: none"> ▪ Defensible space ▪ Fuelbreaks along County Roads 512 and 328 ▪ Fuelbreaks along all community roads ▪ Reduce herbaceous fuel load east of Highway 84 ▪ Manage FRCC 2/3 vegetation to FRCC 1 	<ul style="list-style-type: none"> ▪ Homeowner/NMSFD ▪ County ▪ Community/NMSFD ▪ Private landowner ▪ Private landowners/NMSFD
Buckman Road	<ul style="list-style-type: none"> ▪ Defensible space ▪ Fuelbreak along County Road 341 and Crown Point Road ▪ Fuelbreak along Jicarilla Apache Indian Reservation southern boundary 	<ul style="list-style-type: none"> ▪ Homeowner/NMSFD ▪ County/NMSFD ▪ BIA

Community	Recommended Fuels Treatments	Responsible Organization
	<ul style="list-style-type: none"> ▪ Reduce grass fuel load east of Highway 84 ▪ Manage FRCC 2/3 vegetation to FRCC 1 	<ul style="list-style-type: none"> ▪ Private landowner ▪ Private landowner/NMSFD
Ponderosa	<ul style="list-style-type: none"> ▪ Defensible space ▪ Fuel break along Ponderosa and Crown Point roads ▪ Reduce grass fuel load east of Highway 84 ▪ Manage FRCC 2/3 vegetation to FRCC 1 	<ul style="list-style-type: none"> ▪ Homeowner ▪ County/NMSFD ▪ Private landowner ▪ Private landowner/NMSFD
Ensenada	<ul style="list-style-type: none"> ▪ Defensible space ▪ Mowing along roads ▪ Weed abatement 	<ul style="list-style-type: none"> ▪ Homeowner/NMSFD ▪ State/County ▪ County/Private landowner
Tierra Amarilla	<ul style="list-style-type: none"> ▪ Defensible space ▪ Mowing along roads ▪ Weed abatement 	<ul style="list-style-type: none"> ▪ Homeowner/NMSFD ▪ State/County ▪ County/Private landowner
Los Ojos	<ul style="list-style-type: none"> ▪ Defensible space ▪ Mowing Highway 112 and other roads ▪ Weed abatement 	<ul style="list-style-type: none"> ▪ Homeowner/NMSFD ▪ State/County ▪ County/Private landowner
La Puente	<ul style="list-style-type: none"> ▪ Defensible space ▪ Weed abatement ▪ Mow along Highway 112 	<ul style="list-style-type: none"> ▪ Homeowner/NMSFD ▪ County/Private landowner ▪ State
Plaza Blanca	<ul style="list-style-type: none"> ▪ Defensible space ▪ Mowing along roads ▪ Weed abatement 	<ul style="list-style-type: none"> ▪ Homeowner/NMSFD ▪ State/County ▪ County/Private landowner
Rutherford	<ul style="list-style-type: none"> ▪ Defensible space ▪ Mowing along roads ▪ Weed abatement 	<ul style="list-style-type: none"> ▪ Homeowner/NMSFD ▪ State/County ▪ County/Private landowner
Fort Heron	<ul style="list-style-type: none"> ▪ Defensible space ▪ Mowing along roads ▪ Prescribed fire along Rio Chama Wildlife Area ▪ Salt cedar abatement ▪ Manage FRCC 2/3 vegetation to FRCC 1 	<ul style="list-style-type: none"> ▪ Homeowner/NMSFD ▪ State/County ▪ NMSFD ▪ NM State Parks/NMSFD ▪ Private landowner/NM State Parks
Laguna Vista Estates	<ul style="list-style-type: none"> ▪ Defensible space ▪ Fuelbreaks along Shroyer Drive, Andrews Lane, and other roads ▪ Complete fuelbreak on BIA land west and north of community ▪ Salt Cedar abatement Heron Lake ▪ Reduce herbaceous fuel load ▪ Manage FRCC 2/3 vegetation to FRCC 1 	<ul style="list-style-type: none"> ▪ Homeowner/NMSFD ▪ Community/NMSFD ▪ BIA ▪ NM State Parks/NMSFD ▪ Private landowners ▪ Private landowner/NMSFD/BIA
Piñon Ridge	<ul style="list-style-type: none"> ▪ Defensible space ▪ Mowing Highway 95 ▪ Salt cedar abatement at El Vado Reservoir ▪ Manage FRCC 2/3 vegetation to FRCC 1 	<ul style="list-style-type: none"> ▪ Homeowner/NMSFD ▪ State ▪ NM State Parks/NMSFD ▪ NM State Parks
Chama WUI		
Chama	<ul style="list-style-type: none"> ▪ Defensible space ▪ Weed abatement ▪ Prescribed fire in Edward Sargent State Wildlife Area ▪ Fuelbreak along east boundary of Edward Sargent State Wildlife Area ▪ Fuelbreak along west boundary of Jicarilla Apache Indian Reservation ▪ Prescribed fire along northwest boundary of Jicarilla Apache Indian Reservation ▪ Reduce brush fuel load on Rabbit Peak 	<ul style="list-style-type: none"> ▪ Home owner/NMSFD ▪ Village/Private landowner ▪ NM Game & Fish/NMSFD ▪ NM Game & Fish/NMSFD ▪ BIA ▪ BIA ▪ NMSFD
Cumbres &	<ul style="list-style-type: none"> ▪ Increase fuelbreak width along track 	<ul style="list-style-type: none"> ▪ Cumbres & Toltec Scenic

Community	Recommended Fuels Treatments	Responsible Organization
Toltec Scenic Railroad	<ul style="list-style-type: none"> ▪ Apply ballast along track ▪ Prescribed fire in Edward Sargent State Wildlife Area ▪ Fuelbreak along southeast boundary of Edward Sargent State Wildlife Area ▪ Prescribed fire in Jicarilla Apache Indian Reservation ▪ Manage FRCC 2/3 vegetation to FRCC 1 	<ul style="list-style-type: none"> ▪ Railroad ▪ Cumbres & Toltec Scenic Railroad ▪ NM Game & Fish/NMSFD ▪ NM Game & Fish/NMSFD ▪ BIA ▪ BIA/Private landowner/NMSFD
Chama West – Lumberton WUI		
Chama West	<ul style="list-style-type: none"> ▪ Defensible space ▪ Weed abatement ▪ Prescribed fire in Bill Humphries State Wildlife Area ▪ Fuelbreak along BIA boundary to the west ▪ Manage FRCC 2/3 vegetation to FRCC 1 	<ul style="list-style-type: none"> ▪ Home owner/NMSFD ▪ County/Private landowner ▪ NM Game & Fish/NMSFD ▪ BIA ▪ Private landowner/NMSFD
Biggs	<ul style="list-style-type: none"> ▪ Defensible space ▪ Weed abatement ▪ Manage FRCC 2/3 vegetation to FRCC 1 	<ul style="list-style-type: none"> ▪ Homeowner/NMSFD ▪ County/Private landowner ▪ Private landowner/NMSFD
Lumberton	<ul style="list-style-type: none"> ▪ Defensible space ▪ Weed abatement ▪ Fuelbreak along BIA boundary to the west 	<ul style="list-style-type: none"> ▪ Homeowner/NMSFD ▪ County/Private landowner ▪ Private landowner/NMSFD
Diamante	<ul style="list-style-type: none"> ▪ Defensible space ▪ Weed abatement ▪ Manage FRCC 2/3 vegetation to FRCC 1 	<ul style="list-style-type: none"> ▪ Homeowner/NMSFD ▪ County/Private landowner ▪ Private landowner/NMSFD

5.1.1 Defensible Space

An action that can immediately improve community wildfire risks and hazards is the implementation of defensible space around individual homes. It is recommended that defensible space be created for homes in all WUIs following the NMSFD guidelines (<http://www.emnrd.state.nm.us/fd/index.htm>). Homeowners need to evaluate their own situation to determine needed actions. NMSFD is available to help homeowners determine the best actions to protect structures. Also considerable information is available through the Firewise program (www.firewise.org). Firewise is an interagency effort to supply information and training to communities and homeowners on ways to reduce wildfire risks and hazards.

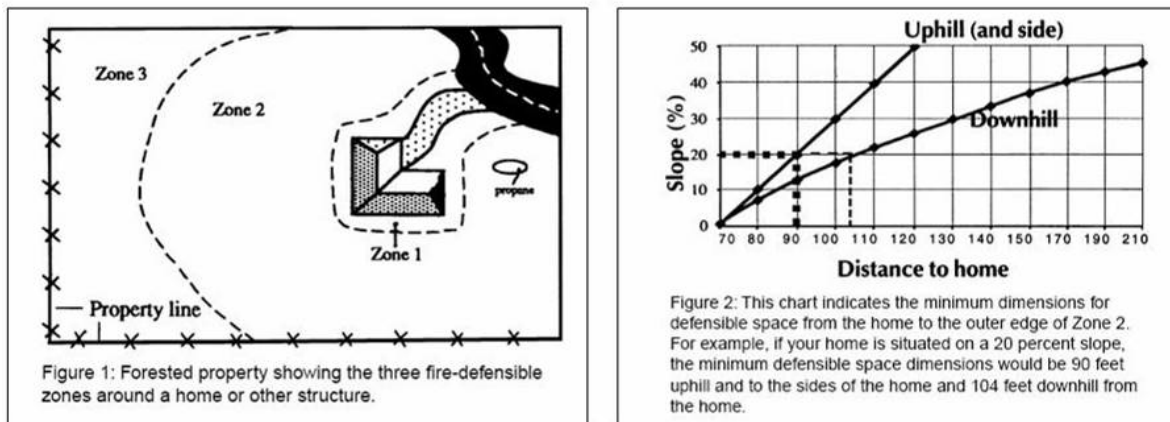
The defensible space concept can also be applied to such things as utility stations, communication towers, recreation facilities, and other important structures. Defensible space is an important practice for reducing wildfire risks and hazards to structures. Defensible space is part of the International Wildland-Urban Interface Code (IWUIC) and it is recommended by NMSFD. Also, the use of low-flammable construction practices for roofs, siding, decks and porches is recommended in accordance with IWUIC.

When defensible space is combined with fire-resistant construction, the risk of structure loss is greatly reduced. When these principals are consistently applied across a neighborhood, everybody benefits. Additionally, in the event of a wildfire, homes and neighborhoods with defensible space are much more likely to be assigned structure

defense crews than those without. Defensible space provides room for firefighters to protect structures. There are normally three components to a defensible space (Dennis 2006):

- Zone 1 is the area of maximum modification and treatment (Figure 1). It consists of an area 15 to 30 feet around the structure where all flammable vegetation is removed. Remaining vegetation is pruned, mowed, and watered. The width of Zone 1 depends on the flammability of the structure.
- Zone 2 is an area of fuel reduction that extends from Zone 1 up to a distance of 125 feet depending on slope (Figure 1). Stressed, diseased, dead, or dying trees and shrubs are removed. The remaining large trees and shrubs are trimmed and pruned to eliminate horizontal and vertical fuel continuity while enhancing home-site safety and aesthetics.
- Zone 3 is an area of management for landowner objectives and is of no particular size. It extends from the edge of Zone 2 to the property boundary (Figure 1).

Figure 1. NMSFD Defensible Space Guidelines and Standards (Dennis 2006)



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

Table 14. Proposed Wildfire Mitigation Project Schedule for Homeowners and Communities

Year	Project	Actions
1	Annual spring outreach	<ul style="list-style-type: none"> ▪ Contact and/or organize homeowners
	Annual spring mitigation (defensible space)	<ul style="list-style-type: none"> ▪ Clean roofs and gutters ▪ Trim and thin trees and bushes in Zone 1 ▪ Rake and remove fine fuels from Zone 1 and 2 ▪ Relocate firewood from Zone 1 to Zone 2

Year	Project	Actions
		<ul style="list-style-type: none"> ▪ Help a neighbor ▪ Organize debris disposal
2	Annual spring outreach	<ul style="list-style-type: none"> ▪ Contact and/or organize homeowners
	Annual spring mitigation (defensible space)	<ul style="list-style-type: none"> ▪ Trim and thin trees and bushes in Zone 2 ▪ Repeat basic yard cleanup in Zones 1 and 2 ▪ Help a neighbor ▪ Organize woody debris disposal
3	Annual spring outreach	<ul style="list-style-type: none"> ▪ Contact and/or organize homeowners ▪ Advise individual homeowners on needed improvements to construction features
	Annual spring mitigation (defensible space)	<ul style="list-style-type: none"> ▪ If necessary, coordinate defensible space efforts between homeowner groups who have created defensible space and adjacent open space land managers ▪ Work with NMSFD to improve forest or rangeland health in Zone 3 ▪ Repeat basic yard cleanup in Zones 1 and 2
4	Annual spring outreach	<ul style="list-style-type: none"> ▪ Contact and/or organize homeowners ▪ Follow up on construction feature recommendations
	Annual spring mitigation (defensible space)	<ul style="list-style-type: none"> ▪ Complete any outstanding projects from previous years ▪ Continue maintenance phase ▪ Initiate construction feature improvements

5.1.2 Grass and Weed Abatement

A common fuel hazard is herbaceous weedy vegetation. Native and non-native weedy grasses and forbs become flashy fuels as they dry in the late summer and fall. These fine fuels ignite easily and burn rapidly. Herbaceous fuels are common and widespread in WUIs. Herbaceous fuels occur among structures, along roads and driveways, in fallowed fields, and abandoned lots.

Grass and weed control should occur annually in order to be effective. Mechanical and manual methods, herbicide, prescribed fire, and livestock grazing can all be used to control grasses and weeds. The approach for grass and weed abatement depends on locations and land area; sometimes a combination of methods is best. The key to successful herbaceous vegetation-fuel control is persistence, as it may take several years to achieve desired abatement and upkeep will be necessary thereafter. Mowing around structures and along roads and driveways is one way to reduce fuel load. Abatement can also occur with the limited use of herbicides by trained and certified applicators. Prescribed fire can be effective and safe when used in appropriate locations away from structures. Annual livestock grazing of the herbaceous vegetation east of Highway 84 between Buckman Road and Brazos Canyon east to the gravel pit will reduce herbaceous-fuel loads and limit the chance of wind driven fire burning into the coniferous forests where the communities of Buckman Road, Ponderosa Estates, and Brazos Canyon are located. Communities and private landowners should work with the county extension office to determine methods for weed abatement.

5.1.3 Fuelbreaks

A fuelbreak is an area where fuel continuity and load is reduced to improve wildfire control opportunities. Fuelbreaks provide areas where firefighters may have opportunities

to suppress fire. The width and length of the fuelbreak depends on terrain, wind patterns, and values to be protected. Strategically placed fuelbreaks reduce horizontal and vertical fuel continuity (<http://csfs.colostate.edu/library>).

Fuelbreaks do not require that all vegetation be removed to bare soil or rock (Figure 2). They can be aesthetically pleasing and improve wildlife habitat. Typically, trees are thinned to a spacing of 10 to 15 feet among tree canopies. Dead and diseased trees are removed. The lower tree limbs are pruned 6 to 10 feet from the ground and shrub density is reduced to remove ladder fuels. Ladder fuels are small trees and large shrubs that may conduct surface fire in tree canopies. When thinning trees, it is important to leave trees of various sizes to create diversity in the forest canopy. Herbaceous vegetation may be mowed or grazed to reduce its fuel load. Mechanical equipment and/or prescribed fire are used to create fuelbreaks. Areas with extensive vegetation removal, due to dense tree and shrub growth, may have to be reseeded with native grasses and forbs to reduce soil erosion, enhance wildlife habitat, and control weeds.

Woody debris harvested from the treated areas will need to be disposed. Ideally, the woody debris will be utilized in a post-harvest economic manner such as fuel-wood pellets, mulch, or animal bedding. Information for post-harvest economic development opportunities can be obtained from the New Mexico Forest Industry Association (www.nmfia.org). The harvested limbs and trees can be made available to individuals for free firewood. The last option is to burn the woody debris in burn piles.

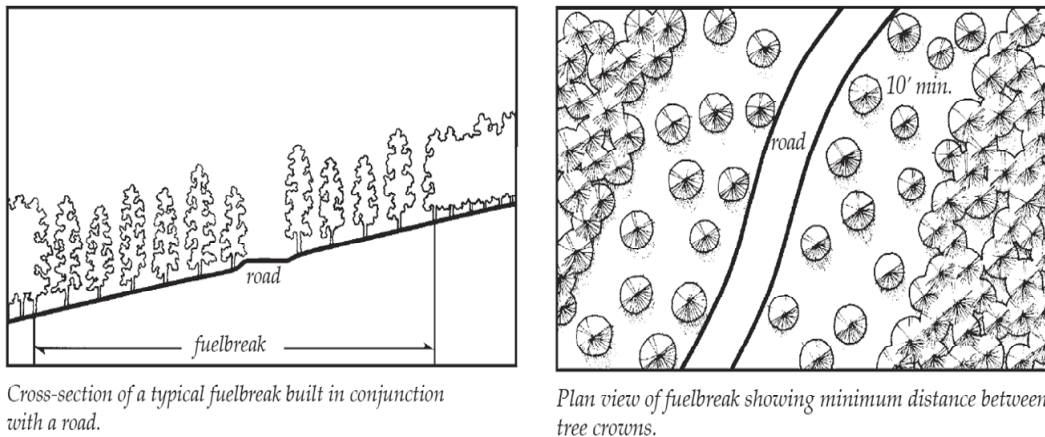
Fuelbreaks are recommended for roads in piñon-juniper and forested areas where trees and shrubs grow along roads. The ideal fuelbreak width on flat ground is 300 feet but width should increase according to slope, fuels, and terrain. Dense tree and shrub growth along roads may limit the evacuation of homeowners and ingress of emergency vehicles because of flames and thick smoke. Such roads include Buckman, Ponderosa (County Road 341), Brazos Canyon (County Road 512), Crown Point (County Road 328), Shroyer Drive, Andrews, and possible others. Fuelbreaks along these roads are necessary for evacuation routes.

Fuelbreaks are also recommended along the south and northwest boundaries of the Jicarilla Apache Indian Reservation and would provide protection to the Cumbres & Toltec Scenic Railroad, Brazos Canyon – Laguna Vista, and Chama WUI communities. A fuel management plan would need to be developed that details extent, specific locations, and mechanical and/or prescribed fire to achieve management objectives.

A fuelbreak between Laguna Vista Estates and Heron Lake Stake Park is recommended. The existing hiking trail could be used to anchor the fuelbreak.

In addition, prescribed fire is planned for the Bill Humphries and Edward Sargent State Wildlife Area and will be conducted by NMSFD. Fires will be conducted over the next few years to improve wildfire habitat and reduce shrub-fuel loads. Prescribed fire will be conducted according to NMSFD procedures and New Mexico State smoke management and air pollution policy.

Figure 2. Fuelbreak along a Road (Dennis, not dated)



5.1.4 Mowing Along roads

The herbaceous-fuel load throughout the assessment area is generally continuous. Highways and roads are features that provide a break to fuel continuity. Mowing to a minimum distance of 6 feet along highways and roads will enhance their usefulness as fuelbreaks and reduce the chances of fire ignitions from vehicles or discarded smoking materials. The mowing along highways and roads should occur once in early summer and again in the fall depending on precipitation and subsequent herbaceous plant growth. New Mexico State Department of Transportation is responsible for mowing along state highways. Rio Arriba County is responsible for mowing along county roads. Private landowners should survey their roads and driveways to determine the need for mowing. Mowing along roads also reduces the chance of fire ignitions from vehicles or discarded smoking material.

5.1.5 Salt Cedar Abatement

Salt cedar is a noxious, invasive shrub that grows around Heron and El Vado lakes. Salt cedar is ranked by New Mexico as a Class C noxious weed. Class C weeds are widespread species with management decisions determined by local authorities based on feasibility of control and level of infestation (<http://weeds.nmsu.edu/>). Pertinent information on salt cedar ecology and reclamation methods has been compiled by New Mexico State University weed management specialists and can be found on their website at <http://agesvr1.nmsu.edu/saltcedar/>.

Salt cedar is a flammable fuel that provides poor wildlife habitat value and uses excessive amounts of water thereby replacing native vegetation. Salt cedar is a flashy fuel that burns rapidly because of its fine foliage and essential oils. Currently, salt cedar is limited in the assessment area but abatement is necessary to prevent expansion to the bosques of rivers and streams. Salt cedar abatement can occur through mechanical harvest, herbicide, or prescribed fire. Usually, a combination of treatments is necessary.

Mechanical harvest followed with painting the stumps with herbicide is usually an effective treatment. Burn piles will be used to remove harvested woody debris. Treated areas should be re-planted with native vegetation such as willows and cottonwood trees.

5.1.6 FRCC Vegetation Management

FRCC is a measure of forest and rangeland health. Vegetation classified as FRCC 2 or 3 are considered unhealthy because there have been changes in plant community attributes and/or the fire regime in comparison with conditions prior to European settlement. Sixty-two percent of the assessment area is classified as FRCC 2 or 3. Vegetation-fuels management plans should consider ways to improve forests and rangelands health. Prescribed fire, mechanical, and herbicide treatments can be used to decrease invasive weeds and decrease woody plant density to improve plant community composition and structure in accordance with historic vegetation characteristics. Federal, state, and private landowners need to collaborate to improve FRCC vegetation classifications in the assessment area. Emphasis on FRCC improvement should occur in WUIs.

Federal agencies and NMSFD have and will continue vegetation-fuels management to reduce fuel hazards and improve forest and rangeland health. Mechanical and prescribed fires have been used for these purposes. The BLM will be conducting vegetation-fuels treatments on their lands west of the Canjilon – Cebolla WUI and southeast of El Vado. Treatments will occur from years 2008 to 2010 on areas ranging in size from 100 to 2,000 acres. The BIA will conduct prescribed fire and mechanical vegetation-fuels treatments on the Jicarilla Apache Indian Reservation on an unspecified amount of land. NMSFD will also conduct prescribed fire on the Edward Sargent and Bill Humphries State Wildlife areas over the next few years to improve wildlife habitat; these efforts will also improve rangeland health and reduce fuel loads.

The Canjilon Range District will be active within the Canjilon – Cebolla WUI to reduce hazardous fuels in future years. Two separate planning efforts (Canjilon WUI-Brush Chopping and Canjilon WUI-Forest Treatments) based on treatment types and objectives are planned:

- **Canjilon WUI-Juan Domingo** – The primary objectives are to forestall piñon-juniper encroachment and maintain discontinuous of forest structure and fuel arrangement on approximately 1,000 acres of sagebrush areas. Equally important objectives would be to decrease soil erosion, increase ground cover and forage quality for livestock and wildlife. The project would primarily entail mechanical treatment (chopping), broadcast seeding of forage and browse species, and prescribed fire or mechanical maintenance of sagebrush-dominated areas primarily located on Mesa Juan Domingo.
- **Canjilon WUI-Forested Areas** – Mechanical treatments of 1,000 acres and prescribed fire on 4,500 acres are planned. This would reduce the overall fuel load within piñon-juniper and ponderosa pine stands surrounding Canjilon. Opportunities for commercial uses will be considered along with personal use fuel wood.

5.1.7 Vegetation-Fuel Treatment Options

Reducing vegetation-fuels continuity and load throughout the assessment area will require a combination of treatment methods. Table 15 presents information on the advantages of various vegetation-fuel treatments. Appropriate fuel treatments for a given area will depend on such things as vegetation-fuels attributes, project acreage, slope steepness, proximity to structures, and access. The project costs of will depend on treatments used, terrain, and acreage. NNSFD can help define project costs. Post-harvest economic use of the woody debris may offset the fuel management costs (Appendix E). Costs should also consider post-treatment rehabilitation as seeding with native plants and erosion control may be necessary. It is imperative that implementers plan for the long-term monitoring and maintenance of all treatments.

Table 15. Vegetation-Fuel Treatment Alternatives

Treatment	Comments
Mechanical Mowing	<ul style="list-style-type: none"> ▪ Appropriate for large, flat grassy areas on relatively flat topography.
Prescribed Fire	<ul style="list-style-type: none"> ▪ Can be very cost effective. ▪ Ecologically beneficial. ▪ Can be used as training opportunities for firefighters. ▪ Cost varies with complexity. ▪ Carries risk of escape, which may be unacceptable in some WUI areas. ▪ Unreliable scheduling due to weather and smoke management constraints.
Brush Mastication	<ul style="list-style-type: none"> ▪ Brush species may re-sprout 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	<ul style="list-style-type: none"> ▪ 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 as the mulch may inhibit seed germination.
Manual Treatment with Chipping or Pile Burning	<ul style="list-style-type: none"> ▪ Allows for removal of merchantable materials or firewood in timber. ▪ Requires chipping, hauling, and pile burning of slash.
Feller Buncher	<ul style="list-style-type: none"> ▪ Mechanical treatment on slopes over 30 percent or 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.
Herbicide	<ul style="list-style-type: none"> ▪ Application can be species or area specific. ▪ Cost per acre will vary depending on application rates and target species. ▪ Easy to apply on steep slopes and other rough terrain. ▪ Costs may be lower than mechanical methods. ▪ Dead woody material may need to be removed. ▪ Applicator license required.

5.2 Recommended Non-Fuels Mitigation

5.2.1 Public Outreach and Education

An effective means to initiate local action is through community education and public outreach. Respondents to the questionnaire considered public outreach as a critical component of reducing wildfire risk (Appendix D). Community outreach should occur through the NRAWUIC or similar organizations setup for each WUI. Examples of the purposes of goals for public outreach include:

- Initiate creation of a WUI or community oversight group to support CWPP implementation and seek grant funding;
- Introduce and discuss the benefits of IWUIC defensible space and construction principals;
- Promote and collaborate on developing defensible spaces around structures;
- Increase awareness for the need to improve forest and rangeland health to reduce wildfire risk; and
- Identify and map evacuation routes.

Annual WUI or community meetings in the spring or fall can spur action on the part of neighborhoods and individuals. The meetings 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 at the public fire stations, post offices, and schools on a regular basis.

5.2.2 Reducing Structure Flammability

Improving the fire-resistant characteristics of structures in the assessment area goes hand-in-hand with the development of defensible space. Screening gutters, roof vents, and deck or porch openings are recommended. Embers from a wildfire can become windborne and travel long distances before settling on roofs and in crevices that could result in fire. Common structural fuel hazards associated with homes in the assessment area include:

- Combustible siding and porch materials;
- Decks or porches with exposed undersides;
- Open attic vents; and
- Propane tanks adjacent or downhill from home.

A recommendation is for the Rio Arriba County and the Village of Chama to consider the adoption of the IWUIC, which will ensure that new construction and remodels within the assessment area will be fire-resistant. The objective of the IWUIC is to establish minimum regulations consistent with nationally recognized good practices for safeguarding life and property. Regulations in the code are intended to mitigate wildfire risks and hazards and to prevent fire from spreading from structure to structure in the

WUI. The codes also help ensure that there is access to water supply for fire suppression. The following items are examples covered by the code:

- Ignition-resistant building materials on new construction, additions, and remodels;
- Ignition-resistant building techniques (such as covering eaves, no openings under houses, decks or porches) on new construction, additions, and remodels;
- Driveway access for fire equipment;
- Vegetation plans for new structures and subdivisions that meet defensible space requirements;
- Vegetation and weed control guidelines;
- Water supply requirements to ensure continuous water supply during a fire; and
- Structure address marking and road marking.

To purchase the code manual or participate in IWUIC training visit www.iccsafe.org. The interagency Firewise program provides free information on ways to reduce structure flammability at www.firewise.com.

5.2.3 Fire Protection Authorities

The fire protection authorities in the assessment area include five VFDs: Chama Municipal FD, Cumbres & Toltec Scenic Railroad, BIA Jicarilla Agency, NMSFD Chama District, and USFS Canjilon Ranger District. In many cases, the VFDs and Chama Municipal FD are the first responders to wildfires. The majority of wildfires burn less than 10 acres before suppression (Table 6). NMSFD and the federal agencies need to work closely with the VFDs and Chama Municipal FD to maintain, and in some cases, improve wildfire fighting equipment, engines, and training.

During the course of the CWPP assessment, VFD fire chiefs, and state and federal fire management officers were interviewed to ascertain their current level of wildfire fighting preparedness and anticipated needs (Table 16).

Table 16. Wildfire Protection Authorities’ Resources and Training Needs

Authority	Resources Needs	Training Needs
Brazos VFD	<ul style="list-style-type: none"> ▪ Substation located in Ponderosa Estates ▪ One pumper ▪ 15 sets of wildland firefighting personal protective equipment including shields ▪ Strategically located water sources ▪ Siren to notify need for wildfire evacuation ▪ Development of a secondary evacuation routes ▪ Unified communication protocol 	<ul style="list-style-type: none"> ▪ Annual National Wildfire Coordinating Group (NWCG) training class ▪ All firefighters trained at NWCG Firefighter (FFT2) level ▪ 50 percent of firefighters trained at the NWCG Advanced Firefighter/Squad Boss (FFT1) level ▪ Per diem and travel to support training

Authority	Resources Needs	Training Needs
Canjilon VFD	with narrowband radios <ul style="list-style-type: none"> ▪ 10 narrowband Bendix King radios ▪ 10 pairs of NWCG approved boots and leather gloves ▪ Strategically located water sources ▪ Unified communication protocol with narrowband radios 	<ul style="list-style-type: none"> ▪ Annual NWCG training class ▪ 4 firefighters trained at the NWCG Firefighter 2 (FFT2) level ▪ Per diem and travel to support training
Laguna Vista VFD	<ul style="list-style-type: none"> ▪ One Type 6 engine ▪ 10 sets of wildland firefighting personal protective equipment including shields ▪ 15-30 narrowband Bendix King radios ▪ One communication base station ▪ Broadband internet access ▪ Three 10,000 g underground water storage tanks ▪ Unified communication protocol with narrowband radios 	<ul style="list-style-type: none"> ▪ Annual NWCG training class ▪ Per diem and travel to support training
Chama Municipal FD	<ul style="list-style-type: none"> ▪ One Type 6 engine ▪ 6 Sets of wildland firefighting personal protective equipment including shields ▪ 5 sets of hand tools such as fire swatter, firefighting shovel, fire rake, and Pulaski ▪ One chain saw ▪ Strategically located water sources ▪ Unified communication protocol with narrowband radios 	<ul style="list-style-type: none"> ▪ Annual NWCG training ▪ 5 firefighters trained at the NWCG Advanced Firefighter/Squad Boss (FFT1) level ▪ One firefighter trained at the Engine Boss (ENGB) level ▪ Per diem and travel to support training
Tierra Amarilla VFD	<ul style="list-style-type: none"> ▪ One Type 6 engine ▪ 10-15 sets of wildland firefighting personal protective equipment including shields ▪ 10-15 narrowband Bendix King radios ▪ 10 sets of hand tools such as fire swatter, firefighting shovel, fire rake, and Pulaski ▪ One chain saw ▪ Strategically located water sources ▪ Unified communication protocol with narrowband radios 	<ul style="list-style-type: none"> ▪ Annual NWCG training ▪ One firefighter trained at the Engine Boss (ENGB) level ▪ Per diem and travel to support training
Cumbres & Toltec Scenic Railroad	<ul style="list-style-type: none"> ▪ None identified ▪ Unified communication protocol with narrowband radios 	<ul style="list-style-type: none"> ▪ Annual NWCG training
BIA Jicarilla Agency	<ul style="list-style-type: none"> ▪ 20 narrowband Bendix King radios ▪ Narrowband repeaters strategically located on reservation ▪ Strategically located water sources ▪ Unified communication protocol 	<ul style="list-style-type: none"> ▪ Annual NWCG training

Authority	Resources Needs	Training Needs
NMSFD, Chama District	<ul style="list-style-type: none"> with narrowband radios ▪ Strategically located water sources ▪ Unified communication protocol with narrowband radios 	<ul style="list-style-type: none"> ▪ Annual NWCG training
USFS, Canjilon Ranger District	<ul style="list-style-type: none"> ▪ Strategically located water sources ▪ Unified communication protocol with narrowband radios 	<ul style="list-style-type: none"> ▪ Annual NWCG training

A common need among the fire authorities is strategically located water sources. The FDs have water available at their stations to re-fill tenders and other engines. There are also dry hydrants at Fort Heron Preserve (one), La Puente (one), Laguna Vista (two), Rutherford (one), Los Brazos (one), and Chama (several). Surface water is available for drafting at Heron Lake, El Vado Lake, Rio Brazos and Rio Chama. The various VFDs also support each others water needs by using tenders to shuttle water where needed. Strategic locations should be identified and developed where additional dry hydrants may be warranted and specific locations to draft from surface water. An example is the West Chama–Lumberton WUI. All water locations should be mapped and the map made available in all wildland engines. Dry hydrants need to be tested annually. Drafting locations should be evaluated annually to determine need for access maintenance and suitability for continued use. Private landowners may need to be contacted to obtain permission to access water on their property. NRAWUIC, NMSFD and VFDs should coordinate efforts to develop the strategic water resources plan and map.

The VFDs need to understand their initial attack response areas. The initial attack areas of the VFDs and Chama Municipal FD should be mapped so that all lands within the assessment area are covered by a fire authority. Currently, when a VFD is dispatched all VFDs may respond. This leaves other areas unattended. The initial attack VFD should size up the incident within their assigned area and then call for additional support as conditions warrant. The NRAWUIC, VFDs, and NMSFD need to work with Rio Arriba County Fire Marshal to establish initial attack areas.

A VFD is needed in the West Chama–Lumberton WUI to reduce response time to wildfire and structure incidents. The Rio Arriba County Fire Marshal needs to evaluate this critical situation. The new VFD will need to be equipped with one or more Type 6 engines, tender, hand tools, personal protection equipment, handheld radios, and trained wildland firefighters.

5.3 Implementation of Mitigation Recommendations

5.3.1 Project Support

Grant funding support is often a necessary component of fuels treatment projects. In addition to opportunities through NMSFD and New Mexico Associations of Counties, an excellent resource funding is the Southwest Area Forest, Fire, and Community Assistance Grants website <http://www.southwestareagrants.org/>. The NRAWUIC should work with

WUIs and communities in obtaining grant funding to support CWPP recommended projects.

The CWPP development process is designed to facilitate collaboration with federal and state agencies on public and private wildfire and fuels management strategies. As the CWPP strategic plan is implemented, dialogue and collaboration needs to be maintained with these agencies in order to coordinate strategies and treatments and to make adjustments as necessary.

Vegetation-Fuels Mitigation Schedule

Table 17 recommends a schedule for vegetation-fuels mitigation projects throughout the assessment area. A five-year timeframe will be needed to accomplish all vegetation-fuels projects. Some vegetation-fuel projects such as mowing along roads and weed abatement need to occur on an annual bases or perhaps more often depending on herbaceous plant growth in response to precipitation. Fuelbreak development along roads, wildlife areas, and federal lands will depend on resources available including money and availability of fuel-management crews. NEPA requirements and other agency specific necessities need to be satisfied before fuel treatments occur on federal and tribal lands.

Table 17. Recommend Vegetation-Fuels Management Schedule

Wildland-Urban Interface	Treatment	Schedule
Cebolla – Canjilon	<ul style="list-style-type: none"> ▪ Defensible space ▪ Grass and weed abatement and mowing along roads ▪ Fuelbreaks on USFS boundary ▪ Manage FRCC 2/3 vegetation to FRCC 1 	<ul style="list-style-type: none"> ▪ See Table 14 ▪ Annually ▪ By 2012 ▪ On-going
Brazos Canyon – Laguna Vista	<ul style="list-style-type: none"> ▪ Defensible space ▪ Mowing along roads ▪ Reduce herbaceous fuels east of Highway 84 ▪ Grass and weed abatement ▪ Fuelbreaks along County Roads Ponderosa, Brazos Canyon, and Buckman roads ▪ Fuelbreak along Jicarilla Apache Reservation Southern boundary ▪ Complete fuelbreak on BIA boundary west of Laguna Vista ▪ Fuelbreaks along Crown Point, Shroyer Drive, and Andrews roads ▪ Fuelbreaks along community roads ▪ Prescribe fire along Rio Chama canyon ▪ Salt Cedar abatement ▪ Manage FRCC 2/3 vegetation to FRCC 1 	<ul style="list-style-type: none"> ▪ See Table 14 ▪ Annually ▪ Annually ▪ Annually ▪ By 2010 ▪ By 2010 ▪ By 2011 ▪ By 2012 ▪ By 2012 ▪ By 2012 ▪ By 2012 ▪ On-going
Chama WUI	<ul style="list-style-type: none"> ▪ Defensible space ▪ Mowing along roads ▪ Grass and weed abatement ▪ Reduce brush fuel on Rabbit Peak ▪ Increase fuelbreak width along Cumbers & Toltec track ▪ Apply ballast along track ▪ Fuelbreak along east and southeast boundaries of Edward Sargent State Wildlife Area 	<ul style="list-style-type: none"> ▪ See Table 14 ▪ Annually ▪ Annually ▪ By 2009 ▪ By 2009 ▪ By 2010 ▪ By 2011

Wildland-Urban Interface	Treatment	Schedule
	<ul style="list-style-type: none"> ▪ Fuelbreak along west and northwest boundaries of Jicarilla Apache Indian Reservation ▪ Prescribed fire along northwest boundary of Jicarilla Apache Indian Reservation ▪ Prescribed fire in Edward Sargent State Wildlife Area ▪ Prescribed fire in Jicarilla Apache Indian Reservation ▪ Manage FRCC 2/3 vegetation to FRCC 1 	<ul style="list-style-type: none"> ▪ By 2011 ▪ By 2012 ▪ By 2012 ▪ By 2012 ▪ On-going
Chama West - Lumberton	<ul style="list-style-type: none"> ▪ Defensible space ▪ Mowing along roads ▪ Grass and weed abatement ▪ Prescribe fire in Bill Humphries State Wildlife Area ▪ Manage FRCC 2/3 vegetation to FRCC 1 	<ul style="list-style-type: none"> ▪ See Table14 ▪ Annually ▪ Annually ▪ By 2010 ▪ On-going

6 EMERGENCY OPERATIONS

6.1 Fire Authority Response

All fire authorities have their own operational procedures and area of responsibility. Mutual aid agreements (MAA) exist among the VFDs and NMSFD for support when conditions warrant. The Canjilon Ranger District and the Canjilon VFD have a MAA to provide wildfire suppression support on private and USFS land in the Cebolla-Canjilon WUI. The USFS, BIA, BLM, and NMSFD operate under an Interagency Joint Powers of Agreement (IJPA), which specifies mutual aid and lands of initial attack (IA) responsibilities.

IA on a wildfire is the first responding force after a wildfire is reported to dispatch by calling 911, 575-588-7831, or 505-827-8080 (collect). An extended attack (EA) occurs when fire escapes the IA and additional forces are needed for suppression or the fire threatens important values such as structures. IA responding authority to a wildfire in the assessment area depends on fire location. The VFDs provide structure and wildfire protection services for communities and on private lands. However, the response areas for the VFDs are not clear. A recommendation is to work with the Rio Arriba County Fire Marshal to clearly define primary response areas. The Chama Municipal FD provides structure and wildfire protection for the Village of Chama. NMSFD has wildfire responsibility on unincorporated private lands and state lands. The USFS provides wildfire protection on USFS lands. The BIA provides wildfire protection on tribal lands. The Cumbres & Toltec Railroad is responsible for IA along the railroad corridor following their fire fighting plan (Appendix F).

The risk of large-scale wildfire exists throughout the assessment area. The possibility for wildfire rate of spread and severity to exceed the IA suppression capability is great due to fuel continuity and load. This is especially true where the surrounding terrain is difficult to access such as Laguna Vista Estates, Ponderosa Estates, and Brazos Canyon. The maintenance of wildfire training, engines, and equipment is essential for rapid response. Extended wildfire incidents in the assessment area could become very complex management challenges. The development and annual review of pre-attack plans for specific locations and scenarios in coordination with likely cooperators would provide tactical and strategic guidelines in the event of an actual wildfire.

6.2 Family Emergency Preparedness and Evacuation Routes

The time to plan for an emergency evacuation is before the incident occurs. Family members should understand what actions are needed in the event of a wildfire incident. Information on preparing for a wildfire evacuation is presented at Firewise (www.firewise.org).

Families can take several steps to prepare for a wildfire event to improve safety and VFD response. A defensible space should be developed around homes and other structures. Private roads and driveways should be at least 12-feet wide with a 15-foot vertical clearance for family egress and emergency vehicle access. House numbers and street

signs should be readily visible. Hand tools such as rakes and shovels should be available for fighting spot fires and debris cleanup. A fully charged hose that reaches around the house should also be available for firefighter use. Families should have known meeting locations and phone numbers to call in case family members are separated.

In the event that the New Mexico State Police order a community to evacuate due to threatening wildfire, residents should understand and know preferred evacuation routes and safe sites. However, the need for evacuation can occur without notice when conditions for wildfire are favorable. Homeowners should be prepared and need to evacuate without formal notice.

Before residents leave, they should take every precaution to reduce the chance of structure loss as time allows. Human safety is the number one concern in an evacuation. Actions should include:

- Removing all debris from rain gutters and roofs;
- Removing flammable materials 30 feet from structures;
- Cleaning leaves and twigs from underneath porches and decks;
- Closing and unlocking windows and doors;
- Placing a ladder for roof access;
- Leaving porch lights on; and
- Taking important papers, pets, pet food, water, medicines and other essential items with you.

When a family returns home after the wildfire passes, the exterior of structures should be monitored for smoke for several days. Embers from the wildfire may have lodged in small cracks and crevices and smolder before flaming.

Evacuation routes vary according to community (Table 18). The appropriate VFD should ensure that residents have the opportunity to become familiar with these procedures. Evacuation plans should outline routes and available evacuation centers. These procedures should be addressed in community meetings, newspaper releases, and distributed door-to-door.

Table 18. Evacuation Routes for Upper Chama Communities

Community	Primary Evacuation Route	Secondary Evacuation Route
Canjilon	State Highway 115	County Road 137 County Road 599
Cebolla	U.S. Highway 84	County Road 310 State Highway 221
Brazos Canyon	State Highway 512	East road off of Lake Circle Drive Fish Tail Road
Buckman Road	County Road 341/Buckman Road	Crown Point Road

Community	Primary Evacuation Route	Secondary Evacuation Route
Ponderosa Estates	County Road 341/Buckman Road	Crown Point Road
Ensenada	State Highway 162	Fish Tail Road, Unnamed roads
Tierra Amarilla	State Highway 162	State Highway 531
Los Ojos	U.S. Highway 84	State Highway 95
La Puente	State Highway 531	State Highway 112
Plaza Blanca	State Highway 95	Unnamed roads
Rutherford	State Highway 95	Unnamed roads
Fort Heron	State Highway 95	Unnamed roads
Laguna Vista Estates	Shroyer Drive	Road needs to be developed
Piñon Ridge	State Highway 95	Thompson Lake Road
Chama	U.S. Highways 64 & 84	State Highways 17 & 29
Cumbres & Toltec Scenic Railroad	State Highway 17	Railroad corridor
Chama West	U.S. Highway 64	Unnamed roads
Biggs	U.S. Highway 64	U.S. Highway 84
Lumberton	U.S. Highway 64	County Road 357
Diamante	County Road 349	Unnamed roads

The main evacuation routes for all communities are paved and maintained roads. However, the secondary evacuation routes for Brazos Canyon and Ponderosa Estates are not paved or maintained and their value for rapid evacuation is questionable. Secondary evacuation routes should be surveyed and judged for suitability of evacuation. Selected roads then need to be upgraded to enable rapid evacuation in the event of a wildfire. Some possible secondary evacuation roads are not named according to the “Roads of Rio Arriba” 1998 map and “New Mexico: Chama Surface Management Status” 2006 map. These roads are not paved and receive minimal maintenance. A recommendation is to identify specific secondary evacuation routes for communities listed in Table 18 with unnamed roads and again survey and judge them as to the suitability for evacuation. Selected roads should then be mapped and upgraded to enable rapid evacuation in the event of a wildfire. All community residents should have information on primary and secondary evacuation routes.

7 UPPER CHAMA CWPP MONITORING AND EVALUATION

7.1 CWPP Plan Adoption

Interagency collaboration, public meetings, and public comment opportunities were incorporated into the CWPP process to provide the opportunity for wide-spread participation and input. Comments and input were solicited from federal, state, local agencies and stakeholders. The CWPP was formally adopted by the Core Team, comprised of representatives from the federal, state, and local agencies, and NRAWUIC.

The HFRA authority for CWPP requires adoption of this plan, as does the FEMA Disaster Mitigation Act of 2000. With formal adoption by the Core Team, participating agencies and WUI communities will be competitive for available hazardous fuels and non-fuels mitigation funding. Furthermore, adoption of this plan highlights a collaborative planning and development process among the NRAWUIC, federal, state, and county, public agencies, communities, and private landowners.

7.2 Sustaining CWPP Efforts

A CWPP can serve as the foundation for a safe and healthy WUI. The implementation of mitigation strategies outlined in this report will greatly reduce risk. The CWPP process encourages private landowners to take an active role as fuel treatment strategies are developed and prioritized. Ownership of CWPP implementation at that local level is the most effective means to achieving effective results and sustaining the effort from year to year.

7.3 CWPP Oversight, Monitoring, and Evaluation

As wildfire hazard reduction efforts are implemented over time and the characteristics of particular WUIs change, NRAWUIC, and Core Team may wish to reassess particular areas and update the findings of this CWPP. A WUI may want to develop a CWPP specific to their own wildfire risks and vegetation-fuels management needs.

Monitoring the progress of project implementation and evaluating the effectiveness of treatments is an important component of CWPP oversight and maintenance. The assessment methodology utilized in this report is a standardized, well-documented hazard and risk survey approach that is designed to provide a benchmark against which future assessments may be compared. Successes, challenges, and new concerns should be noted and guide any modifications to the CWPP.

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APPENDIX A MAPS

- Map 1. Upper Chama CWPP Land Ownership
- Map 2. Upper Chama CWPP Existing Vegetation (Acres)
- Map 3. Upper Chama CWPP Infrastructure
- Map 4. Upper Chama CWPP Wildland-Urban Interface
- Map 5. Upper Chama CWPP Fire Behavior Fuel Model (Acres)
- Map 6. Upper Chama CWPP Historic Reference Fire Regime (Acres)
- Map 7. Upper Chama CWPP Fire History - 1987 to 2007
- Map 8. Upper Chama Ignition Risk Potential
- Map 9. Upper Chama CWPP Fire Regime Condition Class (Acres)
- Map 10. Upper Chama CWPP Proposed Fuels Mitigation

APPENDIX B

NFPA WILDLAND FIRE RISK AND HAZARD SEVERITY ASSESSMENT FORM 1144

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

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Element	Points											
D. Additional Rating Factors (rate all that apply)												
1. Topographical features that adversely affect wildland fire behavior	0-5	_____										
2. Areas with a history of higher fire occurrence than surrounding areas due to special situations (e.g., heavy lightning, railroads, escaped debris burning, and arson)	0-5	_____										
3. Areas that are periodically exposed to unusually severe fire weather and strong dry winds	0-5	_____										
4. Separation of adjacent structures that can contribute to fire spread	0-5	_____										
E. Roofing Assembly												
1. Class A roof	0	_____										
2. Class B roof	3	_____										
3. Class C roof	15	_____										
4. Nonrated	25	_____										
F. Building Construction												
1. Materials (predominate)												
a. Noncombustible/fire-resistive siding, eaves, and deck (<i>see Chapter 8</i>)	0	_____										
b. Noncombustible/fire-resistive siding and combustible deck	5	_____										
c. Combustible siding and deck	10	_____										
2. Building setback relative to slopes of 30% or more												
a. ≥ 9.14 m (30 ft) to slope	1	_____										
b. < 9.14 m (30 ft) to slope	5	_____										
G. Available Fire Protection												
1. Water source availability												
a. Pressurized water source availability												
1892.7 L/min (500 gpm) hydrants ≤ 304.8 m (1000 ft) apart	0	_____										
946.4 L/min (250 gpm) hydrants ≤ 304.8 m (1000 ft) apart	1	_____										
b. Nonpressurized water source availability (off site)												
≥ 946.4 L/min (250 gpm) continuous for 2 hours	3	_____										
< 946.4 L/min (250 gpm) continuous for 2 hours	5	_____										
c. Water unavailable	10	_____										
2. Organized response resources												
a. Station ≤ 8 km (5 mi.) from structure	1	_____										
b. Station > 8 km (5 mi.) from structure	3	_____										
3. Fixed fire protection												
a. NFPA 13, 13R, 13D sprinkler system	0	_____										
b. None	5	_____										
H. Placement of Gas and Electric Utilities												
1. Both underground	0	_____										
2. One underground, one aboveground	3	_____										
3. Both aboveground	5	_____										
I. Totals for Home or Subdivision (Total of all points)												
<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: left;">Hazard Assessment</th> <th style="text-align: left;">Total Points</th> </tr> </thead> <tbody> <tr> <td>Low hazard</td> <td>< 40</td> </tr> <tr> <td>Moderate hazard</td> <td>40-69</td> </tr> <tr> <td>High hazard</td> <td>70-112</td> </tr> <tr> <td>Extreme hazard</td> <td>> 112</td> </tr> </tbody> </table>			Hazard Assessment	Total Points	Low hazard	< 40	Moderate hazard	40-69	High hazard	70-112	Extreme hazard	> 112
Hazard Assessment	Total Points											
Low hazard	< 40											
Moderate hazard	40-69											
High hazard	70-112											
Extreme hazard	> 112											

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APPENDIX C QUESTIONNAIRE

January 2008

Northern Rio Arriba Wildland-Urban Interface Corporation has contracted with Walsh Environmental Scientists and Engineers LLC to develop the Upper Chama Community Wildfire Protection Plan (CWPP). The CWPP is a collaborative effort among federal, state, county, community, and private landowners to determine ways to reduce the risks of wildfire to Upper Chama communities. The results of this questionnaire will be used to help identify and prioritize appropriate mitigation actions. **Community meetings will be held on March 11, 2008 at the Village Chambers in Chama and March 12 at the County Chambers in Tierra Amarilla at 6:30 p.m. each night.** The findings and recommendations for the CWPP will be discussed at the meetings. **You can help by responding to this questionnaire and attending one of the public meetings. Please return this survey to Lowe's Chama Valley Market or mail it to the address on the back by February 15, 2008.**

1. What community do you live in or are closest to? (please write in)	
2. How great of risk does wildfire pose to your community?	<input type="checkbox"/> Extreme Risk <input type="checkbox"/> Moderate Risk <input type="checkbox"/> Low Risk <input type="checkbox"/> No Risk
3. What areas are at extreme fire hazard and pose a risk to homes or property?	<input type="checkbox"/> Forestlands <input type="checkbox"/> Grasslands <input type="checkbox"/> Shrublands <input type="checkbox"/> Juniper Stands <input type="checkbox"/> Other Areas: _____ Location:
4. What is the best way to mitigate or reduce wildfire hazards?	<input type="checkbox"/> Increase number of fire department personnel <input type="checkbox"/> Reduce vegetation (grasses, trees, etc.) on public lands by controlled burns. <input type="checkbox"/> Reduce vegetation (grasses, trees, etc.) on public lands by mechanical treatments. <input type="checkbox"/> Increase firefighting equipment (more trucks, water tenders, etc.) <input type="checkbox"/> Increase water availability <input type="checkbox"/> Encourage private landowners to reduce fuels and develop defensible spaces around

	structures.
5. What recent actions have been taken to reduce the risk of wildfire to your community?	<input type="checkbox"/> None that I am aware of. <input type="checkbox"/> If you know of actions that have been taken, please explain:
6. What fire education programs have occurred in your community?	<input type="checkbox"/> None that I am aware of. <input type="checkbox"/> If you know of programs that have occurred, please explain:
7. Is the community prepared to combat wildfire?	<input type="checkbox"/> <input type="checkbox"/> No, if not, why: <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Yes, if so, how come: <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> I do not know
8. What actions do you think need to be taken to reduce the risk of wildland fire?	
Additional Comments:	

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

Name	
Address	
Phone	

Please fill out this survey and mail, fax, or email your response to:

Walsh Environmental Jerry Barker 4888 Pearl E. Circle, Suite 108 Boulder, CO 80301-2475 jbarker@walshenv.com 303-443-0367 (fax)	
--	--

APPENDIX D UPPER CHAMA QUESTIONNAIRE FEEDBACK SUMMARY

Twelve questionnaires have been received as of February 15, 2008. The following tables summarize the responses of the 20 questionnaires.

Questionnaire Summary

Question		Number of Response
2. How great of risk do wildfires pose to your property and community?	Extreme	13
	Moderate	6
	Low	1
	No	
3. What areas do you think are at extreme fire hazard and pose a risk to homes or property?	Forestlands	17
	Grasslands	11
	Shrublands	8
	Woodlands	8
	Other	
4. What do you think would be the best way to mitigate or reduce these hazardous?	Prescribed fire	7
	Mechanical control	8
	Fuelbreaks	10
	Increase Equipment	12
	Increase Volunteers	12
	Increase available water	12
	Develop Defensible Space	17
	Firewise Education	12
Evacuation Routes		
5. Do you know of recent actions taken to reduce the risk of wildfires or to protect residents from wildfire spreading from public lands onto private lands or visa versa? See Table A.	No	4
	Yes	15
6. Have there been recent fire education programs in your community? See Table B	No	9
	Yes	12
7. Do you think that the community in which you live is prepared to combat wildfire? See Table C	No	10
	Yes	8
	I do not know	1
8. What actions do you think need to be taken to reduce wildfire risk? See Table 2.	See Table D for responses.	

Table A. Summary of Responses to Question Number 5

Comment	Number Received	Comment
1	2	Firefighters encouraging development of defensible space
2	10	Homeowners developing defensible space
3	1	Develop evacuation route in Brazos Canyon
4	2	Fuels mitigation
5	1	Volunteer firefighter training and collaboration
6	1	Increased training, equipment and personal protective equipment in Chama FD

Table B. Summary of Responses to Question Number 6

Comment	Number Received	Comment
1	1	Monthly firefighter training
2	4	Community education
3	2	Newsletter from fire departments
4	1	Fire patrols during holidays
5	1	NRWUIC workshop
6	1	Fire department training
7	1	Forest Service education at meetings
8	1	Periodic fire prevention programs

Table C. Summary of Responses to Question Number 7

Comment	Number Received	Comment
1	5	- Not enough equipment
2	5	- Resources not readily available
3	5	+ Qualified firefighters
4	5	- Firefighters not trained or numbers are few
5	1	- Absentee homeowners
6	1	+ Chama FD

Table D. Summary of Responses to Question Number 8

Comment	Number Received	Comment
1	3	Brush clearing is needed
2	1	Prohibit opening burning during fire season
3	9	Fuels reduction on vacant lots, along roads, a federal boundaries
4	7	Increased community outreach
5	4	Increase the training and number of volunteer firefighters
6	3	Increase water resources
7	2	Upgrade engines
8	1	Improve 911 operations
9	1	Develop road maps for fire departments
10	1	Widen CR 512
11	1	State parks need weed and brush abatement
12	1	Absentee landowners do not care
13	1	Buckman Road is impassible much of the year
14	1	Ingress and egress needs to be improved on many roads
15	1	Use prescribed fire more to reduce fuels

APPENDIX E

CWPP IMPLEMENTATION, FUNDING OPTIONS, AND POST-HARVEST WOODY DEBRIS UTILIZATION

CWPP implementation requires support services such as treatment design (forester) and execution (forest restoration services). Due to the decline in forest operations and timber harvesting in the region, there are very few foresters left in northern New Mexico. The clearinghouse for information on forestry services in New Mexico is the New Mexico Forest Industry Association (Contact Naomi Engleman, 505-412-9028, naomi@nmfia.net). In McKinley and Cibola counties, the Ramah Navajo Forest Restoration Crew (505-775-7140) has been providing forestry restoration services for the Bluewater Community Forestry Restoration project.

There are two major sources of funding for treatment options in the CWPP:

1. Sale of timber and wood products made from CWPP treatment residuals.
2. Government or other grant and cost sharing sources.

Since CWPP treatments in Northern New Mexico, generally, only produce slash and small diameter timber, the value or net revenue generated by treatment project is negative so that supplemental funding sources are needed to complete the treatment projects. See Section on “What to do with small diameter wood and slash” for list of options on utilizing small diameter wood from CWPP treatments. There are a wide variety of governmental and nongovernmental funding sources. Recently, the State of New Mexico has been funding fire mitigation projects with funds made available from mineral severance taxes. This year, the State is making available \$255,000 to Otero County for wildfire hazard mitigation projects. According to a recent press release, the funding will work as follows: “Otero County applied for the cost share program funding, made available from a Western States Wildland/Urban Interface Grant from the USDA Forest Service through the National Fire Plan. The funding will flow through New Mexico State Forestry to Otero County. The intent of the funding is to reduce hazardous fuels by treating densely forested private land and creating defensible space for property in high risk wildland urban interface areas within Otero County. Through the cost share program, 70 percent of the fuels mitigation cost will be covered by the grant, while the remaining 30 percent will be covered by the landowner.” (NM EMRD 2008) We recommend that for other counties in New Mexico to access these funding sources, they contact their local representative from New Mexico State Forestry (<http://www.emrd.state.nm.us/fd/Contactus.htm>). In northern New Mexico contact:

Todd Haines, Bernalillo District Forester: 505-867-2334
Craig Daugherty, Chama District Forester: 575-588-7831

WHAT TO DO WITH SMALL DIAMETER WOOD AND SLASH

There are several options for adding value to the small diameter wood and slash removed during CWPP treatments and using the residuals for mulch and biomass fuel, as well as feedstock for compost and other composite wood products (wood/plastic signs). The small diameter timber could be taken to several local mills for finished processing. We will outline some of these options and how they could be implemented in northern New Mexico.

Local Mulch and Compost Program

Many county and municipal governments in New Mexico have implemented wood mulch and composting program. The New Mexico Recycling Coalition (<http://nmrecycle.org/nmoro.htm>) assists communities in designing, funding, and implementing these programs. Generally, these programs require that there is a central location for receiving and storing the yard waste and CWPP treatment residuals (e.g., the solid waste transfer station). The yard waste and treatment products must be kept separate from other waste wood such as painted wood, demolition waste, and pallets. The residuals are processed through a grinder or chipper to create wood chips that can be used as mulch in the community. Many counties in New Mexico lease a grinder or purchase wood processing services. Grinders may be available for lease from:

- Jerry Connolly: 505-929-1245
- Rick Evans: 505-937-2741
- Brent Racher: 505-937-5551
- Tony Sanchez: 505-280-0358
- Vermeer: 505-345-8787
- Construction Solutions Corp. Albuquerque: 877-901-2600
- Ditch Witch of New Mexico: 505-345-1888 or 800-954-1889

One mistake that counties and other municipalities have made that destroys future markets for wood chips is to offer mulch for free. It is better to charge a nominal fee for the mulch (at least to cover processing and loading costs) than to give it away because it ruins the market for wood chips regionally. An example would be a municipal mulch program on the same scale and treatment residuals as northern New Mexico is the City of Durango, Colorado (<http://www.durangogov.org/Resident/services/recycling/mulch.cfm>). The City of Durango sells wood chip mulch created from spring and fall yard cleanups and Christmas tree collections. The average size of a wood chip is about 3 inches. The price for wood mulch is \$10 per cubic yard. Residents can pick up smaller quantities of mulch at the Durango Recycling center. Mulch will be delivered in 10 cubic-yard truckload quantities within La Plata County. There is a \$50 delivery charge within the city limits in addition to the cost of the mulch. There is an additional charge of \$4 per loaded mile outside of Durango's municipal limits. Mulch deliveries are made on Fridays only.

NMDOT compost and mulch

The New Mexico Department of Transportation (NMDOT) uses wood chips and sawdust as feedstock for products used in highway restoration projects including mulch, compost, and mulch/compost socks. The wood chips and sawdust must meet NMDOT specifications for size, composition, and water content. The New Mexico Recycling Coalition (NMRC) is promoting the value of creating compost and mulch from forest thinning projects with a grant from the U.S. Forest Service's Collaborative Forest Restoration Program. NMRC is offering training "Don't Trash that Slash" for communities to realize the value of composting and mulching chipped forest residuals. (http://www.recyclenewmexico.com/cfrp_project.htm).

Creating NMDOT specified mulch and compost products can be a good economic development opportunity for a community. However, it requires an investment in processing equipment and facility space as well as employee training. For example, some of the steps required to become a compost provider for NMDOT project include:

1. Register as a compost facility with the New Mexico Environment Department (NMED) using the Solid Waste Facility Registration Form, available online at <http://www.nmenv.state.nm.us/swb/doc/213-reg-form.doc>. NMED maintains a list of compost facilities in the state; the list is available online at http://www.recyclenewmexico.com/pdf/COMPOST_FACILITY_LIST.pdf. Additionally, all compost providers must be in compliance with the New Mexico Solid Waste Management Regulations (20 NMAC 9.1).
2. Receive state certification as a Compost Facility Operator. Two classes are offered annually. Please go to www.recyclenewmexico.com/cert_classes.htm to identify class dates, locations and fees. The class is three days.
3. Provide appropriate documentation before delivering compost to a contractor or subcontractor. The documentation must include the following items:
 - a) Feedstocks, by percentage, used in producing the compost.
 - b) An affidavit signed by a responsible company representative stating the following:
 - i. Compost meets the maturity, stability, and debris specifications in Table 1 of the compost standards. Compost standards are available online at http://www.recyclenewmexico.com/pdf/NMDOT_Compost_Specs_May2006.pdf.
 - ii. Compost meets all other specifications in Table 1 of the compost standards as substantiated by a laboratory analysis performed no more than 180 days before compost delivery. Testing labs listed at www.recyclenewmexico.com/nmoro.htm.
 - iii. Copy of aforementioned laboratory analysis.

Biomass Fuel

New Mexico has committed to be a leader in renewable energy. Woody biomass fuel is a key component as reflected in the fact that the State's Renewable Energy Portfolio Standard give two-to-one credits for biomass fuel projects and the number of biomass heating projects that are being developed. There are two options for developing biomass

fuel from CWPP treatment residuals: a) create wood chips that meet biomass fuel specifications; b) create wood chips or sawdust that could be used as feedstock for densified fuel or wood pellet manufacturing. The New Mexico biomass fuel chip specifications find that ground community wood trimmings make for relatively low quality biomass heating fuel because the material's consistency is poor and comes with a greater risk of contaminants. The benefits of using this material is that it is typically a low cost fuel and that it is keeping clean wood from being disposed of in a landfill. Additional mechanical sizing of the ground wood will be required to remove oversized chips and to remove excessive fines for a wood-chip heating system to successfully burn this material.

WOOD FUEL SPECIFICATION 5	
Description	A low quality hog fuel from ground community wood waste or other miscellaneous woody materials
Technical Requirements	
Target Moisture Content	30%
Moisture Content (Acceptable Range)	25%-50%
Minimum Btu's/lb	4,000 (LHV)
Target Chip Size	2" x 2" x 1/4"
Maximum Chip Size	No more than 10% shall be 5 inches or larger in any dimension
Maximum Fines Content	No more than 10% shall be smaller than 1/16". Some dust is allowed.
Total Mineral Content	Maximum 10% (dry matter basis)
Alkali Mineral Content of Ash	Maximum 0.35 lbs/MMBtu
General Requirements Necessary to Meet Technical Requirements	
Wood Species	All
Wood Source	Community tree trimmings and clean waste wood
Age of Wood	Material should be accumulated for several months between periodic grinding
Method of Processing	Grinders can be feed using bucket loaders or with boom grapples. May require a bucket loader to push up material within grapple reach to feed grinder
Recommended Equipment	Tub and horizontal style grinders are the more productive equipment for processing this type of debris.
Handling & Storage	All in-coming material should be checked and double checked to ensure no painted, glued, or treated wood is accepted. Un-ground material can be stored in large stock piles outdoors
Transport	Ideally in live bottom (walking floor) trailers. Roll-off containers can be substituted if the heating plant has the overhead space requirements and overall capability of receiving fuel via dump bodies.
Quality Assurances	Random testing of 2 loads annually to ensure fuel meets specifications.
Contaminants	Chips shall be free of any foreign materials including but not limited to nails, dirt, rocks, dirt, snow, ice, paint, glue, etc.

From: NM EMNRD Wood Chip Fuel Specifications and Procurement Strategies for New Mexico.

In northern New Mexico, wood chip fuel is being used by the Jemez Mountain School District (JMSD) to heat school buildings in Gallina. Some of the project specifications include:

- The biomass facility was completed in January 2005.
- It is designed to heat 96,000 square feet of the district's buildings including the middle school, high school, vocational agriculture building, and two gymnasiums.
- Funding for the biomass energy plant came from the U.S. Forest Service Economic Action Pilot Program (\$450,000), New Mexico Energy and Minerals (\$450,000), and JMSD funds (\$187,000).
- It is estimated that the plant will require 400 tons per year of biomass to produce enough energy to heat the intended square footage.

In addition, tribal communities are developing biomass projects including:

- Southern Ute Tribe – Tribal Housing Develop, Centralized Heating Facility, (planning stages);
- Taos Pueblo – Tribal Facility Centralized Heating System (feasibility/assessment);
- Zuni Furniture Co. – Modular biomass energy system (system testing);
- Jemez Pueblo – Renewable Energy Assessment;
- Mescalero Apache – MFP cogeneration utilizing mill residue (feasibility/assessment); and
- Laguna Pueblo – Renewable Energy Assessment.

Funding from the Bureau of Indian Affairs, Mineral Assessment Program (MAP) is being used to do resource assessments and feasibility studies for four Regional BIA (schools and other facilities) and four Tribal Facilities (\$99,000), as well as Mescalero Apache Forest Products cogeneration facility (\$160,000).



These demonstration projects will help to prove the viability of biomass heating systems on a commercial scale in New Mexico using local forest residuals. This will help to increase the demand, and perhaps someday, the price for wood chips in the region.

In addition to wood chip fuel, CWPP treatment residuals can be used as feedstock for densified wood fuel or wood pellets. Mount Taylor Manufacturing in Milan, New Mexico (<http://mttaylormanufacturing.com/Pellet.html>) makes wood pellets from CWPP treatment residuals, wood chips, waste wood and sawdust from their millwork facility.

Other Products from Small Diameter Timber

In addition to products made from wood chips and sawdust, timber grade logs and small dimensional wood can be used by local mills and wood product facilities to create other value-added wood products. These include:

- Zuni Sawmill, Zuni (Vegas, corbels, furniture from small diameter timber);
- Mount Taylor Millworks, Milan (Sold lineal wood mouldings from small diameter timber);
- Jicarilla Apache Mill, Dulce (Dimensional wood products);
- Pueblo of Jemez Walatowa Woodlands Initiative (Dimensional wood products) ;
- Mescalero Forest Products, Ruidoso (Dimensional wood products); and
- P&M Plastics, Mountainair (Plastic lumber composite for signs from pine or juniper wood fibers and recycled plastic milk bottles).

References:

Jemez Mountain School District CFRP Proposal. Hazardous Fuel Reduction Through Wood Chip Utilization at Jemez Mountain School District.

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<http://www.emnrd.state.nm.us/fd/Contactus.htm>.

<http://nmrecycle.org/nmoro.htm>.

http://www.recyclenewmexico.com/cfrp_project.htm.

<http://www.walatowawoodlands.com/>.

**APPENDIX F
CUMBRES & TOLTEC SCENIC RAILROAD FIRE
FIGHTING PLAN 2006**



Cumbres & Toltec Scenic Railroad

Fire Fighting Plan

2006

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Index
Cumbres & Toltec scenic railroad
Fire plan - 2006

As instituted by the
Cumbres & Toltec Scenic Management Corporation,
Operator

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Cumbres & Toltec scenic railroad

STANDING OPERATING PROCEDURES

FIRE DETECTION/SUPPRESSION

PURPOSE: The purpose of this Standing Operating Procedure (SOP) is to standardize the procedures to be followed by personnel assigned to the Cumbres and Toltec Scenic Railroad (C&TS RR) involved in fire detection and fire suppression.

SCOPE: This SOP is applicable to all personnel who might, during the performance of their duties, be required to assist in firefighting activities. Train Crews, Track Crews, Fire Patrol, Tanker Truck, and Volunteer Right-of-Way Work Teams personnel must be familiar with the contents of this SOP.

REFERENCES: The following publications, in addition to this SOP, are the basis for performing Fire Management/Suppression activities.

Rules and Regulations of the Operating Department: 20-23,30-35,40,300-300A, 500-515,1001-1004, and 2601-2616.

Current Published Time Table

Operating Department Bulletins, Circulars, Crew Schedules, and any special instructions.

Input and consensus from the U.S. Forest Service, governors, state and local governments, and state forestry agencies in New Mexico and Colorado.

I. GENERAL

A. The Cumbres & Toltec Scenic Railroad (C&TS RR), operated by the Cumbres & Toltec Scenic Management Corporation, has certain equipment available for fire management and suppression operations on the railroad. In addition to hand tools the railroad has one Motor car Trailer equipped with a 300-gallon water tank and pump in Chama, and, a 200-gallon water tank and pump Motor car Trailer in Antonito. These can be towed behind larger 4WD Motorcars to follow regularly scheduled trains. In addition the Corporation has acquired a 4WD truck with a 250 gallon water tank and an auxiliary pump, and a 6WD Military style 5-Ton Truck with an 1800 gallon tank for fire protection. And, the C&TS has two 6000-gallon tank cars (0471 and 0472) equipped with a water pump and nozzles to spray the right-of-way behind a locomotive.

B. The progressively staged operation of the aforementioned equipment is determined based on five levels of fire danger (National Fire Danger Rating System). Each successive level provides for greater resource allocation for detection and suppression of fires which may be started as a result of the operation of the C&TS RR.

Identification of the appropriate level of fire danger will be a decision based on input from representatives of the New Mexico Forestry Division, Colorado Forest Service, Rio Grande National Forest, Carson National Forest, and the C&TS RR. These representatives should be qualified at the "Division Supervisor" level or higher in the Incident Command System of emergency management, with wildfire training and experience. Every effort should be made to reach a consensus based on the best possible fire science, such as Energy

Release Component, fuel moisture measurements, predicted "Red Flag" weather events, National Fire Danger Rating System and others as are deemed appropriate by this group.

1. See Appendix A for contact locations, personnel and phone numbers. From these informational inputs the decision for the level of fire detection and suppression activities will be assigned.

2. Levels of Fire Detection/Suppression.

a. **LEVEL 1:** No fire patrols required based on current or very recent wet conditions (typically rain, or possibly snow at higher elevations).

b. **LEVEL 2:** Normal.

Chama: Motor car and water trailer to follow Train #2 to Cumbres Pass, and possibly Osier, and return.

Antonito: Motor car and water trailer to follow Train #1 to Osier.

c. **LEVEL 3:** High to Very High fire danger. Same as Level 2, with the following additions:

Chama: Fire suppression engine will follow the train along Highway 17 to Cumbres Pass, recheck track area on return trip to Chama; second fire patrol (motor car) to follow train along the track. (The additional motor car will carry hand tools and full bladder bags but is primarily for detection.)

Antonito: Motor car and Water Trailer to follow Train #1 to Osier and then return behind Train #4.

d. **LEVEL 4:** Very High to Extreme fire danger. Same as Level 3, except with the following additions:

Chama and Antonito: Auxiliary tank car attached behind the engines of both trains to spray water along the right-of-way. Tank cars will remain with the through train engine and refill as necessary.

e. **LEVEL 5:** Train operations suspended due to extreme fire danger, uncontrolled wildfire along or near the train right-of-way, or other situation that presents a danger to the passengers and crew.

**Track repair crews will also be available at all times to provide additional assistance for fire suppression, if necessary.*

C. It is essential that the operators and users of the fire detection/suppression equipment be knowledgeable in how to use and maintain this equipment so that it is effective in the suppression and management of wild land fires. It is mandatory that all Fire Fighting activities and personnel involved in fighting fires be able to recognize when any fire is beyond their capabilities to control and extinguish and contact the Dispatcher immediately for assistance in control and suppression of any fire.

This is the key factor in fire suppression: know your limitations before you lose control.

D. It is the responsibility of Supervisors (Superintendent, Conductors, and Engineers), Train Crews, Tanker Truck Crew, Fire Patrol Crews, Track Crews (including Contractor Track Crews), and Volunteer Right-of-Way Work Teams to insure that required equipment is on hand and maintained for immediate use. Any problems or deviations must be reported to the General Manager, Superintendent of Operations, or the Chama Dispatcher (or Antonito Station Agent) immediately. All equipment must be checked at the beginning of each work shift as well as at the end of each work shift. The goal is to be able to use any of the fire suppression equipment at a moments notice. Checklists of equipment as well as checklists for before and after operations inspections are provided with each applicable section of this SOP. The immediate supervisor of all activities involved directly or indirectly with fire detection and suppression are responsible for insuring that their equipment is ready to respond to a fire at a moments notice.

E. SAFETY: The first factor of fire detection and suppression is SAFETY.

- Know WHERE you are.
- Know your escape routes and safety zones BEFORE you fight the fire.
- Always be SAFE.
- Communicate your situation to dispatch.

F. Past Experience: The greater majority of fires started by operations of the C&TS RR have been very small and close to the right-of-way. Most have been less than one quarter of an acre. Experience has shown that on the west side of the railroad most fires are between Mile Post 342 and MP 335, with the majority in the MP 340 to MP 336. It is rare that a fire has been started above Cresco at MP 335.10. On the east side of the railroad the terrain and vegetation from Antonito MP 280.70 to MP 299.41 at Big Horn is dry and occasional fires have occurred along the right-of-way primarily in the first four to five miles. From MP 299.41 to Sublette MP 306.6 the terrain and vegetation change from high desert to wooded "mountains" with ponderosa pine, mixed conifer and aspen forest types. A few fires have been started in this area. Careful observation by Train Crews and Fire Patrol Crews in these areas will assist in early detection and suppression of locomotive generated fires. It is essential that a crewmember be on the rear platform of the train in high danger areas.

G. C&TS Fire Marshall. The General Manager of the Railroad will designate an individual who will act as an overall coordinator for the Fire Detection and Suppression activities. This will be an additional duty. The supervisor of this individual will insure that sufficient time is allowed to perform such coordinating activities as is necessary:

H. Changes to this SOP.

1. This document is intended to be a living document that can be flexible and changed to meet current and future needs of the railroad.

I. The following sections of this SOP address specific fire detection/suppression activities. Related appendices are identified.

DAILY PROCEDURES-ALL PERSONNEL

A. All personnel having any involvement in fire management/support, on days assigned or called to work, must accomplish the following:

1. In Chama, check the Train Crew Room, located in the Freight Deck, to review and understand all bulletins, special instructions, and/or orders that may affect operations. Crew call times may vary from day to day depending on assignment so it is important that all related information be reviewed. Each member of assigned Train Crews, Fire Patrol Crews, Tanker Truck Crew, and Track Crews must have their copy of the current Book of Rules and Timetable with them while on duty.

2. In Antonito, check the Ticket Office, Utility Room, or Shop, as needed, to review the same information as above.

3. Crews must obtain appropriate Radios, Log Books, Inspection Forms, and keys, as may be required to operate assigned equipment.

4. Conductors are responsible for all equipment onboard their train. Defects or problems must be reported immediately.

B. GENERAL FIREFIGHTING PROCEDURES:

1. "LCES" = Lookouts, Communications, Escape Route(s), and Safety Zone(s).

a. All personnel need to be informed on LCES.

b. Update throughout the shift.

c. Lookouts/Communications.

(1) Competent and trusted individuals?

(2) Radio and frequencies?

(3) Watch or timepiece?

(4) Map and communications plan?

(5) Knowledge of crews location?

(6) Good vantage and safe location?

d. Escape Routes.

(1) Scouted?

(2) Walkable?

(3) Timed?

(4) Marked?

(5) Away from fire head?

e. Safety Zones (no shelters needed)

(1) Clean Burn / Natural / Man-made / Vehicles.

(2) Scouted?

(3) Timed?

(4) Close enough?

(5) Large enough?

(6) Terrain? Avoid saddles; chutes; box canyons.

(7) Snags or rolling rocks?

2. Safety: "Safety is of the first importance in the discharge of duty".

3. Approach all fires with extreme caution.

4. If WATER is available, USE IT. Batch mix or inject a .5 % solution of class "A" foam

into all water used for fire suppression, with the exception of water which might enter a water source such as a pond or stream. Spray at base of flame from a safe anchor point.

5. Control the perimeter of a fire to keep it from spreading. Once the perimeter has been controlled work the center until all areas are extinguished.

6. Once a fire is controlled, look for and extinguish hot spots.

a. Use water, shovels, McLeod's, rakes, Pulaskis as needed. Create a scraped line to mineral soil around the fire as needed.

7. If a fire is beyond your ability to control ask for assistance immediately and then do what you can to anchor and flank the fire.

8. Always have a safety zone and escape route in the event the fire changes directions and/or turns toward you.

9. If any vehicles are at the fire scene make sure they are pointed away from the fire in the direction of quick escape.

C. BEFORE OPERATIONS CHECKS:

1. ALL equipment used on the Cumbres and Toltec Scenic Railroad has one or more steps required for a "before operations check", i.e. locomotives, coaches, generators, motor cars, tanker truck, radios, motor car trailer w/tank and pump, and, auxiliary tank cars. It is the responsibility of all personnel to insure that the equipment to which they are assigned is inspected and ready to perform its duty. This means that fuel levels, water levels, oil levels, other fluid levels, and general condition must be inspected. Also, pumps, motors, generators must be tested to insure that they work. Motor cars and the tanker truck have log books and forms for Pre-Operation and Post-Operation Inspection. These forms will be maintained daily and kept in the Log Book (See Tab B and Tab Q. Problems noted on trains will be included on the Conductors Daily Report.

2. In the event that some defect or condition is found that cannot be resolved by the operator of a fire equipment item or a train crew member, the dispatcher and the mechanical department must be contacted immediately. In Chama, the General Manager or Shop Foreman should be requested to help resolve the matter. In Antonito, the Operations Manager should be contacted, or the Antonito Station Agent. Faults that would make the equipment ineffective for fire suppression must be repaired BEFORE the unit goes into service.

3. If a unit cannot be repaired it is essential that the dispatcher in Chama, or Antonito Station Agent, be notified so that arrangements can be made for supplemental aid if deemed necessary.

4. Most problems should be detected during "after operations checks". "Before Operation Checks" should be a review to insure that everything was taken care of after the equipment was last operated.

D. AFTER OPERATIONS CHECKS:

1. At the end of each operating session trains crews, track crews, fire patrol crews, and the tanker truck crew will perform after operations checks. This is to insure that all equipment is ready to go at a moments notice. This means fuel and water tanks should be topped off. It could be that equipment may be called out during non-duty hours to support other fire management/suppression operations.

2. As with Before Operations Checks, any defect noted that cannot be resolved by the operator must be reported for immediate resolution. If a unit cannot be repaired the problem must be reported to the Chama Dispatcher immediately.

3. Equipment used for fire fighting on board any regular train, work train, or extra train must be checked at the end of duty. Tools and equipment, especially water backpacks, should be stored and maintained to prevent damage. Any missing or inoperable items must be reported on the Conductors Daily Report, AND, actions initiated immediately to resolve the problem.

4. Conductors are responsible for the operation of equipment on their respective trains. All fires must be noted by location on the Conductors Daily Report. Also, any problems with equipment must be noted on the report and reported to the Chama dispatcher, or the Station Agent in Antonito for reporting to Chama.

PASSENGER TRAIN PERSONNEL, WORK TRAINS, EXTRA TRAINS, AND DIESEL # 19

A. The Conductor is ultimately responsible for the operation of his/her assigned passenger train, extra train, or work train. The Conductor must know, by personal inspection, that the proper fire suppression equipment and tools are on board the train and in operating condition. The Conductor must insure that train crew members, including the engine crew, know where the fire tools are located on each train. If Diesel #19 is operated independently the Engineer is responsible in the same manner as a Conductor for insuring that all required tools and equipment are on board and that operations are conducted in a same manner. The location of equipment must remain the same at all times. Locations of tools must not interfere with passenger safety, and, should be out of the way to prevent damage, especially to the Water Backpacks. Problems noted must be resolved prior to departure. Problems that cannot be resolved must be reported to the Chama dispatcher (or Antonito Station Agent) and noted on the Conductors Daily Report.

B. No train shall depart the yards without knowing that all fire management/ suppression equipment is available and serviceable.

C. Passenger Trains: Fire suppression tools that will be maintained on each regular passenger train and readily accessible for immediate use:

1. Two (2) "Indian" water bags or backpacks
2. One (1) round nose shovel.
3. One (1) steel rake.
4. One (1) McLeod (combination 4' prong rake and hoe)
5. One (1) Pulaski (fire pick)
6. Two 5-Gallon Water Cans to refill water bags.
7. One (1) vehicular type fire extinguisher mounted near generator.

8. Additional gasoline for generators as needed.

D. Extra or Work Trains, including independent use of Diesel #19.

Fire Management/suppression tools that will be maintained on these types of trains:

1. Two (2) "Indian" water bags or backpacks.
2. One (1) round nose shovel.
3. One (1) steel rake.
4. One (1) McLeod (combination 4-prong rake and hoe).
5. One (1) Pulaski (fire pick).
6. Two (2) 5-gallon water cans to refill water bags.
7. One (1) chemical type fire extinguisher as may be required.

D. After Operations Check. At the end of each duty day the Conductor is responsible for insuring that all required equipment is serviceable and in its appropriate place. If "Indian" water bags and water cans are used they must be refilled immediately. Problems noted that cannot be resolved must be noted on the Conductors Daily Report and reported to the Chama dispatcher immediately.

E. All of the above requirements apply to Work Trains, Extra Trains, or Special Trains. The Conductor is responsible for this equipment. Extra tools will be maintained in the train crew room in Chama for Work or Special Trains. At the termination of a Work, Extra, or Special Train the Conductor will insure that all equipment is returned to the train crew room in serviceable condition or note problems on the Daily Conductors Report. When Diesel #19 is operated independently the Engineer must report all defects to the closest dispatch Office.

MOTOR CAR-FIRE PATROL (CHAMA)

A. The first level of defense for fire management/suppression for the regular passenger train out of Chama is a motor car with attached water trailer and two C&TSRR personnel.

1. This on-track fire patrol is responsible for following its assigned passenger train to watch for any fires. Constant contact must be maintained with the passenger train crew for reports of fires. Communication can be via radio, or if close enough, via hand signals. The locations of all fires will be reported to the Conductor for the Daily Conductors Report. This report will be forwarded at the end of the day to NM State Forestry in Los Brazos.

2. Motor car Operator must conduct a radio check with the Dispatcher and the Conductor prior to leaving Chama.

3. Motor car should follow the eastbound train approximately 1200 feet, or 1/4 mile behind the train, but not more than 1/2 mile.

4. When following a westbound train from Osier to Chama the motor car should follow approximately 3/4 to one (1) mile behind the train. This provides a cushion to insure that any fire will be located and put out, and, acts as a final sweep of the area.

5. Fire Patrol personnel must relock all switch locks used, and, must insure that switches are aligned for normal operations.

6. Prior to departing from Chama the lower pump on the water trailer will be started, with the motor on idle, and the by-pass valve opened. This will reduce time at a fire scene trying to start the motor. When stopped at a fire scene close the by-pass valve and run the pump motor at full throttle. The operator must insure that brakes are set and a chain placed behind a wheel.

7. Operators must maintain control of the motor car at all times. Motor cars are to be operated at "Restricted Speed" at all times. Going downgrade on the 4% grade the transmission should be in second gear. On the 1.4% grade third gear should provide adequate speed control. Remember that 300 gallons of water equates to 2400 pounds plus the weight of the trailer itself. This is more than 3000 pounds without brakes. Maintain control at all times.

8. Keep tools organized and easy to reach. Keep the motor car and trailer clean and free of trash at all times. There is NO SMOKING onboard any motor car.

9. Signaling at road crossings. Horns will be sounded with the same signal as used by locomotives when approaching and crossing all road crossings. Two Longs, One Short, and One Long carried through the crossing using lights and horns. If lights and horn become inoperable, stop before entering road crossings.

B. Fire Fighting.

1. Once a fire is located, the site should be approached with extreme caution. Do not get off moving equipment, insure that themMotor car is secure from moving.

2. SAFETY: The first factor of fire suppression and management is safety.

* Know where you are.

* Know where your safety zone is (so you can escape safely) before you address the suppression of the fire.

3. On a small fire attempt to control and extinguish it by using the water hose from the water trailer as described in A.6. above. Work the perimeter of the fire to keep it from spreading. Once the perimeter has been managed turn to the hot spots within the fire. Use the water hose, hand tools, and backpack water bags as needed to clean up the area. Keep in mind that time is of the essence. Be timely in making the assessment that control of the fire cannot be accomplished with available basic tools and the water pump.

a. If it becomes apparent that the control and extinguishing of the fire is going to cause a delay to the ability to be an effective distance from the train, the Fire Patrol MUST contact the train by radio, either directly or through the Chama Dispatcher, and tell them to stop the train until the Fire Patrol can put out the fire and regain the proper distance behind the train.

b. It is MANDATORY that all Fire Patrols be able to recognize when any fire is beyond their capabilities to control and extinguish and contact the Tanker Truck and Chama Dispatcher immediately for assistance in control and suppression. THIS IS THE KEY FACTOR IN FIRE MANAGEMENT—KNOW YOUR LIMITATIONS BEFORE YOU LOSE CONTROL.

4. Once a fire is extinguished, report to the Conductor that the motor car is underway, then, report when at the proper distance behind the train.

5. On occasions when a second motorcar is required to follow the train, it will follow the primary motor car approximately 500 feet behind. Under these conditions if a fire is discovered by the first unit it might, if the fire is very small, radio the second unit as to the location of the fire and will BY-PASS the fire (unless the fire is across and blocking the track). This allows the second unit to engage the fire and the first unit can continue the protection behind the train. Once the second unit has extinguished the fire they will radio the first unit to determine their location and proceed to join up with them.

C. Equipment required to be carried by the Chama Fire Patrol: All firefighting equipment should be protected from incidental damage and carried in such a manner as to be readily available.

1. Two (2) "Indian" water bags or backpacks.
2. Two (2) round nose shovels.
3. Two (2) steel robes.
4. Two (2) McLeod's (combination 4-prong rake and hoe)
5. Two (2) Pulaskis (fire pick).
6. Five (5) gallons of gas.
7. Two (2) vehicular type fire extinguishers: one on motorcar, the other on the water trailer.

D. Maintenance of Equipment: Firefighting crew must follow the procedures in Section II: Daily Procedures—All Personnel. All before operations and after operations procedures must be followed including topping off fuel and water tanks. See Tab B: Motor car and water trailer Inspection Sheet. Defects must be repaired or reported immediately. Before the end of duty all equipment must be prepared to leave at a moments notice.

MOTOR CAR - FIRE PATROL (ANTONITO)

A. The first level of defense for fire management/suppression for the regular passenger train out of Antonito is a motor car with attached Water Trailer and hand tools.

1. This on-track fire patrol is responsible for following its assigned passenger train to be watching for any fires. Constant contact must be maintained with the passenger train crew for reports of ember fires. Communication can be via radio, or if close enough, via hand signals. The locations of all fires will be reported to the Conductor for the Daily Conductors Report. At the end of the day this report will be forwarded to N.M. State Forestry.

2. The Fire Patrol must conduct a radio check with the Antonito dispatcher (Station Agent) and the Conductor prior to leaving Antonito.

3. The motor car should follow the westbound train approximately 1/4 to 1/2 mile behind the train.

4. When following an eastbound train from Osier to Antonito the motor car should follow approximately 3/4 to one (1) mile behind the train. This provides a cushion to insure that any fire will be located and put out, and, acts as a final sweep of the area.

5. Fire Patrol personnel must relock all switch locks used, and, must insure that switches are aligned for normal operations.

6. Prior to departing from Antonito the pump on the water trailer will be started with the pump on idle. This will reduce time at the fire scene trying to start the motor. When stopped at a fire scene run the pump and full throttle. The operator must insure that brakes are set and a chain placed behind a wheel.

7. Operators must maintain control of the motor car at all times. Motor car is to be operated at "Restricted Speed" at all times. Going downgrade on the 1.2% grade third gear should provide adequate speed control. Remember that 200 gallons of water equates to 1600 pounds plus the weight of the trailer itself. Maintain control at all times.

8. Keep tools organized and easy to reach. Keep the motor car clean and free of trash at all times. There is NO SMOKING onboard any motor car.

9. Signaling at road crossings. Horns will be sounded with the same signal as used by locomotives when approaching and crossing all road crossings. Two Longs, One Short, and One Long carried through the crossing, using lights and horns. If lights and horn become inoperable, stop before entering road crossings.

B. Fire Fighting.

1. Once a fire is located, the site should be approached with caution. The motor car should be stopped before reaching the fire. Do not get off moving equipment.

2. SAFETY: The first factor of fire suppression and management is safety.

* Know where you are.

* Know where your safe zone is (so you can escape safely) before you address the suppression/management issues.

3. On a small fire, attempt to control and extinguish it by using the water hose from the water trailer as described in A.6. above. Work the perimeter of the fire to keep it from spreading. Once the perimeter has been managed turn to the hot spots within the fire. Use the hand tools and backpack water bags as needed to clean up the area. Keep in mind that time is of the essence. Be timely in making the assessment that control of the fire cannot be accomplished with available basic tools and the water pump.

a. If it becomes apparent that the control and extinguishing of the fire is going to cause a delay to the ability to be an effective distance from the train, the fire patrol MUST contact the train, by radio (either directly or through the Antonito station agent) and tell them to stop the train until the fire patrol can put out the fire and regain the proper distance behind the train.

b. It is MANDATORY that all fire patrols be able to recognize when any fire is beyond their capabilities to control and extinguish and contact the station agent in Antonito immediately for assistance in control and suppression. THIS IS THE KEY FACTOR IN FIRE SUPPRESSION -- KNOW YOUR LIMITATIONS BEFORE YOU LOSE CONTROL.

4. Once a fire is extinguished report to the Conductor that the motor car is underway, then, report when at the proper distance behind the train.

C. Equipment required to be carried by the Antonito fire patrol. All firefighting equipment should be protected from incidental damage and carried in such a manner as to be readily available.

- * Know where you are.
- * Know where your safe zone is (so you can escape safely) before you address the suppression/management issues.

3. On a small fire attempt to control and extinguish it with hand tools and backpack water pumps. Keep in mind that time is of the essence. Be timely in making the assessment that control of the fire cannot be accomplished with available basic tools.

a. Any fire situation must be evaluated in a timely manner so that assistance can be summoned appropriately to suppress any wildland fire. Always err on the side of caution! It is better to call in assistance and not need it than to call too late.

b. It is MANDATORY that all Fire Patrols be able to recognize when any fire is beyond their capabilities to control and extinguish and contact the Dispatcher immediately for assistance in control and suppression. THIS IS THE KEY FACTOR IN FIRE SUPPRESSION -- KNOW YOUR LIMITATIONS.

4. Once a fire is extinguished report to the dispatcher.

C. Equipment that is required to be carried by Track Gangs, contract track repair operations and volunteer right-of-way work teams follows. All firefighting equipment should be protected from incidental damage and carried in such a manner as to be readily available.

1. One (1) "Indian" water bag or backpack and enough water to refill the "Indian" two (2) times. Water: 10 gallons
2. One (1) round nose shovel.
3. One (1) steel rake.
4. One (1) McLeod (combination 4-prong rake and hoe)
5. One (1) Pulaski (fire pick)
6. One (1) vehicular type fire extinguisher.

D. Maintenance of Equipment and motor car: Track Gangs must follow the procedures in Section II: Daily Procedures—All Personnel. All before operations and after operations procedures must be followed. See Tab B: Motor car and water trailer inspection sheet. Defects must be repaired or reported immediately. All equipment must be prepared and fueled to leave at a moments notice.

Primary Fire Suppression Truck (1-Ton 4X4Truck with 250 gallon tank)

A. Another tool for the suppression of Railroad started fires is a 1-ton 4X4 truck (type 6 standard engine) which will be based out of the Chama Station. This unit is capable of off-road operations and is equipped with an auxiliary pump/engine for pump-and-roll suppression tactics.

1. This truck is responsible for following the passenger train from Chama to Cumbres Pass Summit. It will follow on the Highway 17 behind the motor car/water trailer in support of fire detection and suppression operations. This will allow for immediate response to fire sites in most locations between Chama and Cumbres. See Appendix D: Vehicle Access Points on Cumbres Pass. These sites provide relatively easy access to many points along the right-of-

way. A great deal of care must be exercised when taking this vehicle off-road to prevent a rollover accident on steep hillsides.

2. The truck operator must conduct a radio check with the Chama dispatcher, Conductor of Train #3, and the motor car — fire patrol prior to leaving Chama.

3. The Operator must conduct a test of the auxiliary pump prior to departure from Chama.

4. Tanker truck personnel must relock any gates used for access to the railroad right-of-way.

5. Tanker truck operators must maintain control of the truck at all times, especially going downgrade. When stopping on any grade wheel blocks should be used.

6. All tools and hoses must be kept organized and easy to reach. The truck must be kept clean and free of trash at all times. There is NO SMOKING in or on the truck at any time.

7. The tanker truck WILL stop at all railroad crossings.

B. Fire Fighting.

1. Once the tanker truck reaches a fire site, the fire should be approached with extreme caution. The truck must not be parked in an area that has the least fuel loading, pointed away from the fire.

2. The operator must not leave the truck unless he is sure that it is properly parked with the brakes set. Wheel blocks should be used at all times.

3. SAFETY: The first factor of fire suppression and management is safety.

* Know where you are.

* Know where your safe zone is (so you can escape safely) before you address the suppression/management issues.

4. On a small fire attempt to control and extinguish it by using one or more of the water hoses. Coordinate your effort with motor car personnel if they are on site. Work the perimeter of the fire to keep it from spreading. Once the perimeter has been managed turn to the hot spots within the fire. Use hand tools as necessary to clean up the area. If practical, release the motor car to catch up to the train.

a. Keep in mind that time is of the essence. Be timely in making the assessment that control of the fire cannot be accomplished with available equipment

b. It is MANDATORY that all fire teams be able to recognize when any fire is beyond their capabilities to control and extinguish and contact the Dispatcher immediately for mutual aid in control and suppression. THIS IS THE KEY FACTOR IN FIRE MANAGEMENT —KNOW YOUR LIMITATIONS.

5. Once a fire is extinguished report to the Conductor, the motor car, and the Chama dispatcher that the site is free of fire. Return to the highway and be prepared to support other operations.

C Equipment to be carried by the 4X4 fire truck. All firefighting equipment should be protected from incidental damage and carried in such a manner as to be readily available.

1. Two (2) Round Nose Shovels.
2. Two (2) Steel Rakes.
3. Two (2) McLeod*s.
4. Two (2) Pulaskis.
5. 200 Feet of 1-1/2" Hose
6. 200 Feet of 1" Hose.
7. 200 Feet 3/4" Hose.
8. Two (2) ten pound vehicular type fire extinguishers: One mounted near the front of the truck and the second mounted near the rear pony pump engine.

E. Pony Engine Starting Procedures:

1. Turn on Ignition Switch.
2. Pull out Hand choke all the way.
3. Push Starter Button---as soon as engine starts push the choke halfway back in.
4. Let Engine idle for 30 seconds and push the choke in all the way.
5. Adjust Manual Starter as needed.

F. Maintenance of Equipment: Firefighting crews must follow the procedures in Section 81: Daily Procedures—All Personnel. All before operations and after operations procedures must be followed including topping off fuel and water tanks. See Appendix C: Tanker Truck Inspection Sheet. Defects must be repaired or reported immediately. Before the end of duty all equipment must be prepared to leave at a moments notice.

G. This truck will be stationed in the Chama Yard, filled and ready to leave at a moments notice 24 hours a day, 7 days a week.

H. Only qualified and trained personnel will operate this vehicle.

TANKER TRUCK (5-Ton Truck with 1800 gallon tank)

A. Another resource for fire suppression from the highway is a 5-ton Tanker Truck. This is a military style 6WD truck capable of limited off-road operations. It is equipped with an auxiliary

pump, which can deliver water through a live reel or hose lays. With the capability to deliver a large quantity of water to an incident this truck can also be used to support the smaller fire engine and motor cars during extended suppression operations.

1. The Tanker Truck will be stationed at the Chama station and will be available to provide additional suppression capacity as needed for fires with road access or limited off-road access. This unit could be dispatched to the Antonito side if necessary for staging or suppression activities, or could replace the 4X4 fire truck if that unit was moved to the Antonito side. Flexibility in the use of the two fire trucks will maximize their effectiveness. A closest available resource concept should be applied in moving these two units to support detection and suppression activities. See Appendix D: Vehicle Access Points on Cumbres Pass. The sites provide relatively easy access to many points along the right-of-way. A great deal of care must be exercised when taking this vehicle off-road to prevent a rollover accident on steep hillsides.

2. The Tanker Truck Operator must conduct a radio check with the Chama dispatcher, Conductor of Train #3, and the motor car—Fire Patrol prior to leaving Chama.

3. The operator must conduct a test of the auxiliary pump engine prior to departure from Chama.

4. Tanker truck personnel must relock any gates used for access to the railroad right-of-way.

5. Tanker truck operators must maintain control of the truck at all times, especially going downgrade. When stopping on any grade wheel blocks should be used.

6. All tools and hoses must be kept organized and easy to reach. The truck must be kept clean and free of trash at all times. There is NO SMOKING in or on the truck at any time.

7. The Tanker truck WILL stop at all railroad crossings.

B. Fire Fighting.

1. Once the tanker truck reaches a fire site, the fire should be approached with extreme caution. The truck must not be parked in an area that has the least fuel loading, parked pointed away from the fire.

2. The operator must not leave the truck unless he is sure that it is properly parked with the brakes set. Wheel blocks should be used at all times.

3. SAFETY: The first factor of fire suppression and management is safety.

* Know where you are.

* Know where your safe zone is (so you can escape safely) before you address the suppression/management issues.

4. On a small fire attempt to control and extinguish it by using one or more of the water hoses. Coordinate your effort with motor car personnel if they are on site. Work the perimeter of the fire to keep it from spreading. Once the perimeter has been managed turn to the hot spots within the fire. Use hand tools as necessary to clean up the area. If practical, release the motor car to catch up to the train.

a. Keep in mind that time is of the essence. Be timely in making the assessment that control of the fire cannot be accomplished with available equipment

b. It is **MANDATORY** that all fire teams be able to recognize when any fire is beyond their capabilities to control and extinguish and contact the Dispatcher immediately for mutual aid in control and suppression. **THIS IS THE KEY FACTOR IN FIRE MANAGEMENT —KNOW YOUR LIMITATIONS.**

5. Once a fire is extinguished report to the Conductor, the motor car, and the Chama dispatcher that the site is free of fire. Return to the highway and be prepared to support other operations.

C Equipment to be carried by the tanker truck. All firefighting equipment should be protected from incidental damage and carried in such a manner as to be readily available.

1. Two (2) Round Nose Shovels.

2. Two (2) Steel Rakes.

3. Two (2) McLeod*s.

4. Two (2) Pulaskis.

5. 200 Feet of 1-1/2" Hose

6. 300 Feet of 1" Hose.

7. 400 Feet 3/4" Hose.

8. Two (2) ten pound vehicular type fire extinguishers: One mounted near the front of the truck and the second mounted near the rear pony pump engine.

D. Diesel engine starting procedures:

1. Turn on Battery Main Switch. Listen for fuel pump to pump. Wait 30 seconds.

2. Turn on Ignition Key, depress throttle pedal 1/2", Turn key to starter position.

3. Wait for engine to start. Do not crank engine more than 15 seconds at a time. If engine does not start after 15 seconds let starter cool for two (2) minutes before trying again.

E. Pony Engine Starting Procedures:

1. Turn on Ignition Switch.

2. Pull out Hand choke all the way.

3. Push Starter Button—as soon as engine starts push the choke halfway back in.

4. Let Engine idle for 30 seconds and push the choke in all the way.

5. Adjust Manual Starter as needed.

F. Maintenance of Equipment: Firefighting crews must follow the procedures in Section 81: Daily Procedures—All Personnel. All before operations and after operations procedures must be followed including topping off fuel and water tanks. See Appendix C: Tanker Truck Inspection

Sheet. Defects must be repaired or reported immediately. Before the end of duty all equipment must be prepared to leave at a moments notice.

G. The tanker truck will be stationed in the Chama Yard, filled and ready to leave at a moments notice 24 hours a day, 7 days a week.

H. Only qualified and trained personnel will operate this vehicle.

AUXILIARY TANK CARS

A. When Level 4 of the Levels of Fire Suppression is reached the two auxiliary tank cars 0471 and 0472 will be used on both trains. The Tank cars will be trailed behind the "road engine" to pre-treat fuels along the right-of-way with water, and can also be used to fight fires near the train.

1. Each tank car carries 6000 gallons of water and can, through the use of a gasoline-powered water pump and water distribution system, dampen the right-of-way from the centerline out to approximately 15 feet on each side. Most fires start close to the track and the tank cars provide a spray of water after the locomotive passes to greatly reduce or in most cases eliminate ignitions in this zone.

2. The primary use of the tank cars is during the climbs upgrade from Chama to Cumbres, Osier to Cumbres, and from Antonito to Osier. Based on conditions their use can be modified by regulating the flow of water.

3. Also, due to the lack of water or additional fire suppression support between Antonito and Sublette, it will be necessary to monitor and regulate the use of water.

4. Each tank car carries a 50-foot hose (minimum) and firefighting nozzle. This provides for fire suppression close to the train and a source to fill water backpacks as needed.

5. If both tank cars are in use they will remain with the road engine and go through to the end terminal. If only one tank car is in use it will remain with the train it started with.

6. Depending on water availability the westbound tank car should be filled at Sublette (if water is available) [locomotive water has priority] and Osier. The eastbound tank car can be filled at Cumbres if there is sufficient water [locomotive water has priority], or at Los Pinos.

7. Care must be exercised by the train crew to watch and see when the tank car(s) run out of water and stop the train to turn off the pump so that it does not run without water.

B. Fire Fighting.

1. At a fire site the primary use of the tank car will be to protect the train and to provide fire suppression near the train. At no time should the tank car and train be stopped in a vulnerable place. Passenger safety is paramount. If conditions warrant the passenger cars should be left at a site away from the fire with appropriate hand brakes set.

2. The tank car can fill water backpacks as needed.

C. Equipment to be carried on each tank car.

1. Brake Club for tying down the car if left at a fire scene.
2. 5 gallons of gas for the pump motor.

3. 50-foot one-inch fire hose minimum. 100 feet preferred.
4. One (1) vehicular type fire extinguisher mounted near the pump.

D. Maintenance of Equipment: The Conductor is responsible for insuring that the procedures in Section II: Daily Procedures—All personnel, are carried out. All before and after operations procedures must be followed as well as insuring that arrangements are made to fill the tank car with water at the earliest possible time. The pump motor must be fueled at the end of each day. Before the end of duty all equipment must be prepared to leave at a moments notice.

FIRST AID AND THUNDERSTORM INFORMATION

A. First Aid Guidelines—a simple review.

1. LEGALITY: Do only what you know how to do and keep records of actions.
2. BLOODBORN PATHOGENS: Personal protective equipment (pocket mask, latex gloves, and goggles) should be worn if contact with bodily fluids is possible.
3. TREATMENT PRINCIPLES:
 - Think-prevent further injury; remove from danger. No liquids for the unconscious.
 - Fast Exam: Airway, Breathing, Circulation (The ABC's).
 - Thorough Exam—head to toe and side to side (symmetry).
 - Keep readable records and send a copy with the patient when evacuating.

B. SPECIFIC TREATMENTS:

- Bleeding: Direct pressure, elevate, and pressure point.
- Shock: Lay patient down, elevate feet, keep warm and replace fluids if conscious.
- Fractures: Splint joints above and below injury and monitor pulse past injury.
- " Bee Sting (anaphylaxis): Life threatening—see if the patient has a sting kit and transport immediately.
- Bums: Remove heat source, cool with water, dry wrap and replace fluids.
- Diarrhea: Drink fluids in large quantities.
- Eye Injuries: Wash out foreign material, don't open swollen eyes, leave impaled objects and pad and bandage both eyes.
- Heat Exhaustion: Skin gray, cool, and clammy. Rest in cool place and replace electrolytes, i.e. sports drinks like Gatorade.
- " Heat Stroke: Skin dry, red, temperature hot. Cool and transport immediately.

C. BURN INJURY TREATMENT:

1. Remove person from heat source, extinguish with water.
2. Provide basic first aid
 - Maintain airway, breathing, circulation (ABCs).
 - Provide oxygen, if available and trained to administer.
 - Treat for shock by keeping person warm, feet elevated.
3. Assess degree of burn and area affected:
 - First Degree - affected skin's outer layer. Redness, mild swelling, tenderness, and mild to moderate pain.
 - Second Degree - extends through entire outer layer and into inner layer of skin. Blisters, swelling, weeping of fluids, and severe pain.
 - Third Degree - extends through all skin layers and into underlying fat, muscle, and bone. Discoloration (charred, white or cherry red), leathery, parchment like, dry appearance. Pain is absent.
 - Rule of Nine for determining area burned:

Head	9%	Front Torso	18%
Back Torso	8%	Left Arm	9%
Right Arm	9%	Left Leg	9%
Right Leg	9%	Perineum	1%
4. Cut away only burned clothing. DO NOT cut away clothing stuck to burned skin.
5. Apply cool, clear water over burned area. DO NOT soak person or use cold water and ice packs. This encourages hypothermia.
6. For severe burns or burns covering large area of body:
 - Wrap in clean, sterile sheet followed by plastic sheet
 - Place inside of sleeping bag or cover with insulated blanket.
7. Monitor ABCs and keep burn area moist.
8. Avoid hypothermia and overheating.

D. Thunderstorm Safety: The mature state of a storm may be noted by a sudden reverse in wind direction, a noticeable rise in wind speed, and a sharp drop in temperature. Heavy rain, hail, and lightning occur only in the mature state of a thunderstorm.

Stay out of creek beds.

- Do not use radios or telephones.
- Put down all tools.
- Sit or crouch if in open country.
- Avoid grouping together.
- Do not handle flammable materials in open containers.
- Stay in your vehicle. Take shelter in vehicles if possible.
- Take shelter in a building if available.
- When there is no shelter, avoid high objects such as lone trees. If only isolated trees are near by, the best protection is to crouch in the open, keeping a distance

of twice the height of the tree away. Keep away from wire fences, telephone lines, and conductive elevated objects.

- Avoid ridge tops, hilltops, wide-open spaces, ledges, rock outcroppings, and exposed areas.
- Advise personnel if they feel an electrical charge—if their hair stands on end or their skin tingles—lightning may be about to strike them. They must drop to the ground immediately.

ROUTINE MAINTENANCE AND WINTERIZATION OF EQUIPMENT

A. All equipment used for fire suppression must be maintained in top condition and ready to react to fire danger at a moments notice. To insure that C&TS Railroad personnel perform needed maintenance Checklists for Before and After Operations Inspections and Maintenance are provided in Tabs B and C for motor cars and the tanker truck. Regular recurring maintenance services must also be performed on gasoline pump motors and generators. The following schedules are recommended for maintaining equipment.

B. Generators:

1. Oil: Change twice a month (1st and 15th) and at the end of the season.
2. Air Filter: Change once a month and at the beginning of each season.
3. Spark Plugs: New plug at the beginning of each season and at mid-season. Clean as needed in between.
4. Daily: Check oil level and add as needed. Fill Gasoline at the end of each day.
5. When routine maintenance is performed indicate what was done on the Inspection Sheets or the Conductors Daily Report.

C. Gasoline Water Pumps:

1. Oil: Change twice a month (1st and 15th) and at the end of the season.
2. Air Filter: Change once a month and at the beginning of each season.
3. Spark Plugs: New plug at the beginning of each season and at mid-season. Clean as needed in between.
4. Daily: Check oil level and add as needed. Fill gasoline at the end of each day.
5. When routine maintenance is performed indicate what was done on the Inspection Sheets or the Conductors Daily Report

D. Gasoline Powered Motor cars:

1. Oil & Filter: Change once a month and at the end of the season. Check level of transmission and axle oil.
2. Air Filter: Change once a month and at the beginning of each season.
3. Spark Plugs: New plugs, points, and condenser at the beginning of each season. Remove and clean at the middle of the season. Replace as needed.
4. Daily: Check oil level and add as needed. Fill gasoline at the end of each day.
5. Chains (4WD): Lubricate weekly.
6. Axle Bearings: Lubricate twice a month (1st and 15th).
7. Axles: Lubricate twice a month (1st and 15th).
8. Battery: Check water level (use distilled water to add). Insure terminals are free of corrosion and clean.
9. When routine maintenance is performed indicate what was done on the Inspection Sheets.

E. Diesel Powered Motor Cars:

1. Oil & Filter: Change once a month and at the end of the season.
2. Air Filter: Change once a month and at the beginning of each season.
3. Daily: Check oil and add as needed. Fuel Daily.
4. Axles: Lubricate twice a month (1st and 15th).
5. Axle Bearings: Lubricate twice a month (1st and 15th).
6. Battery: Check water level (use distilled water to add). Insure terminals are free of corrosion and dean.
7. When routine maintenance is performed indicate what was done on the daily Inspection Sheets.

F. Fire Trucks;

1. Oil & Filter: Change at beginning of each season and every 3000 miles.
2. Air Filter: Change at beginning of each season.
3. Batteries: Check water level (use distilled water to fill).
4. Fuel Filters: Change once a month.
5. Auxiliary pump Engines:
 - a. Oil & Filter: Change once a month and end of season.
 - b. Spark Plug: New plug at beginning of season. Clean as needed.
 - c. Points/Condenser: Change at beginning of season.
 - d. Fuel Filter: Change at beginning of season.

6. When routine maintenance is performed indicate what was done on the daily Inspection Sheets.

G. Winterization:

1. Water Trailers:
 - a. Perform end of season maintenance as required.
 - b. Drain all water tanks. Do not replace drain plugs. Tape drain plugs to drain area.
 - c. Open all water valves. Insure that no water is in water lines.
 - d. Drain pump body. Tape drain plug to pump.
 - e. Drain gas from pump motor.
 - f. Secure hoses and nozzles, fire extinguishers, and tools in Crew Room in Chama or designated area in Antonito.
2. Generators:
 - a. Perform end of season maintenance as required.
 - b. Clean unit thoroughly.
 - c. Drain gas from tank and carburetor.
 - d. Store inside.
3. Tank cars:
 - a. Drain tanks, leave plugs off-leave in compartment with pump.
 - b. Leave drain levers in dome open.
 - c. Store hoses and nozzles, tools, and fire extinguishers in Crew Room (Chama) or designated area in Antonito.
4. Fire Trucks:
 - a. Drain all water tanks.
 - b. Leave all valves open.
 - c. Blow out water lines.

- d. Perform end of season maintenance as required on truck and auxiliary pump engines.
- e. Store batteries in area that will not freeze.
- f. Drain gasoline from auxiliary engine.
- g. Store fire extinguishers in crew room.

5. Motor cars:

- a. Perform end of season maintenance as required.
- b. Store in secure area.
- c. Store batteries in area that will not freeze. Mark batteries for motor car.
- d. Drain gasoline from tank and sediment bowls.
- e. Store fire extinguishers and tools in crew room in Chama, or designated area in Antonito.

APPENDIX A

CONTACT INFORMATION

1. General Manager, C&TS Railroad:
Tim Tennant 505-756-1279
2. Chief Dispatcher, C&TSRR:
Ronnica Lopez 719-376-5483
3. Chief Mechanical Officer, C&TS RR
Marvin Casias 719-580-0652
4. Administration Manager, C&TSRR
Teresa Smith 505-756-1280
5. C&TS RR Fire Marshall
Soni Honegger 505-756-2202
6. New Mexico State Forestry Division-Brazos
EMERGENCY FIRE REPORTING 505-827-8080
Craig Daugherty 505-588-7831
Ron Graham 505-588-7831
7. Colorado State Forest Service-Alamosa
Boyd Lebeda 719-589-2271
719-588-3377
8. Carson National Forest, USFS in New Mexico
Martin Chavez 505-758-6200
Emesto Hurtado 505-751-3230
9. Rio Grande National Forest USFS in Colorado
719-580-6302
Peter Clark 719-852-5941
Roberto Martinez 719-274-6302
10. C&TSRR Commission
Leo Schmitz, Executive Director 719-580-6860
Commission Office, Antonito, CO 719-376-5488

APPENDIX B

DAILY MOTOR CAR INSPECTIONS CHECKLIST

BEFORE AND AFTER OPERATIONS CHECKLIST

DATE: _____ MOTOR CAR NUMBER: _____

Operator/Inspector: AM _____ PM _____

Mark each item with one of the following: Y=Yes/Okay; N=Defective; M=Missing; N/A = Not applicable. Give details of defective items under "Remarks."

AM	PM	AM	PM	AM	PM
___ Battery	___	___ Muffler	___	___ Trailer Wheels	___
___ Brakes	___	___ Oil Level	___	___ Trailer Pump	___
___ Carburetor	___	___ Oil Pressure	___	___ Hoses	___
___ Fuel Injector	___	___ Radiator	___	___ Trailer Tow Bar	___
___ Drive Chain	___	___ Safety Chain	___	___ Water Level	___
___ Engine	___	___ Fire Ext.	___	___ Shovel	___
___ Front Axle	___	___ Rags	___	___ Pulaski	___
___ Rear Axle	___	___ Fusees	___	___ Rake	___
___ Fuel Tank	___	___ Torpedos	___	___ McLeod	___
___ Fuel Filter	___	___ Transmission	___	___ Hand Tools	___
___ Horn	___	___ Wheels	___	___ Trailer Axles	___
___ Head Lights	___	___ Windows	___		
___ Running Lights	___	___ Water Bags	___		
___ Shovels	___	___ Rake	___		
___ Pulaski	___	___ McLeod	___		

REMARKS:

Condition of the Motor car is Satisfactory: AM ___
PM Condition of the Water Trailer is Satisfactory: AM ___
PM _

Defects Noted have been corrected by:

Date:

Shop
Foreman.

Defects Noted need not be corrected for safe operation:

I. Routine Maintenance Performed: _____

APPENDIX C

DAILY TANKER TRUCK INSPECTSONS CHECKLIST

BEFORE AND AFTER OPERATIONS CHECKLIST

DATE:

Operator/Inspector: AM _____ PM _____

Indicate the appropriate response: Y=Yes/okay; N=Defective; M=Missing; N/A=Not applicable.
Give details of defective items under "REMARKS".

AM

PM AM

PM AM

PM

Battery
Brakes
Engine

Fuel injector
Front Axle
Rear Axles
Fuel Tank
Fuel Filter
Fuel Tank
Horn
Head Lights
Tail Lights

Oil Level
Oil Pressure
Radiator
Transmission
Tires/Wheels
Windows
Water Bags
Hand Tools
Transmission

Water Pump
WP Oil
Hoses Hose
Reel Water
Level Shovel
Pulaski Rake
McLeod
Hand Tools

Other items inspected: _____

REMARKS: _____

Condition of the Tanker Truck is Satisfactory: AM ____ PM ____

Condition of the Tanker Truck Pump is Satisfactory. AM ____
PM ____

Defects Noted have been corrected by: _____

Shop Foreman.

Defects Noted need not be corrected for safe operation: _____

Routine Maintenance Performed: _____

APPENDIX D

TANKER TRUCK ACCESS POINTS ON CUMBRES PASS

1. To assist in fire fighting measures it may be necessary for the Tanker Truck to use its off-road capabilities to get to a fire site. There are a number of gates and fence access points between Chama and Cumbres as well as from Cumbres to Los Pinos.
2. The following maps, taken from "Ticket to Toltec", are marked with access points and a suggested route to sites near the C&TS RR right-of-way.
3. It is imperative that no risks be taken while trying to gain closer access to the right-of-way. The Tanker Truck should never be driven across the face of a steep grade that could cause a roll-over.
4. Drivers must insure that brakes are properly set and wheel blocks used to insure that the vehicle will not move. If there is a doubt the driver must stay in the cab and the assistant driver will perform the fire suppression operations.

APPENDIX E

COLOR CODES FOR FIRE-DANGER CLASSES

A. The Fire Danger rating is established locally for each public land unit in the Southwest Area. They are based on fuel types (i.e. grass, brush, slash, to timber), fuel moisture content (i.e. 10-hour fuel sticks) weather (i.e. precipitation, relative humidity, temperature, cloud cover, etc), and station elevation, among others. Each afternoon data is collected from each public land management unit. It is entered into the Weather Information Management System (WIMS), and an adjective fire danger reading is provided to that particular day. The ratings and color codes for broad fire-danger classes are useful for fire management and for information the general public of fire danger. The following descriptions and codes are provided on a web site: <http://www.fs.fed.us/r3/fire/swainfo/southwest/swa-firedanger.htm>.

B. The following descriptions are used in Section I.B.2 and prescribe the equipment assigned for the Fire-Danger Classes.

1. LOW—Color Code Green.
2. MODERATE-Color Code Blue.
3. HIGH-Color Code Yellow.
4. VERY HIGH-Color Code Orange.
5. EXTREME-Color Code Red.

C. Each of the above classes has a description about fuels and what may start fires. It is felt that the classes and assigned colors are sufficient for this SOP.

Appendix F

Distribution of Cumbres & Toltec Railroad Fire Plan for 2006

C&TS General Manager
C&TS Management Corporation Board
C&TS Railroad Commission office and members
C&TS Fire Marshall
New Mexico State Forestry
U.S.D.A. Forest Service – Carson National Forest and Rio Grande National Forest
Friends of the C&TS RR
Chama Dispatcher (C&TS)
Antonito Dispatcher (C&TS)
Chama Fire Patrol
Antonito Fire Patrol
Chama Pumper Truck
Antonito Station Agent
Chama Crew Room
Chama Fire Department
Antonito Fire Department

Appendix G

Cumbres & Toltec Railroad

Conductor's Daily Fire Report Form

Receiving Entity: N.M. State Forestry

Conductor Reporting for C&TS: _____

Date of Report: _____

Fires less than 1/10 acre: _____

Fires less than .5 acre: _____

Fires less than one acre: _____

Fires less than five acres: _____

Fires more than five acres: _____ size: _____

Total Fires: _____

Total acres: _____

Resources used:

____ C&TS only

____ Additional resources, i.e. _____

____ NMSF Division required

____ National Forest assistance required

Safety Action Plan
Initiated: April 19, 2007 Current Revision: 1/21/08

	Source	Responsibility	Target Completion Date	Comments/Progress
1. Develop a Corporate Health and Safety System with a Plan, Do, Check, Act closed-loop process	ARCO		March 2008	
a. Develop SMART (Specific, Measurable, Attainable, Realistic, and Timely) Goals	ARCO	Management Safety Committee	May 2007	5/22/07: LB to draft interim goals for 2007 5/31/07: 2007 goals established
b. Identify Gaps in existing policies and procedures	ARCO	Lindsay/ Kristen	June 2007	
c. Implement specific action items to improve H&S behavior of employees (refer to item 2)	ARCO			
d. Implement regular in-house monitoring/auditing and evaluation	ARCO	Lindsay/ Kristen/ Tim/ Ron	May 2007	5/22/07: TL has checklist. Incorporate into 2007 goals
e. Implement system to assure policies and procedures are revised based on lessons-learned	ARCO	Management Safety Committee	May 2007	5/22/07: Conduct follow-up on new policies after 1 - 3 months
f. Formalize record keeping	ARCO	Ann/Kristen	Aug 2007	5/22/07: Need document control system. LB to find examples 6/28/07 Draft completed; to Kristen for first review
g. Initiate VPP process: attend VPP conference, meet with Brad Baptiste, modify action plan as needed)	ARCO	Lindsay, Kristen	May 2007	5/22/07: LB & KB at conf. last week 5/31/07: Meeting with Brad B. 6/27 6/27/07: Meeting with Brad Baptiste
2. Develop a written and documented Behavior Based Safety Program	ARCO			
a. Recognize individuals for identifying, reporting, and correcting unsafe conditions	ARCO	Kristen/Emplo yee Safety Committee	April 2007	5/22/07: AH to provide info from Pinnacle
b. Recognize individuals for	ARCO	Kristen/Emplo	April 2007	5/22/07: in progress

APPENDIX G LIST OF PREPARES

Preparer	Company
Jerry Barker, Ph.D., Rangeland and Fire Ecologist	Walsh Environmental Scientists and Engineers, LLC
Margaret Carew, GIS Specialist	Walsh Environmental Scientists and Engineers, LLC
Stan Spencer, Principal Scientist	Walsh Environmental Scientists and Engineers, LLC
Danielle Cassidy, Ecologist	Walsh Environmental Scientists and Engineers, LLC
Carolyn Dunmire	Walsh Environmental Scientists and Engineers, LLC

APPENDIX H LIST OF PEOPLE REQUESTED TO REVIEW DRAFT CWPP

Reviewer	Organization
Ron Stafford – Co-Chair	Northern Rio Arriba Wildland-Urban Interface Corporation
Rosemary O’Neill – Co-Chair	Northern Rio Arriba Wildland-Urban Interface Corporation
B.J. Samora	City of Chama and Chama Fire Department
Jerome Sanchez	Rio Arriba County Fire Marshal
Mateo Devargas	Rio Arriba County Fire Marshal
Dwayne Merritt	Rio Arriba County Emergency Response
Kit Taylor	Laguna Vista Volunteer Fire Department
Mike Kerrigan	USFS Carson National Forest
Pat Pacheco	BLM Taos Field Office
Carl Romnes	BIA Jicarilla Agency
Craig Daugherty	New Mexico State Forestry Division
Anthony Marquez	Herron State Park

**APPENDIX I
CD-ROM WITH ELECTRONIC FILES OF CWPP AND
MAPS**