2016 UPDATE OF THE CLAUNCH-PINTO SOIL AND WATER CONSERVATION DISTRICT COMMUNITY WILDFIRE PROTECTION PLAN

Prepared for

CLAUNCH-PINTO SOIL AND WATER CONSERVATION DISTRICT
1206 South Highway 55
P.O. Box 129
Mountainair, New Mexico 87036
Telephone (505) 847-2243

Prepared by

SWCA ENVIRONMENTAL CONSULTANTS
5647 Jefferson Street, NE
Albuquerque, New Mexico 87109
Telephone (505) 254-1115; Facsimile (505) 254-1116
www.swca.com

Victoria Williams, M.S.

Cody Stropki, Ph.D.

SWCA Project No. 34450

August 1, 2016

EXECUTIVE SUMMARY

This document has been updated to highlight the progress that has been made throughout the Claunch-Pinto Soil and Water Conservation District (herein called the District) since 2008. This document will also continue to address wildfire threats to communities within the District. This plan has updated the recommendations to abate catastrophic wildfire and minimize their impacts to communities. This District-wide plan was updated in conjunction with a county-wide plan for Torrance County, since a large portion of the District falls within Torrance County. A group of multi-jurisdictional agencies (federal, state, and local), organizations, and residents joined together as a Core Team to develop this plan, which is termed the Claunch-Pinto Soil and Water Conservation District Community Wildfire Protection Plan (CPCWPP).

The District encompasses a range of community types, including scattered ranching headquarters, small land-grant communities, National Forest in-holdings, new conservation-oriented developments, and larger incorporated towns. The natural environment is equally diverse, from plains grasslands, through savanna piñon-juniper woodlands, to montane mixed conifer forests. Each of these cover types has its own associated fire hazards and these are discussed throughout the document. Community perceptions of these hazards vary drastically with noticeable complacency of fire risk by grassland residents. Public education forms an important component of this plan as an attempt to highlight common misconceptions of fire risk. The importance of public education and outreach in conjunction with recommended physical actions to reduce hazardous fuels are outlined in this plan.

The purpose of the CPCWPP is to assist in protecting human life and reducing property loss due to wildfire throughout the District. The plan is the result of a community-wide wildland fire protection planning process and the compilation of documents, reports, and data developed by a wide array of contributors. The initial plan was compiled in 2008, in response to the federal Healthy Forest Restoration Act (HFRA) of 2003.

The CPCWPP meets the requirements of the HFRA by:

1) Having been developed collaboratively by multiple agencies at the state and local level in consultation with federal agencies and other interested parties.
2) Prioritizing and identifying fuel reduction treatments and recommending the types and methods of treatments to protect at-risk communities and pertinent infrastructure.
3) Suggesting multi-party mitigation, monitoring, and outreach.
4) Recommending measures and action items that residents and communities can take to reduce the ignitability of structures.
5) Facilitating public information meetings to educate and involve the community to participate in and contribute to the development of the CPCWPP.

The planning process served to identify many physical hazards throughout the District that could increase the threat of wildfire to communities. The public also helped to identify community values that they would most like to see protected. By incorporating public and Core Team input into the recommendations, treatments were tailored specifically for the District to be sensitive to local

values and concerns. The plan raised the importance of collaboration between multi-jurisdictional agencies in order to develop fuels mitigation treatment programs to address wildfire hazards. A major finding of the plan was that it identified the lack of resources available to residents of the District in terms of emergency response. Dependence upon volunteer firefighters and limited County-based staff and resources put the communities at high levels of risk from wildfire.

The CPCWPP planning process highlighted the fire risks and hazards throughout the District, but also the actions taken since 2008 to reduce the wildfire risks within the District. It is clear that it takes a combination of homeowner and community awareness, public education, agency collaboration, and treatments in order to fully reduce wildfire risk. During the update of this plan the public were extremely active in the online survey and offered many great suggestions on areas of which they have concern. As in 2008, a majority of the public that participated in the surveys has widespread agreement regarding the need for defensible space and treatment on private lands and greater public education and outreach on fire safe practices. The message throughout this document is that the greatest fire mitigation could be achieved through the actions of individual homeowners. It is important to stress that this document is an initial step in educating the public and treating areas of concern, and should serve as a tool in doing so. The CPCWPP should be treated as a *live document* to be updated approximately every 2 years or as major occurrences happen within the District's boundary. The plan should be revised to reflect changes, modifications, or new information that may contribute to an updated Claunch Pinto CWPP. These elements are essential to the success of mitigating wildfire risk throughout the planning area and will be important in maintaining the ideas and priorities of the plan and the communities in the future.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

°C	degrees Celsius
°F	degrees Fahrenheit
BAER	Burned Area Emergency Rehabilitation
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BTU/ft/sec	British Thermal Units per feet, per second
CAR	Community at Risk
CBH	Canopy Base Height
CFRP	Collaborative Forest Restoration Program
ch/h	chains per hour
CIG	Conservation Innovation Grants
CR	County Road
CVAR	Community Values at Risk
CPCWPP	Claunch-Pinto Community Wildfire Protection Plan
CWA	Clean Water Act
CWPP	Community Wildfire Protection Plan
DHS	Department of Homeland Security
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FP&S	Fire Prevention and Safety Grants
FR	fire regime
FRCC	Fire Regime Condition Class
FRI	fire-return interval
GAID	Geographic Area Interagency Dispatch
GAO	U.S. Government Accountability Office
GIS	geographic information system
GPS	global positioning system
HFRA	Healthy Forest Restoration Act
I-25	Interstate 25
IC	Incident Command
ICC	International Code Council
JPA	Joint Powers Agreement
m	meter(s)
m²/ha	square meters per hectare
MAA	mutual aid agreement
MRCOG	Mid-Region Council of Governments
NEPA	National Environmental Policy Act
NFP	National Fire Plan
NFPA	National Fire Protection Association
NIFC	National Interagency Fire Center
NMDOT	New Mexico Department of Transportation
NM-FPTF	New Mexico Fire Planning Task Force
NMFRP	New Mexico Forest Restoration Principles
NMSF	New Mexico State Forestry
NRCS	Natural Resources Conservation Service

PNM	Public Service Company of New Mexico
RAWS	remote automated weather station
RMP	Resource Management Plan
SAF	Society of American Foresters
SAFER	Staffing for Adequate Fire and Emergency Response
SWCD	Soil and Water Conservation District
t/ac	tons per acre
USDA	U.S. Department of Agriculture
USDI	U.S. Department of the Interior
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
WUI	Wildland Urban Interface

This page intentionally left blank

1.0 INTRODUCTION

This Community Wildfire Prevention Plan (CWPP), entitled the Claunch-Pinto Soil and Water Conservation District Community Wildfire Prevention Plan (CPCWPP), evaluates wildfire threat to communities and infrastructure and identifies measures that homeowners and land managers can make to reduce the impact of wildfire to life, property, and other Community Values at Risk (CVARs). The Claunch-Pinto Soil and Water Conservation District (hereafter referred to as the District) covers 1,291,779 acres of central New Mexico, encompassing the southern portion of Torrance County (hereafter referred to as the County), northeastern Socorro County, northwestern Lincoln County, and the southeastern edge of Valencia County (Figure 1.1). The District promotes the use of conservation practices and resource management that enhances watershed health and productivity. As part of their mission, the District provides comprehensive services and support to help protect land, resources, and communities from catastrophic wildland fire. Since a majority of the District land lies in Torrance County it was decided that the joint Core Team of stakeholders would be re-established to update both the CPCWPP and a Torrance County Community Wildfire Protection Plan. SWCA Environmental Consultants was contracted to facilitate the planning process and help update the plans for both the County and the District.

This region supports a variety of ecosystems and land uses and includes both rural and urban communities. The topography ranges from the high mountainous areas of the Manzano and Gallinas Mountains to the rolling piñon-juniper foothills surrounding the towns of Mountainair and Corona, to open mesa grassland and ranchland of the lowlands. Because of the many varied land types and land uses throughout the District, the CPCWPP is a collaborative plan that seeks to incorporate the many values and opinions of the citizens who have made this area their home. This CWPP has been developed to address wildfire threat to communities throughout the District; it provides recommendations to abate catastrophic wildfires and minimize their impacts on these communities.

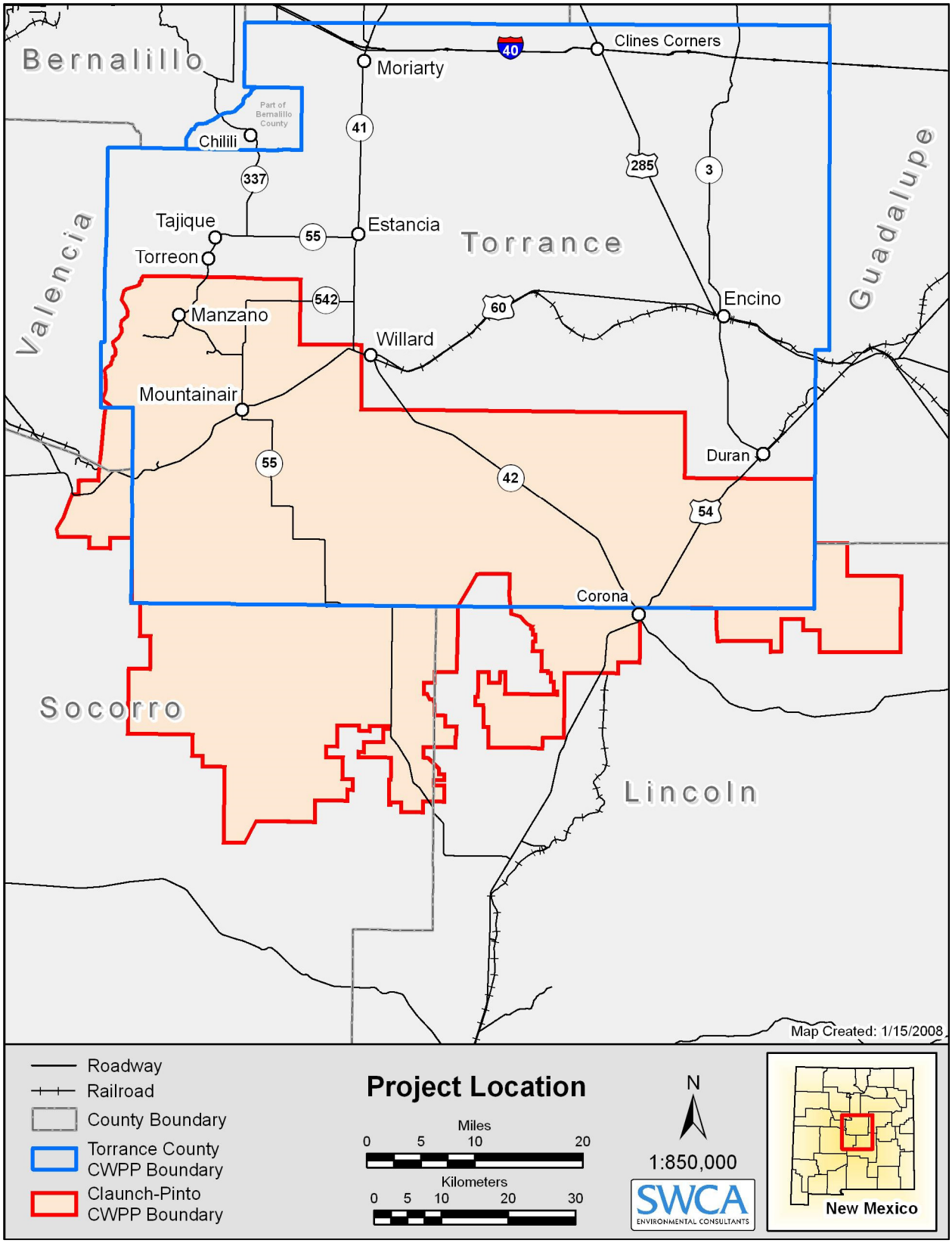


Figure 1.1. Claunch-Pinto Community Wildfire Protection Plan project location.

1.1 UPDATES SINCE THE 2008 PLAN WITHIN THE DISTRICT

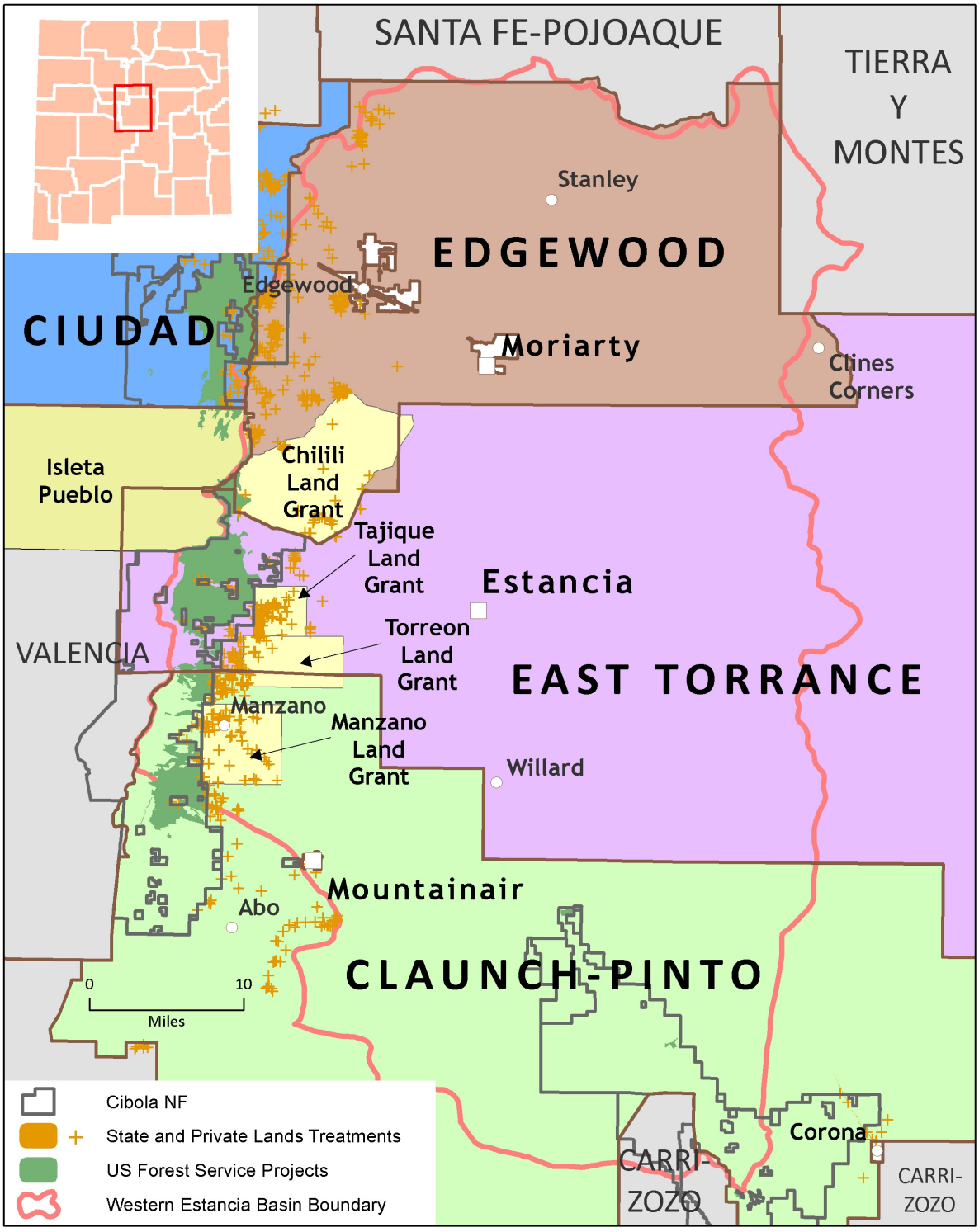
Since the initial development of the CPCWPP was adopted in 2008, the District and its partners have been extremely active in securing funding to plan and implement fuel-reduction treatments as well as help rehabilitate areas impacted by the large wildfires in 2007–2008. The Ojo Peak, Big Springs, and Trigo wildfires burned approximately 27,000 acres and destroyed over 70 structures throughout this District, many of which were homes. This included the entire community of Sherwood Forest, which was rated at an extreme risk in the 2008 CWPP. Since the wildfires in 2007–2008, this area had not seen a wildfire over 100 acres in size until June 13, 2016, when the Dog Head Fire started just north of the District's boundaries on the Cibola National Forest.

The District and its partners have taken a cross-jurisdictional, landscape-scale approach over the past 8 years in conducting fuel-reduction treatments and educational outreach. In fact since 2008, over 5,000 acres have been treated across a cross-jurisdictional landscape with many more projects currently happening or in the planning stages (Figure 1.2). The efforts have led to the District and its partners bringing in over $7 million to help with educational outreach, fuel-reduction treatments, environmental compliance, and forest worker trainings. Moving forward into the future the District and its partners will use this document to help guide them through the areas still in need of treatment, of which there are many. One new issues that has developed since 2008 is the bark beetle outbreak that has resulted in the die off of large numbers of pinyon trees throughout the planning area.

Table 1.1 and Figure 1.2 below highlight the accomplishments that have been made since 2008 within the District. This table includes projects that were highlighted in the original plan as well as other projects that were not part of the original plan, but lead to increases in defensible space within the Wildland Urban Interface (WUI).

Table 1.1. Summary of Projects Completed Since 2008.

Project	Location	Method	Served to:	Implementation
Removal of saltcedar from riparian areas	All infested areas located within the district.	Remove saltcedar using chemical and mechanical means.	Protect watershed health by lower fire danger within the riparian areas and reduce the invasive species present throughout the district.	Project work continues to happen throughout the District as ongoing annual funding sources are targeted.
Remove piñon-juniper and other shrubs encroaching on highway right-of-way	Highways 42 and 54 close to Corona.	Handcutting and chipping of slash.	Reduce the chance of an inadvertent human caused ignitions along the road. The piñon-juniper woodland was too dense and too close to road. This project also protected drivers through the area by allowing them to see the wildlife and livestock before they are on the road. .	The Districted Removed all vegetation to at least 30 feet from the road and reduced the piñon-juniper density on a 0.5 mile area.
Red Canyon Collaborative Forest Restoration Program (CFRP)	Red Canyon Area above to town of Manzano on FS 422.	Reduce the density of Ponderosa Pine trees in order to restore watershed health and limit the impacts of fire if one were to occur.	Protect the watersheds from catastrophic wildfire as this area supplies water to the town of Manzano through the reduction of overstory tress. This area is one of the last unburned watersheds in the Manzano Mountains.	Both NEPA planning and Implementation work were completed from 2008-2011. This worked resulted in 350 acres being treated and 360 acres being cleared through the NEPA process for treatments
Ojo Peak CFRP	East of FS Road 422. Ox Canyon within the Ojo Peak burn scar	Restore a perennial drainage (Ox Canyon) that was impacted by the Ojo Peak Wildfire through the application of erosion mitigation methods using native material and provide thinning in adjacent unburned areas.	Restore the functioning of this important drainage through reducing the amount of hillslope and channel erosion and thin 125 acres of adjacent unburned forest.	Project was implemented and completed in 2013-2014.
Romero CFRP	Red Canyon Area above to town of Manzano on FS 422.	Reduce forest density through mechanical treatments in order to restore watershed health and limit the impacts of fire.	Protect the watersheds from catastrophic wildfire as this area supplies water to the town of Manzano. This area is one of the last unburned watersheds in the Manzano Mountains.	Used the NEPA that was completed by the Red Canyon CFRP to implement this project starting in 2014.
Estancia Basin Watershed Health and Restoration Project	Estancia Basin ds	Reduce the density of trees a	Provide homeowners with a cost-share program to enable residents to increase their defensible space	Project is ongoing given funding is available.
Mobile Workshop for Wildfire Education Outreach	Entire planning area as well as adjacent areas	Create a mobile display to inform residents at public events about the dangers of living in the WUI.	Educate the public on the causes and effects of wildfire and what can be done to limit the impacts on private lands.	Project was implemented in July 2016
Manzano State Park Restoration Project	Manzano Mountain State Park	Reduce the density of the forest through hand cutting and chipping of the slash.	Protect the State park from catastrophic wildfire as well as provide protection for residents located downwind of the park, which include the town of Manzano.	Project was implemented in 2014-2015.
Deer Canyon WUI improvement	State Lands adjacent to Deer Canyon Preserve	Reduce the density of the Pinon-Juniper trees to reduce potential for wildfire moving into Deer Canyon.	Provided a 60 acre fuel break SW of Deer Canyon on State lands.	Project was implemented in 2015



Estancia Basin Watershed Health, Restoration, and Monitoring Project Area, July 2016.

Figure 1.2. **Map showing implemented and active planning projects within the District and Torrance County along the Manzano Mountains.**
Source: New Mexico Forest and Watershed Restoration Institute

1.2 OVERVIEW OF COMMUNITY WILDFIRE PROTECTION PLANS

Over the last two decades, large and severe wildfires have been making regular headline news across the southwestern United States, largely because of their associated tragic human and structural losses. Communities are increasingly moving into wildland areas, expanding what is termed the Wildland Urban Interface, and so the human impacts of wildfire have become ever more apparent. In order to mitigate these impacts, communities located in fire-prone environments need to have a plan to prepare for, reduce the risk of, and adapt to wildland fire events. Community Wildfire Protection Plans help accomplish these goals. A CWPP provides recommendations that are intended to reduce, but not eliminate, the extreme severity or risk of wildland fire.

In recognition of widespread declining forest health, in 2003 the U.S. Congress passed and President Bush signed into law the Healthy Forest Restoration Act (HFRA) (Public Law 108-148). The HFRA expedites the development and implementation of hazardous fuels-reduction projects on federal land and emphasizes the need for federal agencies to work collaboratively with communities. A key component of the HFRA is the development of CWPPs, which facilitate the collaboration between federal agencies and communities in order to develop hazardous fuels reduction projects and place priority on treatment areas identified by communities in a CWPP. A CWPP also allows communities to establish their own definition of the WUI, specifically suited for each plan. In addition, communities with an established CWPP will be given priority for funding of hazardous fuels reduction projects carried out in accordance with the HFRA.

Although the HFRA and the specific guidelines are new, the principles behind the CWPP program are not. The National and State Fire Plans, the Western Governors' Association *10-Year Comprehensive Strategy* (2006), and the Federal Emergency Management Agency (FEMA) Disaster Mitigation Act of 2000 all mandate community-based planning efforts with full stakeholder participation, coordination, project identification, prioritization, funding review, and multi-agency cooperation. In 2009, the U.S. Government Accountability Office (GAO) emphasized the need for a cohesive strategy in order to capitalize on the steps that had been made by federal agencies with respect to fire preparedness (GAO 2009). Despite these policy initiatives for fire prevention, federal funding for wildfire suppression has continued to rise, and the acres burned annually have also increased over the last 50 years (Gorte 2011). In 2009, Congress enacted the Federal Land Assistance, Management and Enhancement Act (FLAME) (Public Law 111-88) in order to insulate other agency programs for high wildfire suppression costs by creating a separate funding structure for emergency supplemental wildfire suppression efforts (Gorte 2011). FLAME identified the need for a cohesive strategy for the management of wildland fire. In March 2011, the U.S. Department of Agriculture (USDA) and U.S. Department of the Interior unveiled the National Cohesive Wildland Fire Management Strategy as a collaborative effort to identify, define, and address wildland fire management problems and opportunities for successful wildland fire management (Wildland Fire Leadership Council 2012). In June 2012, the second phase of this three-phase strategy was launched and focused on regional-level planning for the restoration of landscapes, building fire-adapted communities and effective, risk-based wildfire response. More information on Phase II of the strategy can be found at:

- http://www.forestsandrangelands.gov/strategy/documents/reports/phase2/CSPhaseIIReport_FINAL20120524.pdf

New Mexico State Forestry (NMSF) has statutory responsibilities for cooperation with federal, state, and local agencies in the development of systems and methods for the prevention, control, suppression, and use of prescribed fires on rural lands and within rural communities on all non-federal and non-municipal lands in the state (NMSA 1978, Section 68-2-8). As a result, NMSF is involved in the CWPP planning process. The New Mexico Fire Planning Task Force (NM-FPTF) was created in 2003 by New Mexico legislature to identify the WUI areas (Communities at Risk [CARs]) in the state that were most vulnerable to wildland fire danger. The NM-FPTF updates its CARs list annually and reviews completed CWPPs and approves those that are compliant with the HFRA. The *2015 Communities at Risk Plan* identified 688 CARs, which has more than doubled since this plan was adopted in 2008 when only 300 CARs were identified (NMSF 2015).

A CWPP provides background information about a project area, a discussion of CVARs, community base maps, a fire risk assessment, recommendations for identifying treatment areas to reduce fuels, recommendations for promoting education and awareness about wildland fires, and monitoring and assessment strategies. Collaboration between federal agencies and communities is necessary to develop hazardous fuels reduction projects and to place priority on treatment areas identified by communities in a CWPP.

Assessments of CVARs provide a measure of people, property, and natural and other resources that could suffer losses in a wildfire. Examples of CVARs may include housing, businesses, infrastructure (including utilities, trails, roads), natural resources (including wildlife), cultural resources, recreation areas and open space, scenic resources (including significant landscapes), and water resources. Those CVARs identified by community members strongly influence the recommendations and the risk assessment in a CWPP, and those identified for the CPCWPP are described in greater detail in Section 4.0.

Community base maps provide baseline information, such as the project boundary, areas at potential risk of wildland fire, areas containing critical human infrastructure (e.g., escape routes, water supply structures, power or communication lines), and the preliminary designation of the community's WUI zone. These maps are used to assess and make recommendations regarding protection and risk-reduction priorities. Key base maps are presented in the body of this section; other base maps can be found in Appendix A.

The risk assessment, an important part of a CWPP, has two components. One component uses geographic information system (GIS) and fire behavior modeling to identify areas that are at the greatest risk in the event of a wildland fire; this model is described here as a Composite Hazard/Risk Assessment and is discussed in detail in Section 4.0. Maps of the individual components of the risk assessment are helpful in visualizing the steps used in the model, as is presenting the modeling components separately so that the reader is able to see how the comprehensive model was created. The second component involves individual community hazard and risk assessments that identify hazards that could put each community at risk in the event of a wildland fire.

Implementation of recommendations for fuels treatment areas and public education and awareness is not required. However, if funding becomes available, the recommendations may be used as guidelines for the implementation process. The monitoring and assessment strategies for the CPCWPP are addressed in Section 5.0.

1.3 GOAL OF A COMMUNITY WILDFIRE PROTECTION PLAN

The goal of a CWPP is to enable local communities to improve their wildfire mitigation capacity while working with government agencies to identify high fire-risk areas and prioritize areas for mitigation, fire suppression, and emergency preparedness. The minimum requirements for a CWPP, as stated in the HFRA, are as follows:

1. **Collaboration:** Local and state government representatives, in consultation with federal agencies or other interested groups, must collaboratively develop a CWPP (Society of American Foresters [SAF] 2004).

2. **Prioritized Fuel Reduction:** A CWPP must identify and prioritize areas for hazardous fuels reduction and treatments, and, further, it must recommend the types and methods of treatment that will protect one or more at-risk communities and their essential infrastructures (SAF 2004).

3. **Treatments of Structural Ignitability:** A CWPP must recommend measures that communities and homeowners can take to reduce the ignitability of structures throughout the area addressed by the plan (SAF 2004).

The CPCWPP addresses all the requirements for completion of a CWPP outlined in the HFRA, paying special attention to the desires and needs of the communities and multiple jurisdictions throughout the planning area.

1.4 PLANNING PROCESS

The SAF, in collaboration with the National Association of Counties, the National Association of State Foresters, the Western Governors' Association, and the Communities Committee, developed a guide entitled *Preparing a Community Wildfire Protection Plan: A Handbook for Wildland-Urban Interface Communities* to provide communities with a clear process to use in developing a CWPP. The guide, available online at http://www.safnet.org/policyandpress/cwpphandbook.pdf, outlines eight steps for developing a CWPP and has been followed in preparing this CPCWPP. The eight recommended steps are as follows:

Step One: Convene Decision Makers. Form a Core Team made up of representatives from the appropriate local governments, local fire authorities, and state agencies responsible for forest management.

Step Two: Involve Federal Agencies. Identify and engage local representatives of the U.S. Forest Service (USFS) and the Bureau of Land Management (BLM). Contact and involve other land management agencies as appropriate.

Step Three: Engage Interested Parties. Contact and encourage active involvement in plan development from a broad range of interested organizations and stakeholders.

Step Four: Establish a Community Base Map. Work with partners to establish a baseline map (or maps) defining the community's WUI and showing inhabited areas at risk, forested areas that contain critical human infrastructure, and forest areas at risk for large-scale fire disturbance.

Step Five: Develop a Community Risk Assessment. Work with partners to develop a community risk assessment that considers fuel hazards; risk of wildfire occurrence; homes, businesses, and essential infrastructure at risk; other CVARs; and local preparedness capability. Rate the level of risk for each factor and incorporate this information into the base map(s) as appropriate.

Step Six: Establish Community Priorities and Recommendations. Use the base map(s) and community risk assessment to facilitate a collaborative community discussion that leads to the identification of local priorities for fuels treatment, structural ignitability reduction, and other issues of interest, such as improving fire response capability. Clearly indicate whether priority projects are directly related to protection of communities and essential infrastructure or to reducing wildfire risks to other community values.

Step Seven: Develop an Action Plan and Assessment Strategy. Consider developing a detailed implementation strategy to accompany the CWPP, as well as a monitoring plan that will ensure its long-term success.

Step Eight: Finalize Community Wildfire Protection Plan. Finalize the CWPP and communicate the results to community and key partners.

1.5 CORE TEAM

The first step for the update of the CPCWPP was to reconvene the broad group of stakeholders representing both agency and private interests that participated to form the first Core Team. Since a large number of jurisdictions are represented in this particular planning area, an extensive distribution list was developed to invite as many stakeholders to join the Core Team as possible. This included state and federal agency representatives; three Soil and Water Conservation Districts (SWCDs)—East Torrance, Edgewood, and Claunch-Pinto; and county and municipal fire department and emergency management personnel. Private landowners were also invited through the public outreach process; a number are members of the Core Team (please see Appendix B for a complete list). The CPCWPP was overseen by the District Manager, Dierdre Tarr, and the Torrance County Community Wildfire Protection Plan was overseen by the Torrance County Emergency Manager, Javier Sanchez. The first Core Team meeting was held on April 5, 2016. The second core team meeting was held on May 3, 2016, and final core team meeting will occur in August 2016. Average attendance at Core Team meetings was approximately 15 people.

1.6 PROJECT BOUNDARY

One of the first tasks of the Core Team was to establish the boundaries of the geographical area to be included in the CPCWPP. The Core Team decided that the planning area boundary would coincide with the District jurisdictional boundary, as was the case for the 2008 document (see Figure 1.1). This area encompasses parts of Torrance, Lincoln, Socorro, and Valencia Counties. Because of the varied landownership and cross-boundary nature of the District, involvement of all four counties was an important part of making sure the CPCWPP meets the needs of all stakeholders and jurisdictions.

1.7 PUBLIC INVOLVEMENT

1.7.1 SURVEYS

Project-specific surveys were developed with input from the Core Team and information from the previous survey. The surveys provided a tool to assess public opinion and to guide decision-making for the CPCWPP. Surveys regarding the CPCWPP were distributed by partners in paper format, but were also available online. Project partners used their websites to link to the survey as well as using listserves to reach a larger audience. Approximately 80 community members responded to the survey (Appendix C). Survey responses were compiled using SurveyMonkey (www.surveymonkey.com) which allows for rapid reporting of survey response statistics. The diverse responses about fire risk and mitigation options formed the basis for the recommendations and action items presented within the CPCWPP. Please see Appendix D for community comments received in the surveys and the overall results of all the survey questions.

2.0 BACKGROUND

2.1 LOCATION AND GEOGRAPHY

The CPCWPP boundary is defined by the boundary of the Claunch-Pinto Soil and Water Conservation District, which is located in the approximate center of New Mexico. The District encompasses the southern portion of Torrance County, the northeastern part of Socorro County, the northwestern part of Lincoln County, and the southern tip of Valencia County. The planning area includes multiple cities, towns, communities, roadways, and railroads. Towns and villages located in the District are Abo, Claunch, Corona, Manzano, Mountainair, and Punta de Agua. Overall, the District is highly rural with Mountainair being the largest municipality within the District. Private and state lands comprise 88% of the District. The remaining 12% is land administered by the USFS, the BLM, and the National Park Service (Figure 2.1).

The main transportation corridors through the planning area include U.S. Route 60, which runs east-west through the northwestern portion of the District and is intersected by State Highway 55, which runs north-south. U.S. Route 54 bisects the eastern corner of the District traveling southwest-northeast and is intersected by State Highway 42, which travels from the north-central part of the District to its southeastern edge.

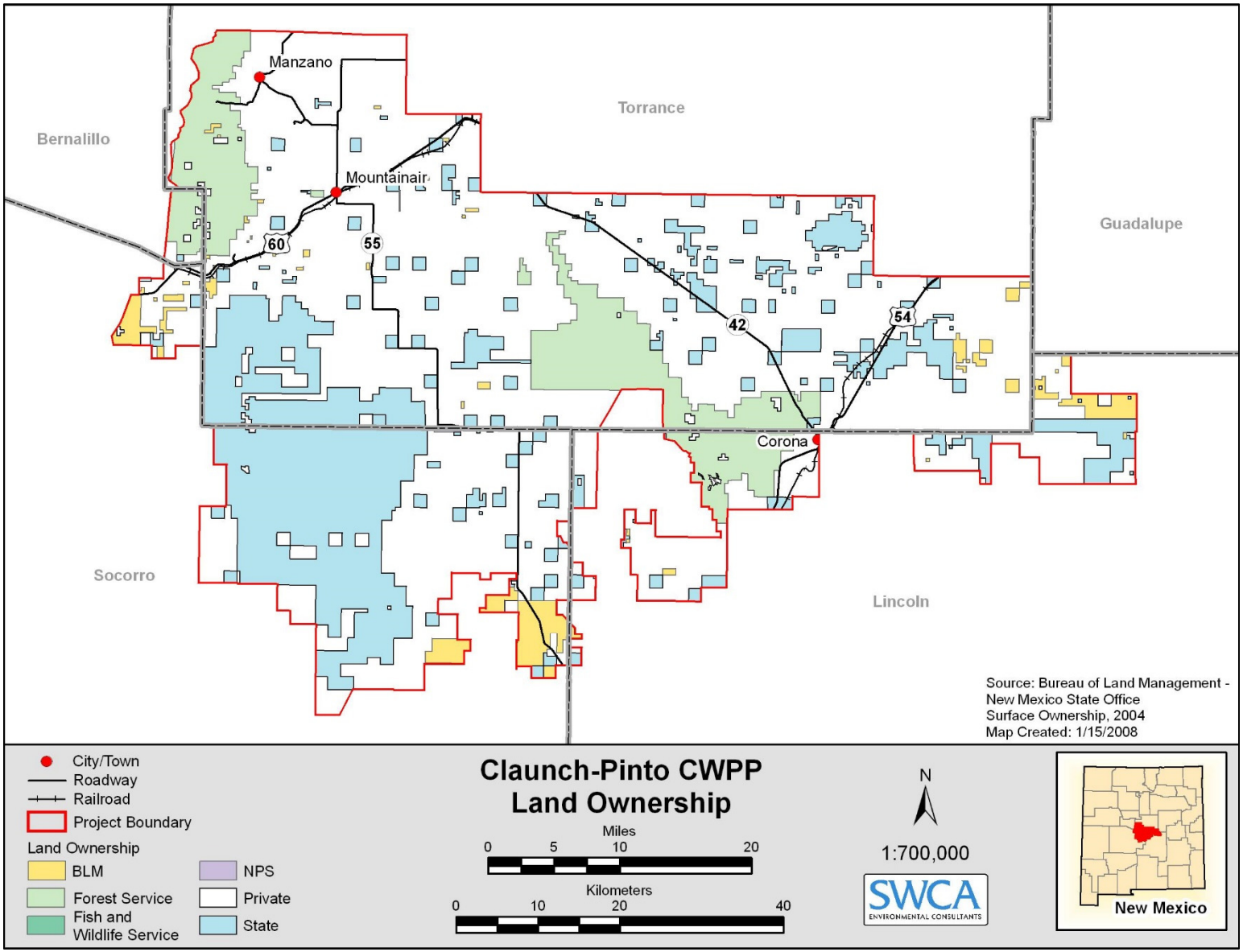


Figure 2.1. Land ownership in the CPCWPP area.

2.2 POPULATION

The largest town in the District is Mountainair, which had a population of 895 in 2013. All other towns throughout the District have populations of 165 or less (U.S. Census Bureau 2010). Populated areas within the District had housing densities that ranged from fewer than five housing units per square mile in the smaller, more rural communities to 530 housing units per square mile in the town of Mountainair (U.S. Census Bureau 2010). Overall, residential areas across the District are primarily rural.

Within the District, economic and employment statistics are somewhat variable, depending on the community and available employment opportunities. The State of New Mexico had an overall median household income of $44,927 in 2013. In 1999, the District's largest median household income was $28,594 in the town of Corona. In general, the range of median incomes in 2010 was from about $12,566 to $28,594. However, the majority of the communities within the District had annual median incomes ranging within $20,000 to $30,000 for 2010 (U.S. Census Bureau 2010).

2.3 HISTORY AND LAND USE

Human occupation within the District is believed to date from the transition period between the Late Pleistocene and Holocene periods about 7,000 years ago (Mid-Region Council of Governments [MRCOG] 2007). Most archaeologists believe that during this time, bands of mobile hunter-gatherers (Paleoindians) subsisted primarily on large game supported by the cooler, wetter environment of that era, but they would have collected wild plant foods as well (Wase et al. 2003). Near the beginning of the A.D. 1300s, pueblo cultures populated the Salinas Valley in the region. These pueblo communities may have developed from the earlier transient populations, settling permanently in the area (Ivey 1988). Pueblo communities used agriculture, constructed elaborate dwelling structures, and relied on persistent surface water resources. Between A.D. 1100 and 1500, a massive pueblo called Gran Quivira was used as an outpost of Anasazi civilization and was a busy trading center where traders bartered salt found within the area for buffalo meat and hides provided by the Plains Indians and woven cotton goods from the Rio Grande Pueblos (MRCOG 2007).

After initial explorations, the Spanish established a permanent settlement in New Mexico in 1598 and began to spread into many areas throughout the state (Scurlock 1998). In the 1600s, the Spanish began building missions at many of the large pueblos. Shortly after, years of drought, Apache attacks, and epidemics drove the pueblo people to the Rio Grande, and by the late 1600s, the pueblos in the Salinas Valley were deserted. Land uses such as logging, mining, irrigation, and livestock grazing began to increase significantly in the 1800s as Spanish settlement continued to expand across New Mexico. These land uses were further augmented by Anglo-American settlement in the late 1800s (Scurlock 1998).

Conservation districts were initiated in the 1930s when Congress enacted the Soil Conservation Act of 1935 to address concerns relating to soil erosion. This act directed the Secretary of Agriculture to establish the Soil Conservation Service to implement new soil conservation policies. The concept of conservation districts was developed to enlist the cooperation of landowners and occupiers in carrying out the programs authorized by the act. The Claunch-Pinto Soil and Water

Conservation District was organized on September 17, 1941, and part of the West Torrance District was further consolidated with the Claunch-Pinto District in 1967.

2.4 NEW MEXICO CLIMATE

New Mexico has a mild, arid to semiarid, continental climate characterized by abundant sunshine, light total precipitation, low relative humidity, and relatively large annual and diurnal temperature ranges. The Southwest region, including New Mexico, is located in the confluence of mid-latitude and subtropical circulation patterns that are coupled with orographic influences, which ultimately account for variable climatic conditions across the region (Sheppard et al. 2002). Overall climate regimes in the state typically consist of cyclical drought- or wet-year patterns that are driven by El Niño-Southern Oscillation. Understanding the effects of El Niño-Southern Oscillation and Pacific Decadal Oscillation on the climate of the region is important for planning fire management and mitigation activities because of their impact on precipitation, snow pack, and the subsequent influences on vegetation growth and fuel moistures (Swetnam and Betancourt 1990, 1998).

Across New Mexico, average hours of annual sunshine range from nearly 3,700 hours in the southwestern portions of the state to 2,800 hours in the north-central portions. July is generally the warmest month of the year for New Mexico, with average monthly maximum temperatures ranging from 90 degrees Fahrenheit (ºF) at lower elevations to 75°F to 80ºF at higher elevations. A preponderance of clear skies and generally low relative humidity permits rapid cooling after sundown, resulting in comfortable summer nights. Generally, January is the coldest month, with average daytime temperatures ranging from the mid 50sºF to the mid 30sºF. The frost-free season ranges from more than 200 days in the southern valleys to fewer than 80 days in the northern mountains, where some high mountain valleys have freezes in the summer months.

A wide variation in annual precipitation is characteristic of arid and semiarid climates. Generally, July and August are the wettest months of the year, accounting for 30% to 40% of the state's annual precipitation. Summer rains take place almost entirely as frequent, brief, and intense thunderstorms. The moisture associated with these storms originates in the Gulf of Mexico. Winter is the driest season in New Mexico, when precipitation is primarily a result of frontal activity associated with Pacific Ocean storms that move across the country from west to east. Much of this precipitation falls as snow in mountain areas. Wind speeds across New Mexico are usually moderate. However, relatively strong and unpredictable winds can accompany frontal activity during the late winter and spring. Wind direction is typically from the southwest.

Landscape-scale drought and above-average precipitation have historically occurred at irregular intervals and with varying degrees of intensity in the past, as documented by tree-ring and other data. A period of warm and notably wet climatic conditions that were preceded by a significant drought in the 1950s took place from 1976 to 1991 (Swetnam and Betancourt 1998). Severe and prolonged droughts on record have occurred once every century on average (Gray et al. 2003). Currently, New Mexico is experiencing its eighth year of drought, which is expected to continue indefinitely (New Mexico Drought Task Force 2006).

Climate change is well documented as affecting both global and local environments, and will likely have even more pronounced impacts for the foreseeable future. Recent key articles on changing Southwest and New Mexico climate by Gutzler (2013) and Llewellyn and Vaddey (2013) discuss

how the climate of the Southwest has been documented as becoming warmer and less predictable, and how drought is becoming more common and more severe than in the past. The average annual ambient temperatures for the Upper and Middle Rio Grande regions of New Mexico (Colorado border to Truth or Consequences, New Mexico) has increased from 1971 to 2012 by 1.4 degrees Celsius (°C) (2.5°F), and in mountainous areas that increase has been even greater at 1.5°C (2.7°F) (Llewellyn and Vaddey 2013). Winter temperatures (December, January, and February) have been warming by as much as 1.3°C (2.3°F) since 1970 (National Weather Service [NWS] 2015). Long-term episodic droughts have occurred in the Southwest region for centuries (Gutzler 2013), but the region is strongly affected by ongoing and projected century-scale climate change (Llewellyn and Vaddey 2013).

2.4.1 Claunch-Pinto Soil and Water Conservation District Climate

The climate within the District is mild, characterized by relatively light annual precipitation, a wide range of diurnal and annual temperatures, abundant sunshine, and low relative humidity, which combine to create arid to semiarid climatic conditions. Elevations in the Manzano Mountains above 9,000 feet are typically cooler and moister with a sub-humid climate regime. Differences in elevation and location within the District contribute to the divergent climatic regimes within the CWPP planning area. Variations in aspect and elevation add to the effects of climate on vegetation distribution and are a component in management considerations.

With the exception of the Manzano and Gallinas mountains, elevations do not vary much across the District; thus, mean annual temperature ranges do not vary significantly. Mean annual temperatures range from 51.3ºF in Corona to 53.4ºF at Gran Quivira (Table 2.1). In the summer months, daily temperatures may exceed 100ºF with the warmest temperatures generally occurring in June, before the onset of the monsoon thunderstorm season. Within the planning area, maximum mean annual temperatures range from 64.1ºF at Corona to 68.9ºF at Gran Quivira. Minimum annual temperatures range from 35.5ºF in Mountainair to 37.9ºF at Gran Quivira (see Table 2.1). Throughout the winter months, minimum temperatures below freezing are common, and the coldest temperatures generally occur in January. The average length of the frost season is October 1 to May 20.

Like most semiarid regions, the District experiences some variation in seasonal and annual precipitation. However, the mean annual precipitation is typically light and ranges from 14.2 inches in Mountainair to 17.0 inches at Corona. The maximum annual rainfall in the planning area has been recorded as high as 27.0 inches at Mountainair; however, Corona has the largest mean annual snowfall of 29.0 inches. Gran Quivira has the lowest minimum average annual precipitation at 6.3 inches (see Table 2.1). The largest quantity of precipitation occurs in July and August during monsoonal moisture patterns that produce high-intensity storms. These storms also generate intense lightning activity, which may result in multiple fire ignitions across a fire management district from one storm. The driest season is winter, with much of the precipitation falling as snow in the mountains and rain in the valleys.

Table 2.1. Summary of Climatic Data for Selected Weather Stations in the Claunch-Pinto Soil and Water Conservation District

Station	Elevation (feet)	Annual Temperature (°F)			Annual Precipitation (inches)				Period of Record
		Mean Annual	Max	Min	Mean Annual	Max	Min	Mean Snowfall	
Mountainair	6,500	51.5	67.5	35.5	14.2	27.0	6.8	24.2	1914–2012
Gran Quivira	6,600	53.4	68.9	38.0	15.2	25.5	6.3	21.4	1938–2015
Corona	6,600	51.3	64.1	38.5	17.0	23.8	9.2	29.0	1992–2015

Source: Western Regional Climate Center (2016).

2.5 TOPOGRAPHY

The District encompasses an area of approximately 1,291,779 acres with overall elevations ranging from approximately 6,000 feet to just over 10,000 feet. The largest percentage of the area is characterized by gently rolling, high plains topography with a narrow elevational range from approximately 6,000 to 6,900 feet. The Manzano and Gallinas Mountains account for most of the topographic relief in the District. The topography surrounding Corona is characterized by rough foothills at the foot of the mountain ranges.

The District is part of the valley known to geologists as the Great Estancia Basin, an ancient lakebed lying alongside the Manzano and Sandia Mountains. The lakes evaporated leaving salt beds, which became a resource for Native people and Spanish colonists (MRCOG 2007).

2.6 VEGETATION AND LAND COVER

2.6.1 CURRENT CONDITIONS

The majority of the vegetation within the District is composed of grassland communities with dispersed patches of shrublands and piñon-juniper woodlands that are encroaching on the native grasslands. Forested areas exist primarily in the Manzano Mountains and higher elevations. Vegetation types within the District are primarily a function of elevation, slope, aspect, substrate, and associated climatic regimes. Modified Southwestern Regional Gap Analysis Project land cover descriptions were used as the primary tool for evaluating the vegetated ecosystems within the CWPP project area (U.S. Geological Survey [USGS] 2006). Vegetative characteristics change over time; thus, historic vegetation conditions are discussed in a later section because they play a large role in historic fire regimes. Although a wide variety of different vegetative communities exists in the District, the dominant ecosystems are described below. The wildfires that occurred in 2007–2008 on the District have significant changed the vegetative communities over large parts of the burn scars within the Manzano Mountains. For example, the ponderosa pine forest that burned at a high severities during the Ojo Peak, Trigo and Big Springs fires have transitioned into an understory of shrubs, most of which are oak. However, within the fire perimeters ponderosa pine seedlings are becoming established and will eventually become part of the overstory. Due to these large fires including the recent Dog Head fire a majority of the Manzano Mountains are in a state of transition, but should recover to proper ecological functioning over time. There are still numerous areas that are in need of treatments in order to prevent future large fires from adversely impacting the area.

2.6.2 WESTERN GREAT PLAINS SHORTGRASS PRAIRIE

Western Great Plains Shortgrass Prairie occupies approximately 85% to 90% of the District. The vegetative structure of this community is characteristic of most shortgrass prairie ecosystems.

This vegetative system represents a large area of flat to rolling uplands along the western Great Plains in the rain shadow of the Rocky Mountains, and it ranges from the Nebraska panhandle south into New Mexico. Although historically overgrazed, these grassland areas still display relatively rich vegetative species diversity (USGS 2006), dominated or co-dominated by very drought-resistant perennial bunch grasses, such as blue grama (*Bouteloua gracilis*). Other graminoids associated with this system include sideoats grama (*B. curtipendula*), hairy grama (*B. hirsuta*), buffalograss (*Buchloe dactyloides*), needle and thread grass (*Hesperostipa comata*), purple three-awn (*Aristida purpurea*), prairie junegrass (*Koeleria macrantha*), western wheatgrass (*Pascopyrum smithii*), James' galleta grass (*Pleuraphis jamesii*), alkali sacaton (*Sporobolus airoides*), and sand dropseed (*S. cryptandrus*).

Mid-height grass species, such as needle and thread grass and sand dropseed, may be present in this ecosystem, especially in sandy soils, but are co-dominant to shortgrass species. Scattered shrubs and dwarf shrubs of sagebrush species (*Artemisia* spp.), spreading buckwheat (*Eriogonum effusum*), four-wing saltbush (*Atriplex canescens*), and broom snakeweed (*Gutierrezia sarothrae*) may also be present within this ecosystem. Big bluestem (*Andropogon gerardii*) and little bluestem (*Schizachyrium scoparium*) are also found along roadsides and drainages and could contribute to the fine fuel loading and fire risk along highways.

2.6.3 INTERMOUNTAIN BASINS MIXED SALT DESERT SCRUB

Shrub/Scrub-type habitats exist in patches throughout the District. The vegetative structure of these ecosystems is more complex than grassland ecosystems and has relatively sparse to continuous ground cover.

Vegetation within the mixed salt desert scrub community is characterized by open to moderately dense shrub cover composed of one or more saltbush species. Other shrub species that may be present include sagebrush species, yellow rabbitbrush (*Chrysothamnus viscidiflorus*), rubber rabbitbrush (*Ericameria nauseosus*), winterfat (*Krascheninnikovia lanata*), and broom snakeweed (*Gutierrezia sarothrae*). The herbaceous layer varies from sparse to moderately dense and includes species similar to those found in the intermountain basins grassland and shrub-steppe systems.

2.6.4 PIÑON-JUNIPER HABITAT

Piñon-juniper woodlands are commonly associated with the low mountains and plateau regions of north-central New Mexico. However, severe climatic events occurring during the growing season, such as drought and frost, are thought to limit the upper and lower ranges of this cover type. The canopy is dominated by piñon pine (*Pinus edulis*) and one-seed juniper (*Juniperus monosperma*). The understory associated with this land cover type is variable and may be dominated by shrubs or grasses, or may be absent. Common midstory shrubs in this ecosystem include sagebrush, mountain mahogany (*Cercocarpus montanus*), and scrub/Gambel oak (*Quercus gambelii*). Common understory herbaceous species are blue grama, Arizona fescue (*Festuca arizonica*), and James' galleta grass.

2.6.5 SOUTHERN ROCKY MOUNTAIN PONDEROSA PINE WOODLAND

This very widespread ecological system is most common throughout the Rocky Mountains. This woodland ecosystem occurs at the ecotone between grasslands or shrublands and more mesic coniferous forests. This ecosystem can be found on all slopes and aspects; however, it is most common on moderately steep to very steep slopes and ridge tops. Ponderosa pine (*Pinus ponderosa*) is the predominant conifer. Douglas-fir (*Pseudotsuga menziesii*), piñon pine, and juniper species may also be present in the canopy. Many dense even-aged stands reflect a history of heavy logging in this cover type, which increases the potential for stand replacing fire in this area.

The understory shrubs, although somewhat limited due to the ever-increasing canopy cover, consist of big sagebrush (*Artemisia tridentata*), mountain mahogany, scrub oak, western snowberry (*Symphoricarpos occidentalis*), Wood's rose (*Rosa woodsii*), and kinnikinnick (*Arctostaphylos uva-ursi*). Common herbaceous understory components include species of needle and thread grass, fescue (*Festuca* spp.), muhly (*Muhlenbergia capillaries*), and grama (*Bouteloua* spp.).

2.6.6 HIGH MONTANE AND SUBALPINE MIXED CONIFER

This high-elevation environment is located mostly above 9,000 feet but also occurs on steeper north-facing slopes as low as 7,500 feet and consists primarily of Rocky Mountain mixed conifer forest and woodland and Southern Rocky Mountain montane/subalpine grassland vegetative communities.

This habitat type is found at locations within the Manzano and Sandia Mountains at elevations ranging from 7,500 to 10,500 feet. Because this habitat type occurs over such a wide elevation range, this ecological association is highly variable, depending especially on temperature and moisture relationships. At the lower end of the elevation range, the mixed conifer forest and woodland is found on the steep, cool, north-facing slopes, while in the upper elevations it occurs on both north- and south-facing slopes. Douglas-fir and white fir (*Abies concolor*) are the most common canopy dominants, but blue spruce (*Picea pungens*), Engelmann spruce (*Picea engelmannii*), and ponderosa pine may also be present. This ecosystem includes patches of mixed conifer and aspen (*Populus tremuloides*) stands. Many cold-deciduous shrub species are common in the understory, including kinnikinnick, Oregon grape (*Mahonia repens*), snowberry (*Symphoricarpos* spp.), Gambel oak, Oregon boxleaf (*Paxistima myrsinites*), and common juniper (*Juniperus communis*). Herbaceous species may include Arizona fescue (*Festuca arizonica*), sedges (*Carex* spp.), bluebunch wheatgrass (*Pseudoroegneria spicata*), and meadow rue (*Thalictrum* spp.). Naturally occurring fires are of variable return intervals, but are typically infrequent due to cool, moist conditions of this habitat type.

2.6.7 SOUTHERN ROCKY MOUNTAIN MONTANE/SUBALPINE GRASSLANDS

Southern Rocky Mountain montane/subalpine grassland habitats are scattered throughout the high-elevation, south-facing slopes and plateaus within the Manzano and Sandia Mountains. Soils in these areas resemble prairie soils, in that they are well drained and relatively high in organic matter with a dark brown A-horizon. These areas typically support two to three dominant bunch grasses, including Arizona fescue, timber oatgrass (*Danthonia intermedia*), mountain muhly (*Muhlenbergia montana*), blue grama, and bluebunch wheatgrass (*Pseudoroegneria spicata*).

2.6.8 Riparian Areas

Limited perennial water courses exist in the planning area with most areas dominated by run-off from flashy monsoons. Riparian woodlands do exist along the flood zones of arroyos and lakes and ponds. This vegetation type consists primarily of cottonwood species (*Populus* spp.), willow (*Salix* spp.), saltcedar (*Tamarix* spp.), Russian olive (*Elaeagnus angustifolia*), and a variety of other riparian species.

2.6.9 Other Land Cover Types

Developed and Agricultural Land Cover

Scattered areas throughout the District consist of agricultural land and developed areas (e.g., cities, towns, communities, parks, etc.). Agricultural areas are typically areas that have vegetation planted for livestock grazing and/or are used for hay or seed crops, areas being used for cropland production, or land that is actively tilled. Developed areas include all locales that contain human developments that account for greater than 20% of the total land cover. Much of the District maintains its original rural nature (Figure 2.2).

Figure 2.2. Rural nature of the Claunch-Pinto Soil and Water Conservation District.

Sparsely Vegetated or Barren Cover Types

Sparsely vegetated or barren areas are also scattered throughout the District, but they do not account for much acreage. These areas include rocky outcrops, cliffs, stabilized dunes, volcanic rock lands, and warm desert washes or playas. Vegetative cover in these environments is generally less than 10% of the ground cover.

2.7 HISTORICAL CONDITIONS

Much of the current vegetation, dominant species, and percentage of cover throughout the District is not representative of historical vegetative conditions. Shifts have occurred in the distribution of vegetative communities and alterations of vegetation from native to non-native species. Vegetation changes may be due to natural influences, such as disturbances or shifts in climate regimes, or they may be the result of human influences. Areas typically undergo natural succession following disturbances, including wildfires, rockslides, insect infestation and disease, or avalanches. Human-induced change in ecosystems is typically caused by overgrazing of herbaceous vegetation, logging, wildfire suppression, hydrologic alteration, chaining, and farming. In the early 1900s, a stretch of favorable weather in the Estancia Valley fueled a dry-land farming boom that effectively ended during the drought of the 1950s. Farming pinto beans, a crop that thrived on dry-land farming techniques, was so productive that Mountainair proclaimed itself to be the "Pinto Bean Capital of the World."

The quaking aspen stands in the high elevations of the District probably appeared following disturbances such as a wildfire. These areas are of particular management concern because of their inferior health, but they have relatively important wildlife value. Aspen trees require full sunlight to develop and will thrive until they reach 50 to 60 years old. Many of the aspen stands within the area are now growing in the shade of coniferous species, which are becoming a dominant component of the tree canopy. Aspen stands begin to decline when they are no longer in full sunlight. Aspen stands are typically one genetic individual with the same root system (clone). In order to stimulate resprouting from the clone's root system, a disturbance such as fire that kills the above-ground portion of the tree and opens the canopy is required.

2.7.1 HISTORICAL CONDITIONS AND PRESENT CHANGES IN FIRE-ADAPTED ECOSYSTEMS

Fire has played an important role in many ecosystems in the Southwest, but the frequency of this important disturbance mechanism has been highly variable. Tree-ring dating (dendrochronology) has shown that, in historical times, ponderosa pine forests burned every 7 to 10 years, grasslands every 5 to 10 years, spruce-fir greater than 100 years and piñon-juniper from 300 to 400 years (Baker and Shinneman 2004; Romme et al. 2007). These fires were ignited by both humans and lightning. A major shift occurred around the turn of the twentieth century, when land management policies began to require the immediate response and full suppression of wildfires. Ranchers and farmers feared the loss of pasture and agricultural lands, and forest fires threatened homes and timber resources. By the 1940s, improved firefighting equipment and increased manpower had effectively eliminated most wildfires. The unforeseen consequences of excessive fuel buildups and vegetation type conversions across much of the western United States are, in part, the result of decades of successful fire-suppression activities. This effect has been most pronounced in forest types that would have historically undergone frequent low-intensity fire (Allen et al. 2002).

Many different vegetation communities have been converted from their historical conditions. Grasslands cover most areas in the District from approximately 6,000 to 7,000 feet in elevation. These ecosystems contained native bunch grasses, such as various grama species. In some areas, current conditions have been altered by past and continuous intensive grazing and farming practices, which have denuded native grasslands. They now exist in sparse, patchy stands and are

encroached upon by juniper trees, shrubs, and cholla (*Opuntia imbricata*). Prior to European settlement, lightning-caused fires and fires ignited by various Native American groups were common and removed encroaching shrubs, forbs, and trees, and promoted vigorous grassland vegetation (Scurlock 1998). Juniper savannas and piñon-juniper woodlands have also changed over time and have expanded above their historical range and densities as a result of livestock grazing, fire suppression, and climatic variation (Allen and Breshears 1998; Swetnam et al. 1999).

Ponderosa pine communities have exhibited significant differences from historical conditions that were described as much more open and park-like with frequent, low-severity fires maintaining this structure (Covington and Moore 1994). Currently, southwestern ponderosa pine forests have developed sharp increases in tree density, understory growth, and fuel buildup, which have contributed to recent high-intensity crown fires (Covington and Moore 1994). As these systems burn they are transitioning into shrub lands, with oak species dominating the coverage.

2.7.2 Non-native and Invasive Species

Non-native plant species and noxious weeds should be addressed in fuels reduction programs, and attention should be given to using practices that limit their spread and establishment. Some non-native plant species have adapted to fire regimes within the Southwest and are capable of out-competing most native species in the post-fire environment. These species also typically cause dramatic changes in the fire regime, thus changing entire plant communities.

A non-native and invasive species that is causing great concern in the region is saltcedar (*Tamarix* spp.). Saltcedar, also referred to as tamarisk, is common in riparian areas in the Southwest. Campbell and Dick-Peddie (1964) reported that saltcedar did not occur in areas with a dense cottonwood overstory, but was found only on adjacent disturbed sites. Since the time of that publication, several cottonwood-dominated riparian communities have been described as having saltcedar occurring at varying densities in the subcanopy (Ellis 2001).

Once established, saltcedar can obtain water at deeper groundwater elevations and has higher water-use efficiency than native riparian trees in both mature and post-fire communities (Busch 1995; Busch and Smith 1993). One of the major competitive advantages of saltcedar is its ability to sprout from the root crown following fire or other disturbances (e.g., flood, herbicides) that kill or severely injure aboveground portions of the plant (Brotherson and Field 1987; Brotherson and Winkel 1986; Smith et al. 1998). Saltcedar flammability increases with the buildup of dead and senescent woody material within the dense bases of the plant (Busch 1995). It can also contribute to increased canopy density, which creates volatile fuel ladders and increases the likelihood of wildfire (Smith et al. 1998). Other non-native species, such as Russian olive (*Elaeagnus angustifolia*), may be common in riparian areas, and they have created similar problems to those created by saltcedar.

Saltcedar, Russian olive, and Scotch thistle all are on the State list of noxious weeds for New Mexico.

2.8 INSECTS AND DISEASE

2.8.1 INSECTS

Native insect epidemics within plant communities are usually part of a natural disturbance cycle similar to wildfire. They are often cyclic in nature and are usually followed by the natural succession of vegetation over time. Of primary interest are those that attack tree species because of the implications for fire management.

Present-day insect epidemics in forests are more extensive than they have been in the past (Kurz et al. 2008). This may be a result of drought-related stress and/or to faster completion of insect life cycles due to warmer climate regimes. Stands of trees that have been killed by insects have varying degrees of fire danger associated with them depending on the time lapse following an insect attack and structure of the dead fuels that remain. However, forests with a large degree of mortality following an insect attack may have the potential to experience extremely high fire danger, especially if a large degree of needle cover remains in the canopy.

Insects that have infested or have the potential to infect the forests within and around the CPCWPP planning area are discussed below. In recent years since the initial document was adopted in 2008 there have been several outbreaks of bark beetles that have adversely impacted a large number of piñon stands throughout the planning area (Figure 2.3).

For the past two decades, Southwest forests and woodlands have been subjected to increased drought, insect infestation, and disease, which have resulted in a decline in forest health (Clifford et al. 2008; Shaw 2008). Mortality from drought and bark beetle infestation of ponderosa pine, piñon/juniper, and other forest and woodland species throughout the Southwest region increased dramatically between 2000 and 2003 (Zausen et al. 2005). Piñon pine was especially affected, with over 1.9 million acres (774,771 hectares) of piñon across New Mexico and Arizona showing evidence of bark beetle attack by 2003 (Figure 2.3). Some areas experienced greater than 90% piñon mortality (Gaylord et al. 2013), while juniper mortality was significantly lower. Piñon mortality was largely a result of the piñon ips bark beetle (*Ips confuses*), which generally attacks water-stressed or recently dead trees (Raffa et al. 2008; Rogers 1995). A plethora of recent research has focused on the effects that restoration treatments have on the species resistance/susceptibility to bark beetles in ponderosa pine forests (Gaylord 2014).

Figure 2.3. Dead stands of Piñon pine within the planning area and result of insects and disease leading to an increase in wildfire danger within the WUI.

Bark Beetles (Ips Beetles) (*Ips* spp. and *Dendroctonus* spp.). *Ips* beetles, also called engraver beetles, are native insects to North American forests. They attack ponderosa and piñon pines as well as other conifers and are responsible for the huge piñon die-off within the CPCWPP area over the last several years. *Dendroctonus* beetles attack medium to large ponderosa pines, blue spruce, Engelmann spruce, and Douglas firs. Each of these species creates egg galleries, which are distinct to that species in form and shape, which eventually girdle the infected tree. The natural defense of a healthy, rigorous tree is to *pitch out*, or excrete sap into the beetle entrance holes, covering it with sap and killing the invader. Trees are most likely to be successful at this strategy when they are not stressed by competition as a result of high tree density or drought. Once a tree has been colonized, it cannot be stopped.

Twig Beetle (*Pityophthorus* spp.). Twig beetles frequently attack piñon pines, as well as other conifers and occasionally spruce. High populations of this poorly understood native beetle develop in drought-stressed and otherwise injured trees. Breeding is restricted to twigs and small branches. Fading branches throughout the crown and tan sawdust around the attack site can identify trees attacked by the twig beetle. Hand pruning and vigorous watering can sometimes control attacks.

Piñon Needle Scale (Scale) (*Matsucoccus acalyptus*). Scale is a native insect that has the appearance of small black, bean-shaped spots on the piñon pine needles during outbreaks. Scale feeds on the sap of piñon pine needles, damaging cells and leading to decreased vigor, needle drop and dieback, and increased susceptibility to other insects or disease. Sometimes small trees are killed by repeated attacks, and larger trees are weakened to such an extent that they fall victim to attack by bark beetles. Repeated, heavy-scale infestations leave trees with only a few needles alive

at the tips of the branches. Destroying the eggs before they hatch can greatly reduce potential damage.

Piñon Spindle Gall Midge (Midge) (*Pinyonia edulicola*). Midges produce a spindle-shaped swelling from the needle base that is about 0.5 inch long. This insect is a common parasitic insect that rarely causes serious damage. Control is usually not necessary.

Piñon Needle Miners (Needle Miners) (*Coleotechnites edulicola*, *C. ponderosae*). Needle miners are locally common on piñon and ponderosa pines. The various species resemble one another in appearance and damage but have different life cycles. Damage first becomes evident as foliage browns. Closer examination reveals hollowed-out needles. Early needle drop, reduced growth, and tree mortality can result from needle miner infestation. Trees normally recover from needle miner damage without suffering serious injury, but the current drought may alter this.

Roundheaded and Flatheaded Wood Borers (Family Cerambycidae and Family Buprestidae). Roundheaded and flatheaded wood borers attack recently cut, dead, or dying trees and often create complex tunnel systems. Roundheaded borers are the most destructive and tunnel deep into the wood. Freshly cut logs in the woods or firewood stored at a home are common infestation sources. These borers are most prominent after a wildfire. They may also spread into vigas in homes.

Juniper Borers (*Callidium* spp.). Several juniper borers aggressively attack drought-stressed junipers throughout their range. Damage can be extensive before symptoms are apparent. Usually a large portion of the tree or the entire tree dies before the insects' exit holes are noticed. Larvae bore beneath the bark, making galleries and tunneling deep into the wood to complete their life cycle over the course of the winter. Juniper borer damage has been frequently noticed in some larger junipers around homes.

Tiger Moth (*Halisidota argentata*). Tiger moth caterpillars are one of the most common defoliators throughout the West. The species typically selects only a few host trees within an area, and the impacts are thus generally limited. Tiger moth caterpillars defoliate host trees, and while the appearance may seem severe, the damage is generally nonlethal. Host species for tiger moth caterpillars include Douglas fir, true fir, spruce, and pine, all of which exist in the higher plateau and mountain range elevations surrounding the planning area.

2.8.2 DISEASES

Diseases of trees, such as parasitic plants, fungi, and bacteria, can also affect forests in the CPCWPP planning area. These diseases impact forest systems by degrading the productivity and health of the forest. Some of the more common forest diseases that are found in the District are described below. Trees that are killed by disease have the similar potential to increase fire hazards.

Mistletoe (*Arceuthobium* spp., *Phoradendron* spp.). Both dwarf and true mistletoe are common in the project area. Mistletoes are parasitic plants that gradually degrade tree vigor and may eventually kill their hosts over a long period of time following further infestation. Essential water and nutrients within the host are used by the mistletoe, thus depriving the host of needed food. Dwarf mistletoe is found on juniper, piñon pines, ponderosa pines, and firs. It is host-specific (i.e., the species that infects piñon does not infect other trees). True mistletoe is common on junipers in the Southwest. Both types of mistletoe spread from tree to tree and are difficult to control. Dwarf

mistletoe spreads its seed by shooting berries; true mistletoe seeds are spread by birds. In residential areas, pruning can sometimes be effective on smaller trees. Heavy infestations in large trees can be controlled only by cutting down the trees and removing them to stop the spread of the mistletoe to other trees nearby.

Fir Broom Rust (*Melampsorella caryophyllacearum*). Fir broom rust is a species of fungus that has a broom appearance in the tree canopy. Fir broom rust is primarily a forest problem on white firs at higher elevations. A species also infects Engelmann spruce, but it is less common. These infections cause growth loss, top kill, and eventually tree mortality. Both species require alternate hosts to complete their life cycle. No chemical or biological control exists for fir broom rusts.

Needle Cast (*Elytroderma deformans*). Needle cast affects piñon and ponderosa pines. This disease can be damaging because it invades twigs and needles and persists for several years. Symptoms appear in the spring when all the year-old needles turn brown 6–12 mm from the needle base. Incidence of this disease is minimal in the project area.

White Pine Blister Rust (*Cronartium ribicola*). White pine blister rust is a non-native disease caused by a fungus that first arrived in America in the early twentieth century from Asia and Europe. The complex life history of the fungus ultimately results in a lethal infestation of the host tree. The branch and stem canker that result from infestation can result in top-kill, branch die-back, and eventually tree mortality.

3.0 FIRE ENVIRONMENT

3.1 WILDLAND URBAN INTERFACE

The Wildland Urban Interface is defined as those areas where human habitation and development meet or are intermixed with wildland fuels (U.S. Department of the Interior and USDA 2001:752–753). This intermix is prevalent throughout the County and the District. What had been a small WUI historically is now growing as residential development in the area increases. Expansion, land management decisions, and the preference of homeowners to live outside of city limits have resulted in rapid development across the landscape into natural, wildland areas that inherently have associated wildfire risks. Human encroachment into wildland ecosystems in recent decades is increasing the extent of the WUI and is therefore having a significant influence on wildland fire management practices within these areas (Figure 3.1). One example of the expansion of the WUI in the District is the new development of Deer Canyon Preserve south of Mountainair, which offers 20-acre homesites in the piñon-juniper woodlands. New developments vary widely in size. In many of these areas, lots sizes may only be 1 acre.

Figure 3.1. Development in the WUI near Corona.

The WUI creates an environment in which fire can move readily between structural and vegetative fuels, increasing the potential for wildland fire ignitions and the corresponding otential loss of life and property (Figure 3.2). The expansion of the WUI into areas with high fire risks, combined with the collective effects of past management policies and resource management practices, changing land use patterns, prolonged periods of drought, and the introduction of non-native species, have created an urgent need to modify fire management practices and policies and to understand and manage fire risk effectively in the WUI (Pyne 2001; Stephens and Ruth 2005). Where fuels and fire management mitigation techniques have been strategically planned and implemented in WUI areas, it has proven to be effective; however, all WUI mitigation focus areas will be different and should be planned for accordingly.

Figure 3.2. Typical WUI zone in the District.

A CWPP offers the opportunity for collaboration between land managers to establish a definition and a boundary for the local WUI to better understand the specific resources, fuels, topography, and climatic and structural characteristics of the area, as well as to prioritize and plan fuels treatments to mitigate for fire risks. At least 50% of all funds appropriated for projects under HFRA must be used within the WUI area.

The Core Team in 2008 initially defined the WUI boundary within the CPCWPP planning area as a 0.5-mile buffer extending from the edge of communities, critical infrastructure, cultural values, and railroads (Figure 3.3). A 1-mile buffer was created around major roads because roads are seen as a major ignition source as well as critical for evacuation routes. The WUI boundary was later expanded by the Core Team to encompass additional areas of hazardous fuels and populated areas that neighbor national forest land (see Figure 3.3). The Core Team wanted to ensure that the WUI area was sufficient to enable funds to be appropriated for the protection of communities of any size, particularly adjacent to public lands. The Core Team decide to keep the WUI boundaries the same for this update. For all WUI areas, priority should be placed upon treatments most likely to

protect life and property. Map 1 in Appendix A shows critical infrastructure throughout the planning area. Critical infrastructure is described as infrastructure (including hospitals, schools, utilities, communications, bridges, etc.) that should be protected within the WUI zone in the event of a wildland fire. Because of the in-holdings throughout the National Forest and the results of the risk assessment (Section 4.3.2), the Core Team agreed to draw the WUI broadly west of Highway 55 to the District boundary. The Core Team understands that this CWPP definition will supersede the default definition under the HFRA. The Core Team was in favor of the WUI definition, since a strict HFRA definition would exclude non-municipal communities from the WUI, including those impacted by recent wildfires in Torrance County.

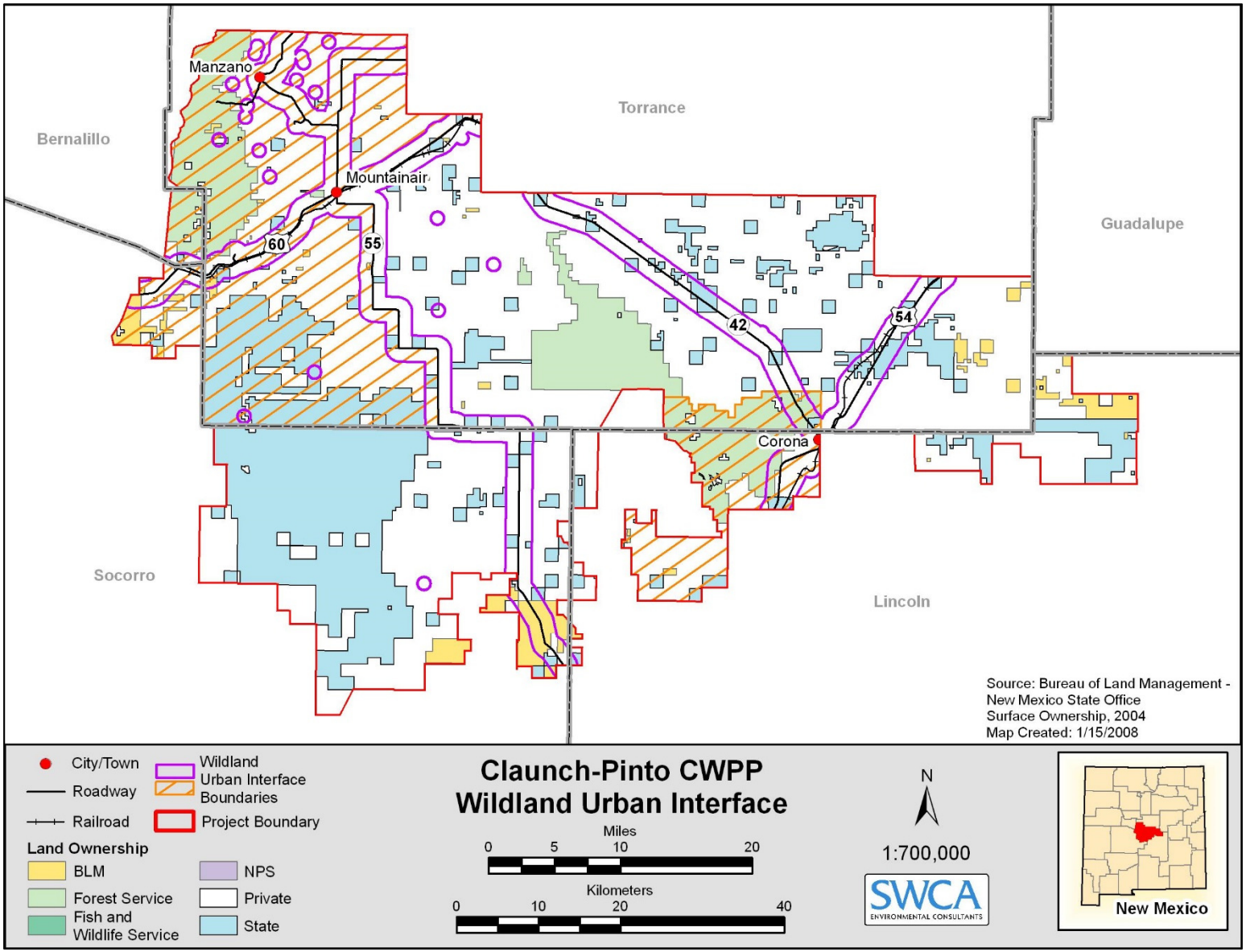


Figure 3.3. Wildland Urban Interface map for the District.

3.2 FIRE HISTORY

3.2.1 FIRE AND NATIVE PEOPLES

Prior to European settlement, Native Americans used fire as a tool to open land for agricultural, hunting, or travel; to drive game for hunting; to promote desirable post-fire herbaceous vegetation; or to manage the land for habitat protection and resource use (Scurlock 1998). As a result, human-caused fires are considered one component of the historical fire regime in the Southwest.

Research has indicated that these burning activities were focused around areas that were inhabited and took place primarily in localized regions during certain time periods across the Southwest; however, the specific influence that Native Americans had on historical fire regimes remains uncertain (Kaye and Swetnam 1999).

3.2.2 PAST FIRE MANAGEMENT POLICIES AND LAND MANAGEMENT ACTIONS

A number of factors have combined over the last 120 years to change forest structure, understory and overstory composition, fuel biomass conditions, and historical fire regimes (Cram et al. 2006). Increased settlement, logging practices (Cooper 1960; Schubert 1974), and heavy grazing (Baker and Shinneman 2004) have all been identified as contributing factors (Cram et al. 2006; Kaye and Swetnam 1999). Some species of non-native vegetation were also introduced during that time period and eventually invaded many native landscapes across the West, subsequently altering natural fire-disturbance processes.

Beginning in the early 1900s, the policy for handling wildland fire leaned heavily toward suppression. Over the years other agencies, such as the BLM, the Bureau of Indian Affairs (BIA), and the National Park Service, have followed the lead of the USFS and adopted fire suppression as the proper means for protecting the nation from wildfire. As a result, many areas now have excessive fuel buildups, dense and continuous vegetative cover, and tree and shrub encroachment into open grasslands, which has resulted to a shift over the past decade to reintroduce fire to the landscape through prescribed burning and the management of wildfires. The use of fire on the landscape can help with the restoration of the natural fire regime.

3.2.3 HISTORICAL DISTURBANCE REGIMES AND CURRENT FIRE CONDITIONS IN THE CWPP AREA

Ponderosa Pine Forest

In a study of the Manzano Mountains, Baisan and Swetnam (1997) found that in the late eighteenth to early nineteenth centuries, the mean fire-return interval (FRI) for this area (around Capilla Peak and Canyon de Turrieta), as recorded in tree-ring surveys, was 7.4 years. From the synchrony and spatial pattern of scarred trees on these ponderosa pine and dry mixed-conifer sites, the authors hypothesized that the fires were largely surface fires covering large areas. Generally, estimates of FRI in ponderosa pine forests range from a minimum of about 2 years to a maximum of nearly 40 years, and many agree that fires were frequent and generally of low severity (Cooper 1960; Covington and Moore 1994; Richardson 1998); according to Cooper (1960), crown fires were not a component of the historical fire regime. The majority of fires occurred in late spring and early summer, before the onset of the summer monsoons (Hunter et al. 2007). Local deviations from

this general rule are also recorded (Hunter et al. 2007) and on a landscape scale, a mixture of open woodlands, meadows, and more dense forests are typical of this forest type (Savage 1991). The effects of fire exclusion on forest structure are thought to be most profound in forests that previously sustained frequent, low-intensity surface fires (Westerling et al. 2006), and it is likely that fire exclusion was a primary cause of departure from historical conditions in ponderosa pine forests. For the most part, frequent fire consumed fuels on the ground surface and culled young trees to maintain an uneven age distribution and mosaic pattern throughout the forest (Allen et al. 2002). Frequent fire disturbance maintained an open, park-like forest structure with canopy openings and an abundant herbaceous and shrubby understory (Biswell 1973; Cooper 1960; Weaver 1947).

A number of recent large fires within the Southwest and the planning area have begun to change the landscape across the ponderosa pine forest. These fires have caused these ecosystems to shift to a forest that is consistent of more sprouting species. Climate change is also playing a large role in how these ecosystems respond following disturbance.

Mixed Conifer/Spruce-fir Forests

Often forest patches affected by low- and high-severity fire are closely juxtaposed in a transition zone made up of a forest type known as mixed conifer (Fulé et al. 2003). Fire histories in mixed conifer forests vary with forest composition, landscape characteristics, and human intervention, but tend to exhibit mixed-severity fire regimes, with both low-intensity surface fires and patchy crown fires (Touchan et al. 1996). Mixed-severity fire regimes are the most complex fire regimes in the western United States (Agee 1998) because of their extreme variability (Agee 2004). A mixed-severity fire regime exists where the typical fire, or combination of fires over time, results in a complex mix of patches of different severity, including unburned, low severity, moderate severity, and high severity (Agee 2004).

Ponderosa pine was once co-dominant in many mixed conifer forests with relatively open stand structures, but fire suppression has allowed the development of dense sapling understories, with regeneration dominated by the more fire-sensitive Douglas fir, white fir, and Engelmann spruce. Forest stand inventory data from Arizona and New Mexico show an 81% increase in the area of mixed conifer forests between 1962 and 1986 (Fitzhugh et al. 1987; Johnson 1994). Herbaceous understories have been reduced by denser canopies and needle litter, and nutrient cycles have been disrupted. Heavy surface fuels and a vertically continuous ladder of dead branches have developed, resulting in increased risks of crown fires (Touchan et al. 1996).

Spruce-fir forests that occur at higher elevations in the District exhibit high densities (782–1,382 trees/acre), high basal areas (28–39 square meters per hectare [m²/ha]), continuous canopy cover (52%–61%), and increased woody debris (28–39 m²/ha). These forest characteristics naturally support high-intensity and severe, stand-replacing fires (Fulé et al. 2003) and an infrequent fire regime. Approximately 80% or more of the aboveground vegetation is either consumed or dies as a result of such fire.

Grasslands

Many authors have suggested that the historical fire-return intervals for grasslands throughout the seventeenth to early nineteenth centuries are thought to have been every 5–10 years (Leopold 1924; McPherson 1995; Swetnam et al. 1992). Fire-suppression policies may have contributed to declining fire frequency in this cover type as well, but other interacting factors may have contributed as well. Intensive livestock grazing around the time of the Civil War is thought to have been responsible for a decline in grassland fires (West 1984). Heavy grazing reduced the fuel available to propagate fire spread and also reduced competition with herbaceous plants, tipping the balance in favor of the woody species. Woodland encroachment, increased tree density, and altered fire behavior characterize many former grasslands of the Southwest. Once woody plants become dominant, their long life spans and their ability to extract both shallow and deep soil moisture can maintain a woodland condition indefinitely (Burgess 1995). Frequent fire plays a significant role in grassland nutrient cycling and successional processes, and long-term exclusion may produce irreversible changes in ecosystem structure and function (McPherson 1995).

Piñon-juniper Woodlands

One of most common vegetative communities in the CPCWPP WUI area is piñon-juniper woodland. These woodlands are some of the most poorly understood ecosystems in terms of fire regimes, but recent research suggests that fire may have been a less-common and less-important disturbance agent in piñon-juniper woodlands as compared with adjacent ponderosa pine and grassland ecosystems. In a recent review of piñon-juniper disturbance regimes, Romme et al. (2007) subdivided the piñon-juniper cover type into three subtypes: areas of potential woodland expansion and contraction, piñon-juniper savannas, and persistent woodlands. These categories are helpful in separating the broad piñon-juniper cover type into distinct communities that are subject to different climatic, topographic, and disturbance conditions.

As mentioned previously, many grasslands in the Southwest have been colonized by trees as a result of a complex interplay of environmental factors. The issue of woodland encroachment into grasslands goes hand in hand with the assessment of historical conditions of the woodlands. Areas of potential expansion and contraction are those zones wherein the boundaries of the piñon-juniper ecotones have shifted. These shifting boundaries have been widely documented (e.g., Gottfried 2004), but the historical condition of the ecosystem may be relative to the time scale of evaluation. Betancourt (1987) has suggested that the changing distribution patterns seen in the last century may be part of larger trends that have occurred over millennia and not the result of land use changes. Overall, it is believed that greater landscape heterogeneity existed previously in many of these areas that are now uniformly covered with relatively young trees (Romme et al. 2007).

Piñon-juniper savannas are found on lower elevation sites with deep soils where most of precipitation comes during the summer monsoon season. Juniper savanna, the most common savanna in New Mexico, consists of widely scattered trees in a grass matrix (Dick-Peddie 1993). Similar to grasslands, the range of savannas has decreased as tree density has increased, but the mechanisms for the tree expansion are complex and the subject of current research. Significant scientific debate currently exists over the natural FRI for savannas, but most experts agree that fire was more frequent in savannas than in persistent woodlands.

Persistent woodlands, characteristic of rugged upland sites with shallow, coarse soils tend to have older and denser trees. Herbaceous vegetation within this community is typically sparse, even in the absence of heavy livestock grazing. Research from persistent woodlands provides strong evidence to support the theory that the natural fire regime of piñon-juniper woodlands have been dominated by infrequent but high-severity fires and that FRIs may have been on the order of 400 years (Baker and Shinneman 2004; Romme et al. 2007). These findings are in stark contrast to previous estimates of piñon-juniper FRIs of 30 to 40 years (Schmidt et al. 2002; Smith 2000). The short FRI estimates were mostly inferred from FRIs of adjacent ponderosa pine ecosystems due to the scarcity of fire-scarred trees in these ecosystems.

In contrast to ponderosa pine, piñon pines and junipers produce relatively small volumes of litter. Understory fuels, either living or dead, must be sufficiently contiguous to carry a low-intensity surface fire. In the absence of fine surface fuels, fires that spread beyond individual trees are most likely wind-driven and spread from crown to crown (Romme et al. 2007). Fire extent is greatest in higher-density woodlands and is limited by both fuels and topography in sparse, low productivity stands on rocky terrain. These hypotheses are supported by the fact that wind-driven crown fire was observed locally in some areas of dense piñon-juniper woodland during the Ojo Peak fire in November 2007. Most scientists agree that fire has been more common in savannas and areas of expansion and contraction than it has been in persistent woodlands, but debate remains on the exact range of fire frequency. Overall, frequent, low-intensity surface fires have not been the predominant fire regime in piñon-juniper woodlands. Therefore, fire exclusion may not have altered forest structure as dramatically in this forest type.

Riparian Corridors

In some local ecosystems a more frequent fire regime has occurred as a result of changes in vegetation composition and structure. Fire-adapted invasive species, such as saltcedar and Russian olive, have invaded many southwestern riparian corridors, increasing both fuel volume and continuity. These species also sprout readily after fire. Although native cottonwoods and willows will also regenerate after fire, they typically have limited survival of resprouting individuals. Studies have found that the density of saltcedar foliage is higher at burned sites than unburned sites within riparian areas (Smith et al. 2006). Native riparian vegetation is not adapted to fire to the extent and severity it is currently experiencing. Fires within this ecological zone are typically of a smaller scale (e.g.., single-tree fires with minimum surface spread). Once saltcedar has been established at a location, it increases the likelihood that the riparian area will burn and, as a result, alter the natural disturbance regime further. These altered fire regimes, rather than the natural hydrologic system, are now influencing the composition and structure of riparian ecosystems in the Southwest (Ellis 2001), as well as causing a threat to communities situated in or adjacent to the riparian zone.

3.2.4 Recent Fire Occurrence in the CWPP Planning Area

Lightning ignitions are historically the most common cause of fires within the District. Lightning is widespread throughout monsoon season, which usually takes place from July through August. Most fires are detected early and suppressed before they gain acreage; however, given the right conditions, some fires may grow large and become difficult to suppress, as was seen with the Ojo Peak and Trigo and Big Springs fires of 2007 and 2008, respectively, and the 2016 Dog Head Fire. In general, annual fire occurrences have increased over the past 15 years, a situation that is most

likely the result of increased numbers of human ignitions but may also be a result of fuel build-ups, changes in climate, and forest disease outbreaks.

A primary concern of residents in the WUI is the growing number of human ignitions, particularly with the development and improvement of roads, residences, and recreational opportunities into wildland areas. Human-caused fires account for almost 46% of the wildfires recorded for the District from 1970 to 2016. Approximately 71% of the human-caused fires within that time period have taken place within the last 15 years. Although the majority of fires take place during the summer months, the recent increase in the number of human-caused ignitions has resulted in an increase in fires throughout the year. Figure 3.4 below shows the occurrence and density of fires throughout the District since 1984.

Fires that have occurred 1984 to 2014 that were reported to NMSF were recorded in all fuel types throughout and within a 1-mile buffer of the planning area (Figure 3.5-Figure 3.8). Approximately 90% of the fires that were ignited within the region were usually smaller than 10 acres in size; however, 50 wildfires larger than 10 acres and 20 fires larger than 100 acres have occurred during the period of record.

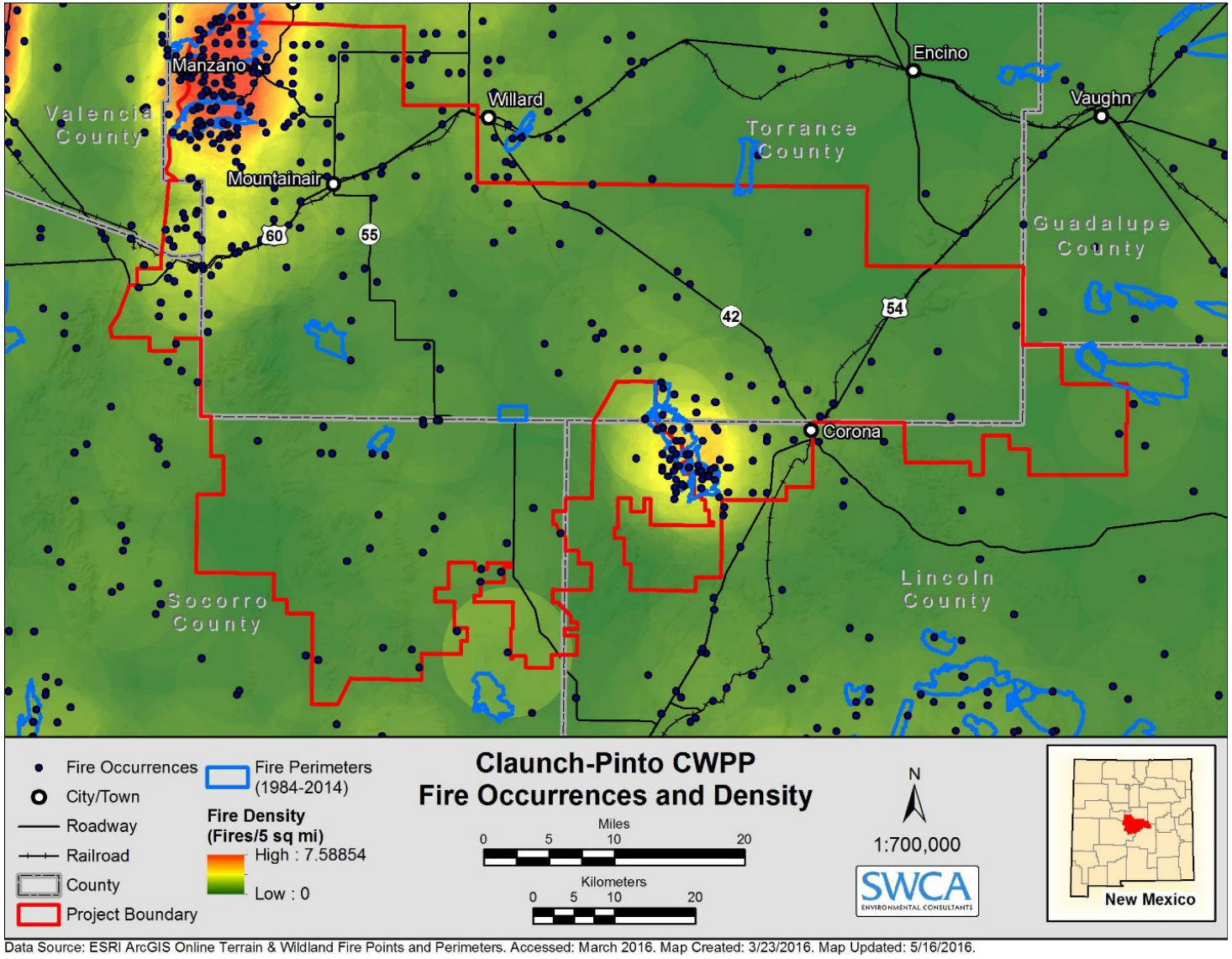


Figure 3.4. Annual fire occurrences and density on record from 1984 to 2014. Source: NMSF and Cibola National Forest fire records

Figure 3.5. Fire in Intermountain Basins Mixed Salt Desert Scrub near Laguna del Perro. *Source: District*

Figure 3.6. Ojo Peak fire, Torrance County, November 2007. *Source: District*

Figure 3.7. Trigo fire, Torrance County, April 2008. *Source: District*

Figure 3.8. The Dog Head Fire started on June 14, 2016 and grew to a large wind driven fire within 48 hours of ignition. *Source: Cody Stropki*

A total of eight fires on record grew to greater than 1,000 acres. Table 3.1 lists the large fires (over 1,000 acres in size) that have occurred within the planning area during the period of record. All of those fires were human caused, except for the Big Springs which was started by a lightning strike and burned 5,478 acres in June 2008.

Table 3.1. Fires over 100 Acres in Size on Record within the District (1970–2016)

Fire Name	Start Date	Acres	Cover Type	Cause
Gallinas	June 13, 1976	1,500		Campfire
Vega	April 18, 1994	1,200	Piñon-juniper	Debris burning
Pinatosa	March 13, 1996	7,100	Ponderosa Pine	Human caused
Pinatosa	April 21, 2001	4,200	Piñon-juniper	Campfire
Pinatosa 2	April 21, 2001	4,497		Human caused
Lookout	May 21, 2004	5,280	Ponderosa Pine	Campfire
Ojo Peak	November 19, 2007	7,500	Piñon-juniper / Ponderosa Pine	Human caused
Trigo	April 15, 2008	13,709	Ponderosa Pine, Gambel Oak and Mixed Conifer	Human caused
Big Springs	June 23, 2008	5,478	Piñon-juniper, Ponderosa Pine, Gambel Oak, and Mixed Conifer	Lightning

Over half of the fires on record took place in the Cibola National Forest, Mountainair Ranger District (approximately 67%), and the highest incidence of fire occurrence for both the USFS and State of New Mexico fire records in the District is in the vicinity of the Manzano Mountains where a large number of communities and structures exist within the WUI. The fire season of 2007–2008 was a particularly bad year due to the Ojo Peak fire, which burned 7,500 acres in November 2007, forced the evacuation of approximately 100 families from their homes and eventually burned seven structures, including three homes. The Trigo fire burned 13,709 acres and destroyed 59 homes, the majority of which were located in the Sherwood Forest subdivision, which no longer exists within the District, and the Big Springs fire, which burned 5,478 acres and destroyed six homes. All three fires occurred in the Cibola National Forest and surrounding private land and exhibited extreme fire behavior including crown fire spread, spotting, and torching. No large fires occurred on the Mountainair Ranger District until June 14, 2016, when the Dog Head Fire was sparked (see Figure 3.9; Figure 3.10). This fire burned across 17,912 acres and occurred primarily on the Chilili Land Grant, CNF, and private lands south and west of Chilili (Figure 3.4). Map 2 in Appendix A illustrates the fire occurrence information for the District.

Figure 3.9. Initial plume of the Dog Head Fire from Mountainair on June 14, 2016.
Source: Cody Stropki

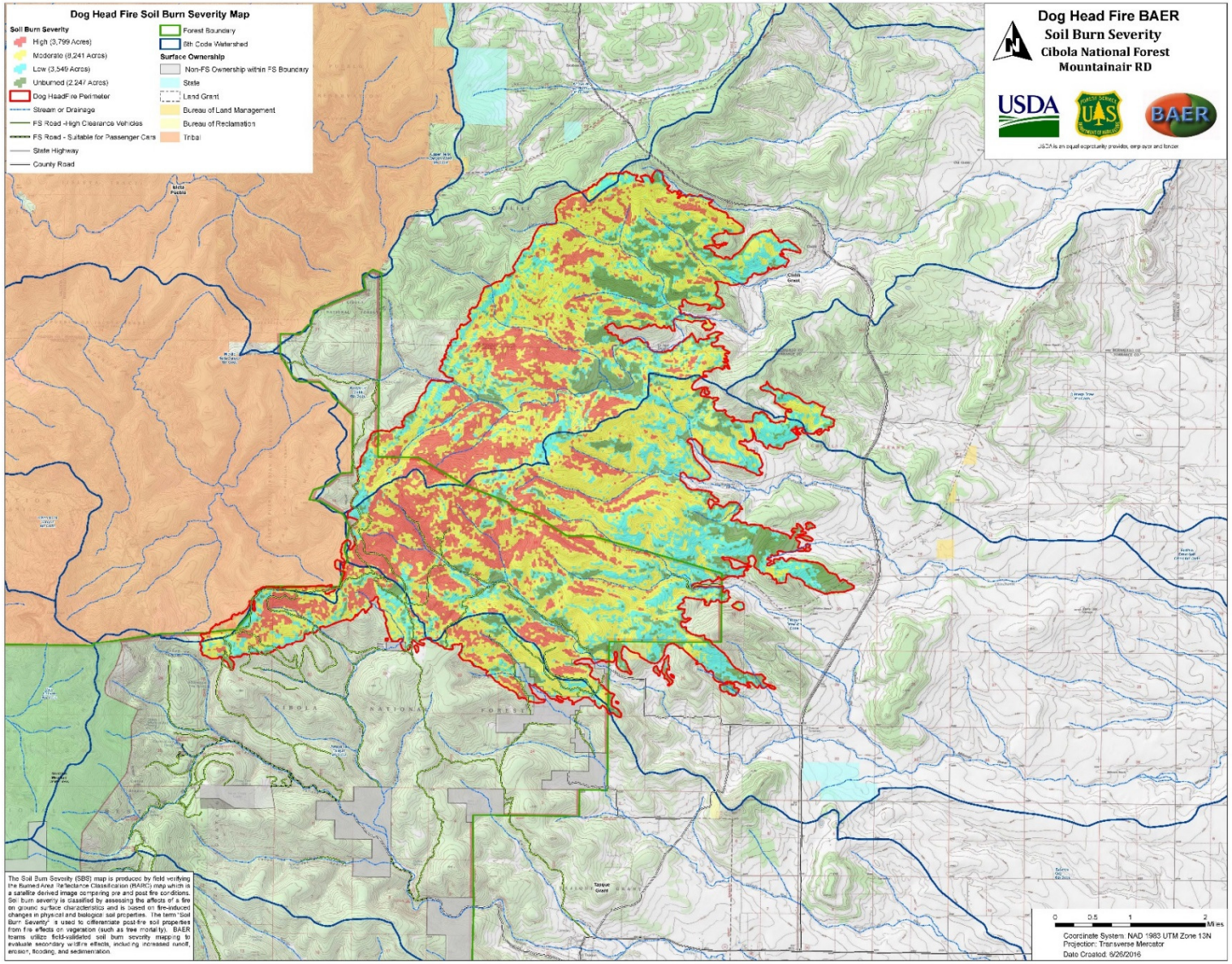


Figure 3.10. Map of burned area and severity across the Dog Head Fire.

3.3 FUTURE CHALLENGES FOR FIRE AND FUELS MANAGEMENT EFFORTS

3.3.1 SOCIAL

Increased public education and outreach is one way to disseminate information regarding fuels reduction so the public can weigh the benefits against the impacts. A wealth of information is available to the public regarding thinning in ponderosa pine; however, other cover types throughout the District (e.g., piñon-juniper) are not as well addressed in the scientific literature. Increased research and monitoring is therefore needed to determine the best management practices that are specific for all cover types. also It is also recommended that land managers adopt the New Mexico Forest Restoration Principles (2006) so that restoration efforts are as sensitive as possible to all ecological and social concerns; this interagency document was collaboratively developed and includes parameters such as retaining old growth trees; reducing the threat of unnatural crown fire; using low-impact techniques; and protecting sensitive communities. Another way the District is trying to increase public education and outreach is through the development of a mobile display that highlights the effects of wildfire and what mitigation measure can be taken to protect both life and property. This mobile display will be used at outreach events including local stakeholder meetings and public events like local fairs.

Thinning has been advocated by many forest research scientists as a means of improving forest health and promoting long-term viability of ponderosa pine forest (Allen et al. 2002; Hunter et al. 2007; Swetnam et al. 1999). This broader forest health message should also be the focus of public outreach and education. In the Southwest, ponderosa pine landscapes were historically composed of a mosaic of meadows and savanna-like forests with low tree density interspersed with more dense forests and higher canopy cover (Savage 1991). Such a structure helps to maintain diverse wildlife and plant habitat, more drought- and insect-resistant trees, and larger old growth stands that thrive with lower competitive stress (Cram et al. 2006). These more open stands, as has been discussed previously, are also more resilient to high-severity wildfire as the potential for crown fire spread is reduced (Agee and Skinner 2005).

3.3.2 CLIMATE

The long periods of drought that have been observed throughout the Southwest, in combination with altered forest management practices and fire exclusion policies over the last century, have resulted in frequent landscape-level, high-severity fires that are beyond the range of natural variability (Allen et al. 2002; Covington and Moore 1994). In the past few years, fires have grown to record sizes and are burning earlier, longer, hotter, and more intensely than they have in the past (Westerling et al. 2006. According to the National Interagency Fire Center (NIFC), occurrence of catastrophic wildfires has greatly increased over the last 20 years. Westerling et al. (2006) claim that a study of large (>1,000 acres) wildfires throughout the western United States for the period 1970 to 2003 saw a pronounced increase in frequency of fire since the mid-1980s (1987–2003 fires were four times more frequent than the 1970–1986 average). The length of the fire season was also observed to increase by 78 days, comparing 1970–1986 to 1987–2003. Within just the last 10 years, a record number of acreages have burned, and numbers are continually getting larger (NIFC 2014).

Changes in relative humidity are blamed for many of these conditions, as increased drying over much of the Southwest has led to an increase in days with high fire danger (Brown et al. 2004). Advanced computer models are now making national-scale simulations of ecosystems, providing predictions of how fire regimes will change in the twenty-first century (Neilson 2004). Western grasslands are predicted to undergo increased woody expansion of piñon-juniper associated with increased precipitation during typical wet seasons. Summer months are predicted to be hotter and longer contributing to increased fire risk (Neilson 2004). Gutzler (2013), in an article that explores regional climate considerations in the U.S./Mexico borderlands, describes the climate variability that the Southwest is prone to and the resultant regional swings that occur between severe drought and pluvial periods. It has become well understood that long-term episodic droughts have been endemic in the Southwest for centuries (Gutzler 2013). He suggests that the border region is strongly affected by ongoing and projected century-scale climate change, and he reports on a strong regional warming trend in recent temperature data that modifies natural drought/pluvial precipitation fluctuations by enhancing evaporative losses and decreasing snowpack in mountainous regions to the north (Brown and Mote 2009). The periodic drought and intense rainfall patterns that Gutzler (2013) and others (Alexander et al. 2006; Gutzler and Robbins 2011; Hurd and Coonrod 2008) project for the region are expected to result in significantly diminished stream flow and drier surface conditions (Seager et al. 2008), shifting the Southwest climate farther toward aridity. Under these greater climatic extremes, fire behavior is expected to become more erratic, with larger flame lengths, increased torching and crowning, and more rapid runs and blowups associated with extremely dry conditions (Brown et al. 2004).

Although fire suppression is still aggressively practiced, fire management techniques are continually adapting and improving. Due to scattered human developments (homes, ranches, and farms) and values (residential and commercial structures, historic and natural values) throughout the WUI, suppression will always have to be a priority. However, combining prescribed fire and managing wildland fire for resource benefit with effective fuels management and restoration techniques have been proven to help re-establish natural fire regimes and reduce the potential for catastrophic wildfires on public lands. The use of prescribed fire on private land is a decision to be made by the rancher, and it is acknowledged that given the prevailing drought such a management technique may not be feasible in the District.

3.4 FIRE REGIMES AND FIRE REGIME CONDITION CLASSES

In order to classify, prioritize, and plan for fuels treatments across a fire management region, methods have been developed to stratify the landscape based on physiographic and ecological characteristics.

3.4.1 FIRE REGIME CLASSIFICATIONS

A natural, or historical, fire regime is a general classification describing the role fire would play throughout a landscape in the absence of modern human intervention but includes the influence of burning by Native American groups (Agee 1993; Brown 1995; Hann et al. 2008).

Fire regime (FR) classes are based on the average number of years between fires (also known as fire frequency or fire return interval) combined with the severity (i.e., the amount of vegetation replacement) of the fire and its effect on the dominant overstory vegetation (Hann et al. 2008).

The five FR classes are:

FR I: Frequency of 0 to 35 years and low (mostly surface fires) to mixed severity (less than 75% of the dominant overstory vegetation is replaced).

FR II: Frequency of 0 to 35 years and high severity (more than 75% of the dominant overstory vegetation is replaced).

FR III: Frequency of 35 to 200+ years and mixed severity (less than 75% of the dominant overstory vegetation is replaced).

FR IV: Frequency of 35 to 200+ years and high severity (more than 75% of the dominant overstory vegetation is replaced).

FR V: Frequency of 200+ years and high severity (more than 75% of the dominant overstory vegetation is replaced).

3.4.2 Fire Regime Condition Class

Natural fire regime reference conditions have been developed for vegetation-fuel class composition, fire frequency, and fire severity in biophysical settings at a landscape level for the Southwest and most other parts of the U.S. (Hann et al. 2008). The Fire Regime Condition Class (FRCC) is a measure of the degree of departure from reference conditions, possibly resulting in changes to key ecosystem components, such as vegetation characteristics (e.g., species composition, structural stage, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity, and pattern; and other associated disturbances, such as insect and disease mortality, grazing, and drought (Hann et al. 2008). Several factors, such as fire suppression, timber harvesting, livestock overgrazing, introduction and establishment of non-native species, introduced disease and insects, and other management activities are all possible causes of this departure from historical conditions (Hann et al. 2008; Schmidt et al. 2002).

The three FRCC rankings are:

FRCC 1: No or low departure from the central tendency of the reference conditions.

FRCC 2: Moderate departure from the central tendency of the reference conditions.

FRCC 3: Extreme departure from the central tendency of the reference conditions.

The central tendency is a composite estimate of the reference condition vegetation characteristics; fuel composition; fire frequency, severity, and pattern; and other associated natural disturbances. Low departure includes a range of ±33% deviation from the central tendency (Hann and Bunnell 2001; Hann et al. 2008; Hardy et al. 2001).

Although the FRCC classification provides a useful concept, many authors have questioned the accuracy and appropriate application of the data (e.g., Della Sala et al. 2004; Schoennagel et al. 2004). The initial mapping project (Schmidt et al. 2002) was intended to provide national-level data and was not recommended for use at finer local scales. Unfortunately, despite the coarse

nature of the data, it has been widely used to inform local management decisions. Another fundamental assumption is that the natural fire regime data that were used in the creation of the system were, in fact, accurate. This assumption may be critically flawed for piñon-juniper woodlands where recent research has indicated a natural fire-return interval on the order of centuries (Baker and Shinneman 2004; Romme et al. 2007) instead of the estimate of decadal disturbance used in the classification system (Schmidt et al. 2002). Based on this difference in the natural fire-return interval, a piñon-juniper stand that was previously mapped as FR I may be more accurately described as FR V, at the opposite end of the spectrum; this would give it an averaged classification of FRCC III. Improved data and local input may help to improve the applicability of the FR and FRCC systems for future decision-making processes, but the FRCC concept should be applied currently with great caution in designing and prioritizing fuels treatments.

Updated graphical FRCC data are not available for the County, as the FRCC classification has been changed to a new classification system (LANDFIRE 2014). The FRCC Map from the 2008 CWPP is provided in Appendix A for reference, however the reader is cautioned that this map does not incorporate the fires that have occurred in the area since 2008.

3.5 FIREFIGHTING CAPABILITIES

Because of the multi-county nature of the District, the CPCWPP planning area is served by a number of firefighting jurisdictions. Two volunteer fire stations fall within the planning area (the Corona Fire Department and the Mountainair Fire Department), but a number of other stations neighboring the District would respond to fires when needed:

Torrance County
- Estancia Fire Department
- Torreon and Tajique Fire Department
- Encino Hills Fire Department
- Willard Fire Department
- McIntosh Fire Department
- Mountainair Fire Department

Socorro County (along the I-25 corridor)
- Veguita Fire Department

Valencia County (along the I-25 corridor)
- Belen Fire Department

Lincoln County
- Corona Fire Department

Guadalupe County
- Vaughn Fire Department

Because these stations are predominantly manned by volunteer firefighters, the capabilities of the stations are limited. Many fire departments in the area are experiencing low recruitment rates and limited funding, and this could result in slowed response times.

Torrance County fire departments are the primary responders to the District. Appendix E includes firefighting resource lists for the County to be used in future planning efforts.

3.6 FIRE MANAGEMENT POLICY

Within the CPCWPP planning area, the responsibility for managing and responding to wildfire varies according to land ownership. Resources available for initial attack on fire starts include federal, state, and local fire departments. Under the New Mexico Joint Powers Agreement (JPA) for Interagency Wildland Fire Protection (State of New Mexico 2008), wildland fire management activities are coordinated between federal agencies and NMSF. New Mexico is divided into initial attack areas, and in each area one agency agrees to take the lead in providing initial attack protection to all lands, regardless of ownership. This policy allows for the response of the "closest forces" concept for suppression and helps to ensure effective and efficient fire management across the state. The application of the closest forces concept in the District means that local fire departments, NMSF, or various federal agencies may provide initial attack depending on the proximity at the time of the incident.

Interagency fire management and dispatch operations for the Torrance County portion of the District are provided by the Albuquerque Interagency Dispatch Center. Interagency fire management and dispatch operations within the Socorro County portion of the District are provided by the Silver City Interagency Dispatch Center. The Alamogordo Interagency Dispatch Center provides interagency coordination for the Lincoln County areas of the District.

3.6.1 PRIVATE LAND

The responsibility for responding to wildfire on private land falls to the jurisdiction in which the incident has occurred, but, as described previously, the closest forces concept under the JPA allows for response by any available personnel and equipment. Typically, when fires that are reported through the 911 system, as is common on private land, municipal or county volunteer fire departments will be the first to respond.

3.6.2 STATE LAND

NMSF has primary responsibility for non-federal, non-municipal, non-tribal, and non-pueblo lands within the CPCWPP area. The State of New Mexico coordinates local government resources, including county and municipal fire departments, for the purposes of coordinating fire management services within and beyond the boundaries of the state per agreements between the state and local governments. Torrance and Valencia counties fall within the Bernalillo District of NMSF. Socorro is administered by the Socorro District, and Lincoln County falls within the Capitan District.

Federal agencies request local government resources through the local office of NMSF. In the event of a wildfire on state land or within Manzano Mountain State Park, local fire departments or other resources may be used for initial attack under the JPA.

3.6.3 U.S. Forest Service

On USFS land, initial attack will be conducted by the USFS whenever possible. The USFS Mountainair Ranger District maintains mutual aid agreements (MAAs) with NMSF, the BLM, Torrance County, and the National Park Service. Under the MAA, agency personnel may respond to incidents outside their agency boundaries.

Wildland fire use (using naturally burning fires in designated, remote sections of forests as a tool for helping to restore forest health and mitigating the escalating costs of fire suppression) is not considered appropriate at this time on the Mountainair Ranger District due to increasing numbers of urban interface homes and the lack of vegetation data to support predictive models. Depending on the location and nature of a wildfire, USFS policies outline appropriate management responses to guide district personnel in the application of specific suppression techniques.

In wilderness areas, the Cibola National Forest supervisor must approve the use of helicopters, portable pumps, and chainsaws, as well as the construction of helicopter landing sites. The Southwestern Regional Forester must approve the use of motorized vehicles and construction of bulldozer lines. Fire strategies call for:

- restoring fire to the ecosystem;
- using prescribed fire to reduce hazards;
- managing wildland fires so that air quality remains in compliance with local, state, and federal laws; and
- minimizing suppression impacts to wilderness and the surrounding area.

3.6.4 National Park Service

National Park Service policy states that all wildland fires will be effectively managed considering the protection of resource values and the safety of firefighters and the public, while using the full range of strategic and tactical operations as described in an approved Fire Management Plan, which is currently in the process of being updated and should be finished by late 2016. The primary goals of the wildland fire management program at Salinas Pueblo Missions National Monument, as stated in its Fire Management Plan, are to protect human health and safety, property, and natural and cultural resources; diminish risk and consequences of severe wildland fires; and, to the extent possible, increase the health of the ecosystem.

To accomplish these goals, human-caused wildland fires will be suppressed, prescribed fire will be introduced where appropriate, and hazardous fuel reduction projects will focus on WUI areas. Fire managers will balance the potential impacts of wildland fire with the potential resource impacts of fire suppression activities in choosing the appropriate management response.

3.6.5 Bureau of Land Management

The BLM operates a State Fire and Aviation Management office in Santa Fe; three District Fire Programs in Albuquerque, Farmington, and Las Cruces, respectively; and two Field Office Programs in Roswell and Carlsbad, respectively. Administrative boundaries for these offices follow county boundaries. Torrance County falls within the management area of the Rio Puerco

Field Office of the BLM's Albuquerque District. Within the Claunch-Pinto District, Socorro County falls within the BLM's Socorro Field Office, and land within Lincoln County is managed by the BLM's Roswell Field Office. The local field office has initial attack responsibility and provides mutual aid assistance for wildland fire activities on BLM-administered public lands. Through the JPA, the BLM also maintains initial attack fire response responsibilities for designated state and private lands.

Each field office in New Mexico has a Resource Management Plan (RMP), which provides management direction for all BLM resources. In 2004, a statewide Resource Management Plan Amendment for fire and fuels was completed. This amendment covered all RMPs in New Mexico and Texas. The purpose of this amendment was to improve the BLM's implementation of the National Fire Plan and the 2001 Federal Fire Policy, while updating direction for fire and fuels management. Fire Management Plans are supplements to the RMPs and are more detailed, site-specific plans. Fire Management Plans establish fire and fuels objectives and implementation strategies, and they serve as a reference for on-the-ground decisions in fire and fuels management. Each field office has an approved Fire Management Plan. These plans are periodically reviewed and updated as needed.

The single overriding priority in BLM fire management is to protect human life, both the public and firefighters. In addition, agency policies aim to protect human communities, their infrastructure, and the natural resources on which they depend. Other property and improvements will be protected. Where possible on BLM land, wildland fire is allowed to function as an essential ecological process and agent of natural change in fire-dependent ecosystems. Management actions also focus on the improvement or maintenance of ecosystem health and wildlife habitat and the protection of high-value cultural, historical, and paleontological resources.

3.7 EVACUATION PROCEDURES

Evacuation procedures outlined here provide a general overview; the reader is cautioned that evacuation procedures are subject to change since every incident is different and evacuations are contingent upon a large number of human and natural factors that could change without warning.

Within the District, evacuation procedures will be ordered by the county in which the incident is located or where evacuation is needed.

3.7.1 TORRANCE COUNTY EVACUATION PROCEDURES

- In Torrance County, emergency response in the event of a wildfire is coordinated by a situation analysis team, made up of the Torrance County Emergency Service Director, the Torrance County Emergency Manager, the Torrance County Manager, the County Sheriff, and the Chairman. The situation analysis team is responsible for making the decisions to evacuate or to shelter-in-place and when to return after evacuating.
- County and state law enforcement, as well as fire and rescue, facilitate evacuations. State police officers typically play a large role in carrying out evacuation orders.
- Evacuation is not mandatory, but firefighters will not go in the remove victims after orders have been given.

- Evacuees should utilize the identified routes. Firefighters and equipment must still be able to access areas while residents are evacuating.
- Evacuees should go to the nearest identified shelters and check-in. Accountability is paramount and the authorities need to be able to identify which homes have been evacuated. After checking in at a shelter, evacuees are free to leave the shelter to stay with friends or relatives. Torrance County maintains an internal list of possible evacuation centers, but the choice of shelter locations and evacuation routes is considered dynamic and is instituted based on the location of the disaster, wind direction, and other factors identified at the time of the disaster.
- Once the evacuation orders have been given, NO ONE will be allowed back into the area until permission is granted by the authorities.
- Evacuees should have a plan with neighbors to aid in the evacuation of elderly residents, people with special needs, and pets and livestock.
- Residents should make arrangements for the shelter of pets and livestock since many emergency shelters and hotels will not allow them.
- Evacuees should notify friends and family.
- Evacuees should notify insurance companies and banks.
- Evacuees should prepare to not return to their homes for many days.

Comments from the Ojo Peak fire highlighted public concerns regarding evacuation procedures in the County. However, following the Trigo fire vast improvements were recognized by the public and the County Emergency Management Team was praised for its evacuation response.

3.7.2 Socorro County Evacuation Procedures

The Socorro County CWPP (2007) outlines procedures specific to fire response in the Socorro County. In Socorro County**,** the incident commander of a wildfire incident is authorized to order an evacuation if conditions immediately threaten the health, safety, or welfare of citizens; if the emergency operations center is not operational; or if county commission members are not available.

The following evacuation stages or Levels of Response apply in Socorro County:

Stage 1: **A notification and/or briefing** will be provided to persons within the affected areas. This stage will be implemented when *fire has a high potential of reaching structures in the area within 24–36 hours.*

Stage 2: **A warning of potential evacuation** will be announced if the need to evacuate is probable. Warnings will include the recommended movement of livestock, large mobile property, and persons requiring special needs or care. This stage will be implemented when *fire has a high potential of reaching structures in the area within 16 hours.*

Stage 3: **An evacuation request** will be issued when the *fire has a high potential of reaching structures within the area in 6 hours.* Residents will be asked to leave within a specified time by

an announced route, and will be asked to assemble at one of the pre-designated locations listed below. Socorro County has established evacuation centers, but additional assembly locations or rerouting may also be identified during an incident.

Stage 4: **An evacuation order** will be issued when the *fire has a high potential of reaching structures in the area within 2 hours or less*, and when a disaster or emergency proclamation has been issued by the incident commander of the jurisdiction affected by the incident. Access to the affected area is prohibited to anyone not authorized by the incident commander or his designee.

Stage 5: **Perimeter roadblocks and patrols** will be set up and maintained once an evacuation order has been issued. The evacuated area will be patrolled 24 hours a day thereafter. Regular status briefings will be provided to evacuees at the pre-designated assembly locations and shelters established by the American Red Cross.

Stage 6: **Return of residents to their homes** will be allowed once the incident commander declares the incident to be under control and the area safe for entry. Evacuation teams will recontact residents after their return to evaluate hardships and special needs.

Implementation Procedures

1. In the event that an evacuation is requested or ordered by the jurisdiction affected and given to the incident commander for implementation, the state police will coordinate the evacuation through officer(s) assigned to the emergency operations center.

2. In the event of noncompliance by residents who have been ordered to evacuate, the state police will coordinate all efforts to recontact those persons and stress the immediacy of the threats and the need for evacuation.

3. Evacuation routes and roadblock locations will be determined by the incident commander specific to each incident. The incident commander will provide this information to the state police and the emergency operations center staff.

4. Assembly locations for residents being evacuated in Socorro County are listed below:

Area:	**Report To:**
Midway	Midway School parking lot
Veguita	La Promesa School parking lot
La Joya	La Promesa School parking lot
Abeytas	Abeytas Fire Department parking lot
Hop Canyon	Magdalena School parking lot
San Antonio	San Antonio School parking lot

In the event of a wildfire, appropriate county emergency management staff will activate the Emergency Alert System. Messages may be broadcast over local radio and television stations. Media notification may be in the form of news reports or through the Emergency Alert System directly. In the event of an evacuation, the responsible jurisdiction's authorized representative may also issue a statement on the jurisdiction's policy on people that do not comply with evacuation

instructions. The statement addresses the consequences for not evacuating, and the services (food, medical, utilities, sanitation, etc.) that will be discontinued or interrupted in the evacuation area.

3.8 INTERNATIONAL WILDLAND URBAN INTERFACE CODE OF THE INTERNATIONAL CODE COUNCIL

Given the current and future expansion of the WUI throughout the CPCWPP planning area, it is recommended that the District adopt the ICC code, at least in part, to increase enforcement of building ordinances in the WUI. Neighboring Bernalillo County has already adopted this code and could act as a model for the Counties within the CPCWPP planning area. These Counties should pursue the code to learn more about its potential application for planning in the WUI. A copy of the code may be obtained from http://www.iccsafe.org.

3.9 FEDERAL TREATMENTS

3.9.1 U.S. FOREST SERVICE FUELS REDUCTION PROJECTS

The USFS conducts ongoing projects to address fire mitigation and forest health within the Mountainair Ranger District. Please refer to Figure 1.2 for a map of treatment history in the Manzano Mountains. Proposed treatments are described in Section 5.5.

3.9.2 BUREAU OF LAND MANAGEMENT FUELS REDUCTION PROJECTS

No BLM proposed treatments are currently underway in the planning area.

4.0 RISK ASSESSMENT

4.1 PURPOSE

The purpose of the hazard and risk assessment is to measure the potential impact of a WUI fire and what current and possible mitigations may have on the resultant risk. Understanding the probable impact of a WUI fire through examination of existing flammables (vegetation and buildings), weather patterns, and topography that influences fire behavior is essential to identifying the best mitigations to reduce risk. Various WUI fire mitigation methods are available; therefore, the hazard/risk model allows a means to evaluate the community and an individual parcel's vulnerability to the hazard and the effect of mitigation options to reduce the vulnerability.

In the wildland fire vernacular, "hazard" generally refers to wildland fuel in terms of its contribution to problem fire behavior and its resistance to control when combined with terrain and weather features. Fire "risk" refers to the chance of a wildfire starting, as determined by the presence and activity of causative agents (National Wildfire Coordinating Group 1998) and other variables that may impact people living in these areas such as dead-end roads and proximity to fire response facilities. No uniform methodology currently exists for synthesizing elements of hazard and risk into a comprehensive analysis, though very general guidelines have been published in the National Association of State Foresters' *Field Guidance for Identifying and Prioritizing Communities at Risk* and the National Wildfire Coordinating Group's *WUI Fire Hazard Assessment Methodology.* Each jurisdiction must evaluate hazard and risk according to the environment and values unique to the area. For the District, elements of hazard and risk were analyzed through a series of steps consistent with National Association of State Foresters and National Wildfire Coordinating Group guidelines.

The risk assessment is two-fold and combines a GIS model of hazard based on fire behavior and fuels modeling technology (Composite Hazard/Risk Assessment) and a field assessment of community hazards and values at risk (Community Hazard/Risk Assessment). From these assessments, land use managers, fire officials, planners, and others can begin to prepare strategies and methods for reducing the threat of wildfire, while working with community members to educate them about methods for reducing the damaging consequences of fire. The fuels reduction treatments can be implemented on both private and public land, so community members have the opportunity to actively apply the treatments on their properties, as well as recommend treatments on public land that they use or care about.

Many methods are available to perform wildfire risk assessments. Different methods will highlight different factors, and it should be emphasized that these assessments illustrate relative risk for the purpose of prioritizing mitigation and planning efforts. Subjectivity plays a role in any WUI risk assessment, and the significance of risk ratings must be kept in perspective. Once relative risk has been determined, components of the assessment can be used to guide mitigation efforts.

4.2 FIRE BEHAVIOR MODEL

4.2.1 OVERVIEW

The wildland fire environment consists of three factors that influence the spread of wildfire: fuels, topography, and weather. Understanding how these factors interact to produce a range of fire behavior is fundamental to determining treatment strategies and priorities in the WUI. In the wildland environment, vegetation is synonymous with fuels. When sufficient fuels for continued combustion are present, the level of risk for those residing in the WUI is heightened. Fire spreads in three ways: (1) surface fire spread—the flaming front remains on the ground surface (in grasses, shrubs, small trees, etc.) and resistance to control is comparatively low; (2) crown fire—the surface fire "ladders" up into the upper levels of the forest canopy and spreads through the tops (or crowns) independent of or along with the surface fire, and when sustained is often beyond the capabilities of suppression resources; and (3) spotting—embers are lifted and carried with the wind ahead of the main fire and ignite in receptive fuels. If profuse and/or long-range (>0.5 mile), resistance to control spotting can be very high. Spotting is often the greatest concern to communities in the path of a wildland fire.

Treating fuels in the WUI can lessen the risk of intense or extreme fire behavior. Studies and observations of fires burning in appropriately treated areas have shown that the fire either remains on or drops to the surface, thus avoiding destructive crown fire and crown scorch (Omi and Kalabokidis 1991; Pollet and Omi 2002). Also, treating fuels decreases spotting potential and increases the ability to detect and suppress any spot fires that do occur. Fuels mitigation efforts therefore should be focused specifically where these critical conditions could develop in or near communities at risk.

4.2.2 FIRE BEHAVIOR MODEL COMPONENTS

For this plan, an assessment of fire behavior was carried out using well-established fire behavior models: FARSITE, FlamMap, BehavePlus, and FireFamilyPlus, as well as ArcGIS Desktop Spatial Analyst tools. Data used in the risk assessment was largely obtained from LANDFIRE.

LANDFIRE

LANDFIRE is a national remote sensing project that provides land managers a data source for all inputs needed for FARSITE, FlamMap, and other fire behavior models. The database is managed by the U.S. Forest Service and the U.S. Department of the Interior and is widely used throughout the United States for land management planning. More information can be obtained from http://www.landfire.gov.

FARSITE

FARSITE is a computer model based on Rothermel's spread equations (Rothermel 1983); the model also incorporates crown fire models. FARSITE uses spatial data on fuels, canopy cover, crown bulk density, canopy base height, canopy height, aspect, slope, elevation, wind, and weather to model fire behavior across a landscape. In essence, FARSITE is a spatial and temporal fire behavior model. FARSITE is used to generate fuel moisture and landscape files as inputs for FlamMap. Information on fire behavior models can be obtained from http://www.fire.org.

FlamMap

Like FARSITE, FlamMap uses a spatial component for its inputs but only provides fire behavior predictions for a single set of weather inputs. In essence, FlamMap gives fire behavior predictions across a landscape for a snapshot of time; however, FlamMap does not predict fire spread across the landscape. FlamMap has been used for the Claunch Pinto CWPP to predict fire behavior across the landscape under extreme (worst case) weather scenarios.

BehavePlus

BehavePlus also uses Rothermel (1983) equations. It is a multifaceted fire behavior model and was used to determine fuel moisture in the risk assessment process.

4.2.3 Fire Behavior Model Inputs

Fuels

The fuels in the planning area are classified using Scott and Burgan's (2005) Standard Fire Behavior Fuel Model classification system. This classification system is based on the Rothermel (1983) surface fire spread equations, and each vegetation and litter type is broken down into 40 fuel models. This classification was selected because of the amount of herbaceous fuel in the planning area. These herbaceous fuels have a dynamic fuel moisture component that affects the intensity to which they would burn based on the degree of pre-fire curing. The Scott and Burgan (2005) system acknowledges this feature of herbaceous fuels and classifies them accordingly.

The general classification of fuels is by fire-carrying fuel type:

- (NB) Nonburnable
- (GR) Grass
- (GS) Grass-Shrub
- (SH) Shrub
- (TU) Timber-Understory
- (TL) Timber-Litter
- (SB) Slash-Blowdown

  Source: Scott and Burgan (2005)

A more detailed breakdown of the fuel types present in the planning area is presented in Table 4.1. Map 4 in Appendix A illustrates the fuels classification throughout the planning area. The dominant fuel types in the District are classified as GR2 and GS2. GR2 is a moderately coarse, continuous grass fuel with a depth of approximately 1 foot. Spread rate in these fuels is high (20–50 chains per hour [ch/h]), and flame lengths are moderate (4–8 feet). This fuel type makes up the majority of the central and eastern portions of the District, with patches of GS2 fuels in the southern portion and western foothills. GS2 fuels are made up of shrubs 1 to 3 feet high with a moderate grass understory. Spread rates and flame lengths are comparable to those of the GS2 fuels. GR1 fuels are found scattered throughout the western portion of the planning area. These fuels are

termed short, sparse, dry-climate grasses. They are usually short grasses either by grazing or by natural structure, and they tend to be discontinuous and patchy providing limited continuity for rate of spread (2–5 ch/h) and low flame lengths (1–4 feet). Taller shrubs (1–3 feet high) and flashy light fuels that generate intense fire behavior could be classified as high risk because the flame lengths often exceed lengths that allow direct suppression by hand crews. SH5 is one example of these high-risk fuel types and is found southwest of Corona. This fuel is typified by heavy shrub fuel loading, very high rates of spread (50–150 ch/h), and very high flame lengths (12–25 feet).

Table 4.1. Fuel Model Classification for CPCWPP Planning Area

1. Nearly pure grass and/or forb type (Grass)

GR1: Grass is short, patchy, and possibly heavily grazed. Spread rate is moderate (5–20 ch/h); flame length low (1–4 feet); fine fuel load 0.40 (tons per acre [t/ac]).
GR2: Moderately coarse continuous grass, average depth about 1 foot. Spread rate high (20–50 ch/h); flame length moderate (4–8 feet); fine fuel load 1.10 (t/ac).
GR3: Very coarse grass, average depth about 2 feet. Spread rate high; flame length moderate
GR4: Moderately coarse continuous grass, average depth about 2 feet. Spread rate very high (50–150 ch/h); flame length high (8–12 feet); fine fuel load 2.15 (t/ac).

2. Mixture of grass and shrub, up to about 50% shrub cover (Grass-Shrub)

GS1: Shrubs are about 1-foot high, low grass load. Spread rate moderate (5–20 ch/h); flame length low (1–4 feet); fine fuel load 1.35 (t/ac).
GS2: Shrubs are 1–3 feet high, moderate grass load. Spread rate high (20–50 ch/h); flame length moderate (4–8 feet); fine fuel load 2.1 (t/ac).

3. Shrubs cover at least 50% of the site; grass sparse to nonexistent (Shrub)

SH1: Low shrub fuel load, fuelbed depth about 1 foot; some grass may be present. Spread rate very low (0–2 ch/h); flame length very low (0–1 foot); fine fuel load 1.7 (t/ac).
SH2: Moderate fuel load (higher than SH1), depth about 1 foot, no grass fuels present. Spread rate low (2–5 ch/h); flame length low (1–4 feet); fine fuel load 5.2 (t/ac).
SH5: Heavy shrub load, depth 4–6 feet. Spread rate very high (50–150 ch/h); flame length very high (12–25 feet); fine fuel load 6.5 (t/ac).
SH6: Dense shrubs, little or no herb fuel, depth about 2 feet. Spread rate high (20–50 ch/h), flame lengths high (8–12 feet) (***only occurring in uplands beyond CWPP boundary***); fine fuel load 4.3 (t/ac).
SH7: Very heavy shrub load, depth 4–6 feet. Spread rate lower than SH5, but flame length similar. Spread rate high (20–50 ch/h); flame length very high (12–25 feet); fine fuel load 6.9 (t/ac).

4. Grass or shrubs mixed with litter from forest canopy (Timber-Understory)

TU1: Fuelbed is low load of grass and/or shrub with litter. Spread rate low (2–5 ch/h); flame length low (1–4 feet); fine fuel load 1.3 (t/ac).
TU5: Fuelbed is high load conifer litter with shrub understory. Spread rate is moderate (5–20 ch/h); flame length moderate (4–8 feet); fine fuel load 7.0 (t/ac).

5. Dead-and-downed woody fuel (litter) beneath a forest canopy (Timber-Litter)

TL1: Light to moderate load, fuels 1–2 inches deep. Spread rate very slow (0–2 ch/h); flame length very low (0–1 foot); fine fuel load 1.0 (t/ac) (Fuelbed is recently burned but able to carry wildland fire)
TL2: Low load, compact. Spread rate very low; flame length very low (Fuelbed composed of broadleaf (hardwood) litter).
TL3: Moderate load conifer litter. Spread rate very low; flame length low (Fuelbed does not include coarse fuels).
TL5: Moderate load, less compact. Spread rate moderate; flame length low (Fuelbed does not include coarse fuels).
TL6: Moderate load, less compact. Spread rate moderate; flame length low (Fuelbed composed of broadleaf (hardwood) litter).
TL8: Moderate load and compactness, may include small amount of herbaceous load. Spread rate moderate; flame length low; fine fuel load 5.8 (t/ac) (Fuelbed composed of long-needle pine litter).
TL9: Very high load conifer litter; spread rate moderate; flame length moderate; fine fuel load 6.65 (t/ac) (Fuelbed composed of broadleaf (hardwood) litter).

6. Insufficient wildland fuel to carry wildland fire under any condition (Nonburnable)

NB1: Urban or suburban development; insufficient wildland fuel to carry wildland fire.

NB3: Agricultural field, maintained in nonburnable condition.

NB8: Open water.

NB9: Bare ground.

Notes:
Based on Scott and Burgan's (2005) 40 Fuel Model System.
Climate is arid to semiarid for all fuel types.
Only categories present on the CWPP fuel maps are presented above. For more information refer to Scott and Burgan (2005).

The mountainous areas in the northwestern portions of the planning area are made up of TL8, TL9, and TU5 fuels. TL8 fuels are timber-litter fuels with a long-needle pine litter and small amounts of herbaceous load beneath a forest canopy; spread rates are moderate (5–20 ch/h) and flame lengths are low (1-foot to 4-foot). TL9 fuels are timber-litter fuels with a very high load of dead-and-downed woody litter beneath a broadleaved forest canopy; these fuels also burn with a moderate rate of spread (5–20 ch/h) and moderate flame length (4–8 feet). Patches of TL9 fuels are found south of Highway 60 and west of Highway 55. Patches of TU5 are found in the northwest portion of the planning area; these are timber-understory fuels where the fuel load is high-load conifer litter with shrub understory; these fuels burn with a moderate rate of spread (5–20 ch/h) and moderate flame length (4-foot to 8-foot). There are also areas that are classified as timber-grass-shrub (TU1) mainly found scattered throughout the grass-shrub fuel types (GS1). These fuels are highly dynamic but burn with a slow rate of spread (2–5ch/h) and low flame length (1–4 feet).

Nonburnable features are also present throughout the planning area with urban fuels (NB1) dominant throughout communities. A patch of open water (NB8) is present in the northeast corner of the District. Due to the fires in the District in 2007-2008 there are also nonburnable areas that are bareground (NB3) within these burn perimeters. There are also some agricultural fields within the District which are classified as NB3 since they are maintained irrigated fields. These fuel types are considered noncombustible when input into the fire behavior model. This is important to note when determining risk in more rural areas where pasture land and cured crops could pose fire danger during certain times of the year, particularly prior to harvest. Land managers should pay close attention to these agricultural fuels in areas where crop burning is a common vegetation management practice.

Topography

Topography is important in determining fire behavior. Steepness of slope, aspect, elevation, and landscape features can all affect fuels, local weather, and rate of spread of wildfire. The topography in the planning area varies significantly from the flat open plains to steep mountainous areas of the Manzano and Gallinas mountains. Aspect and slope can assert significant influence on fire behavior, so where topography does fluctuate, flame lengths, rate of spread, and crowning potential could vary considerably. Other topographic features that could be significant are arroyos and tributaries that may funnel fire and intensify fire behavior. Narrow channel width and presence of vegetated islands are also topographic features that could influence fire spread in bosque areas.

Weather

Of the three fire behavior components, weather is the most likely to fluctuate. Accurately predicting fire weather remains a challenge for forecasters, particularly during drought conditions. As spring and summer winds and rising temperatures dry fuels, particularly on south-facing slopes, conditions can deteriorate rapidly, creating an environment that is susceptible to wildland fire. Fine fuels (grass and timber-litter) can cure rapidly, making them highly flammable in as little as one hour following light precipitation. Low, live fuel moistures of shrubs and trees (typical in drought conditions throughout New Mexico) can significantly contribute to fire behavior in the form of crowning and torching. With a high wind, grass fires can spread rapidly, engulfing communities often with limited warning for evacuation. The creation of defensible space is of vital importance in protecting communities from this type of fire. For instance, a carefully constructed fuel break placed in an appropriate location could protect homes or possibly an entire community from fire.

This type of defensible space can also provide safer conditions for firefighters and improve their ability to suppress the fire and protect life and property.

One of the critical inputs for FlamMap is fuel moisture files. For this purpose weather data have been obtained from FAMWEB (National Wildfire Coordinating Group 2014), a fire weather database maintained by the National Wildfire Coordinating Group. A remote automated weather station (RAWS) was selected within the planning area and data was downloaded from the website. The RAWS was selected based on the reliability of the data, and the likelihood that data represented weather in the planning area.

Using an additional fire program (FireFamily Plus) with the RAWS data, weather files that included prevailing wind direction and 20-foot wind speed were created. Fuel moisture files were then developed for downed (1 hour, 10 hour, and 100 hour) and live herbaceous and live woody fuels. These files represent weather inputs in FlamMap.

4.2.4 Fire Behavior Model Outputs

The following is a discussion of the fire behavior model outputs from FlamMap.

Flame Length

Map 5 in Appendix A illustrates the flame length classifications for the District. Flame length is determined by fuels, weather, and topography and is a particularly important component of the risk assessment because it relates to potential crown fire and suppression tactics. Direct attack by hand lines is usually limited to flame lengths under 4 feet. In excess of 4 feet, indirect suppression is the dominant tactic. Suppression using engines and heavy equipment will move from direct to indirect once flame lengths exceed 8 feet.

The locations predicted to experience the highest flame lengths (>11 feet) are found in the northwestern portion of the District in the Manzano Mountains, largely in the heavy shrub fuel types (SH5). However, a number of areas classified as having potentially high flame lengths (>8 feet and >11 feet), particularly in areas of grass/shrub (GS2) and shrubland fuels (SH6 and SH5), are scattered throughout the southern and central portions of the District. One area particularly susceptible to high flame lengths is southwest of Corona, which creates a particularly high threat to that community, given the potential for strong winds from the southwest. A large portion of the landscape is predicted to exhibit low flame lengths (<4 feet); this is especially evident in the short- and moderate-length grasslands (GR1 and GR2).

Rate of Spread

Map 6 in Appendix A illustrates the classifications for rate of spread for the planning area. As was the case in 2008 the weather parameters used in the FlamMap run in 2016 used the weather parameters recorded during the Ojo Peak fire (i.e., 35 mile-per-hour winds) for consistence purposes. As a result the rates of spread appear contrary to conventional results (i.e., that rates of spread are higher in grasslands than in shrub and timber). The greatest rates of spread are predicted to occur in the shrubland fuels (SH5, SH6) that line the foothills of the Manzano Mountains, in the southern portion of the District south of the Torrance County line, and in and around Corona. Rates of spread in the remaining grass and timber fuels are expected to be moderate under these extreme

wind conditions. Agricultural and urban areas are clearly delineated in this model by their low rate of spread.

Crown Fire

Map 7 in Appendix A illustrates the predicted crown fire potential throughout the planning area. Crown fire activity in the District has been confined to areas of timber fuel (TL9 and TL8). These areas are primarily in the higher-elevation mountain areas in the west and south of the planning area. The remainder of the planning area is predicted to experience surface fire.

Spot Fire Potential

The FlamMap runs indicate active crowning in some areas, a situation that could generate spot fires. This fire behavior has been observed during recent fires throughout the planning area. Spot fires are fires that are caused by flying embers that can move ahead of the flaming front. These new ignitions pose a particular hazard in the mountainous terrain of the Manzanos because fire can be transmitted from the wildland fuels into the neighboring shrub and grasslands or into urban areas and forest in-holdings. Immediate suppression of spot fires is critical to prevent them from increasing the rate of spread and fire behavior, and it also can help firefighters from becoming trapped while fighting the main fire.

Fireline Intensity

Map 8 in Appendix A illustrates the predicted fireline intensity throughout the planning area. Fireline intensity describes the rate of energy released by the flaming front and is measured in British Thermal Units per foot, per second (BTU/ft/sec). Fireline intensity is a good measure by which suppression activities are planned. Direct attack by hand lines is usually limited to fireline intensity less than 100 BTU/ft/sec. For fireline intensity in excess of 100 BTU/ft/sec, indirect suppression is the dominant tactic. Suppression using engines and heavy equipment will move from direct to indirect with a fireline intensity over 500 BTU/ft/sec.

The pattern of expected fireline intensity throughout the District is similar to that of the predicted flame length because fireline intensity is a function of flame length. Flame length and fireline intensity are typically different in heavier fuels, such as timber. For example, if a fire is burning through heavy forest fuels on the ground surface, flame lengths may not be very tall, but the fireline intensity may be high due to the build-up of heat from the longer residence time of the fire burning in heavy fuel. High fireline intensity is predicted to occur in the shrubland communities (SH5 and SH6) in the Manzano and Gallinas Mountains and in additional shrub communities scattered throughout the planning area. The south-central portion of the District is predicted to have high fireline intensity, and the area southwest of Corona is predicted to have extreme fireline intensity.

Fire Occurrence and Density of Starts

Map 9 in Appendix A illustrates the fire occurrence density throughout the planning area. Fire occurrence density is determined by performing a density analysis on fire start locations with ArcGIS desktop Spatial Analyst. These locations have been provided by NMSF and the USFS as GIS points that show the location of fire starts within the project area over the last 46 years (1970–2016). The density analysis has been performed over a 5-mile search radius. The density of previous fire starts is used to determine the risk of ignition of a fire. Map 2 in Appendix A

illustrates the fire occurrence of the area, revealing a definite pattern of fires in the Manzano Mountains, on Cibola National Forest lands, and along the main highways, particularly Highway 60 and Highway 42.

It may be argued that areas that have burned previously are less likely to burn in the future due to lowered fuel loads, but regrowth after the burn and dead-and-downed fuels can contribute to increased fire risk in these previously burned areas. The fuels assessment used to determine the fuel models takes into account the fuel loading of recently burned areas as it is developed from 2015 Landsat imagery. Furthermore, the fire occurrence maps are used to provide information on areas where human-ignited and lightning-ignited fires are prevalent, indicating that these areas could be more prone to fire in the future.

4.3 RISK ASSESSMENT MODEL

4.3.1 GIS OVERLAY PROCESS

All data used in the risk assessment were processed using ESRI ArcGIS Desktop and the ESRI Spatial Analyst Extension. Information on these programs can be found at http://www.esri.com. Data were gathered from all relevant agencies, and the most current data were used.

All fire parameter data sets were "converted raster format" (a common GIS data format consisting of a grid of cells or pixels, with each pixel containing a single value). The cell size for the data is 30 × 30 m (900 m²). Each of the original cell values were reclassified with a new value between 1 and 4, based on the significance of the data (1=lowest, 4=highest). Prior to running the models on the reclassified data sets, each of the input parameters were weighted; that is, they were assigned a percentage value reflecting that parameter's importance in the model. The parameters were then placed into a Weighted Overlay Model, which "stacks" each geographically aligned data set and evaluates an output value derived from each cell value of the overlaid data set in combination with the weighted assessment. The resulting data set contains only values 1 through 4 (1=Low, 2=Medium, 3=High, 4=Extreme) to denote fire risk. This ranking shows the relative fire risk of each cell based on the input parameters. Figure 4.1 shows the individual datasets, the classes assigned to the data, and the relative weights assigned within the modeling framework.

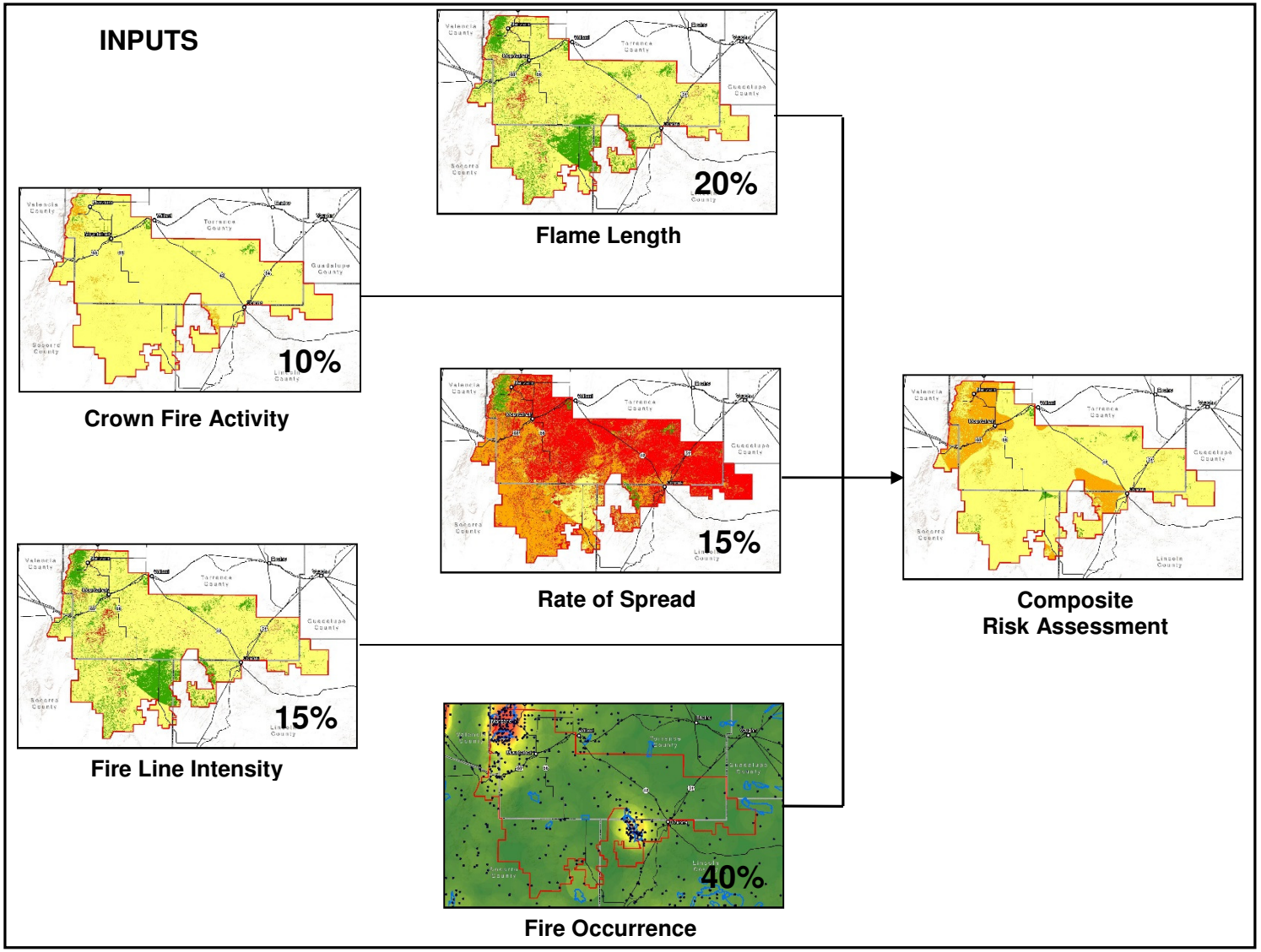


Figure 4.1. Risk assessment GIS layers.

4.3.2 RESULTS

Figure 4.2 depicts the risk assessment for the planning area combining all the fire behavior parameters described above. The risk assessment classifies the planning area into four risk categories: low, moderate, high, and extreme.

The risk assessment illustrates the high risk associated with the Manzano Mountain areas and south-central portion of the District. Extreme risk is scattered throughout these areas and is associated mostly with the dense shrub portion of the fuel complex (SH5 and SH6 fuels) and the timber-understory fuels (TU5). Some areas dominated by timber fuels (TL8 and TL9) are classified as moderate-to-high; the lower flame lengths and rates of spread in these fuel types explain the moderate classification, but crown fire activity raises some areas to high risk. This kind of extreme fire behavior was demonstrated during the Ojo Peak, Trigo, Big Springs, and Dog Head fires. The densest area of extreme risk is located southwest of Corona in an area of high-load, dry-climate shrub (SH5). This shrub fuel has a depth of 4 to 6 feet and burns with a very high rate of spread (50–150 ch/h) and very high flame length (12–25 feet). This area would therefore be a priority for fuels treatment. The greatest concentration of high-risk areas is still found along the western edge of the District from the Manzano Mountains in the north down to the Socorro County line. The central portion of the District is also a high-risk area, but it is at a distance from communities. The Cibola National Forest surrounding Corona and paralleling Highway 42 is also classified as high-risk. Areas that are classified as GR1 are seen as low-risk because the grass tends to be short, patchy, and discontinuous, either from grazing or naturally. The remainder of the District, largely the plains area, is classified as moderate-risk since the grassland fuels could exhibit fire with fast rates of spread and significant ignition potential due to the adjacent road network.

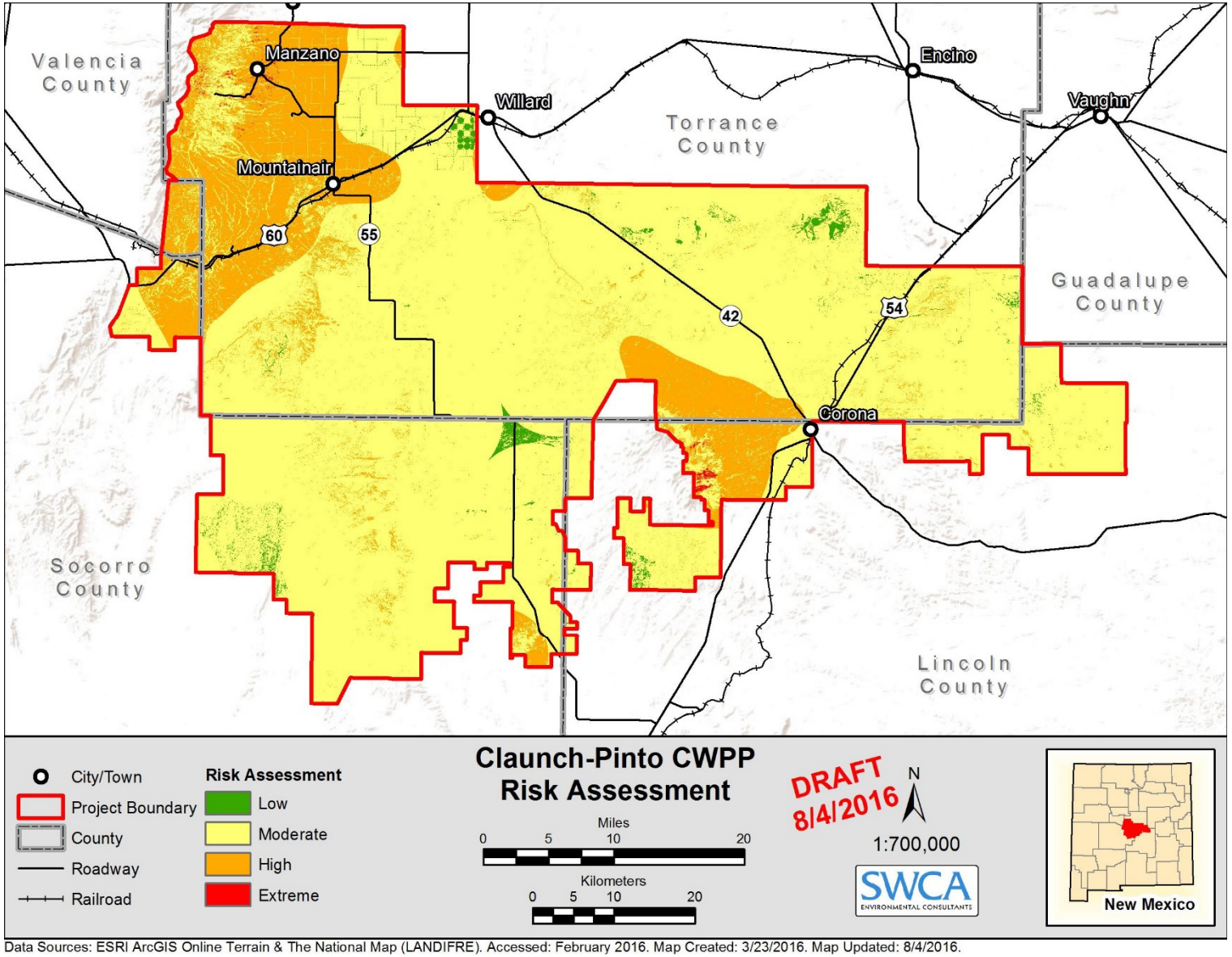


Figure 4.2. Composite Risk/Hazard Assessment.

4.4 COMMUNITY HAZARD/RISK ASSESSMENTS

The communities that were initially assessed in 2008 were revisited during this update to reassess the risk in the area. There have been a lot of changes within the project area since 2008 that may contribute to a lowering of risk ratings. One community surveyed during the 2008 plan, Sherwood Forest, which had been rated as extreme, was completely consumed during the 2008 Trigo Fire and was not visited during this update. The purpose of the reassessments and subsequent hazard ratings is to identify fire hazard and risks and prioritize areas requiring mitigation and more detailed planning. These assessments should not be seen as tactical pre-suppression plans or triage plans. The community assessments help to drive the recommendations for mitigation of structural ignitability and community preparedness as well as public education. They also help to prioritize areas for fuels treatment based on the hazard rating. Table 4.2 below shows the current risk rating compared to what the risk rating was in 2008 for these communities.

The community assessment was carried out using the National Fire Protection Association (NFPA) Wildland Fire Risk and Hazard Severity Form 1144 (NFPA 2008). This form is based upon the NFPA *Standard for Reducing Structure Ignition Hazards from Wildland Fire 2013 Edition*. The standard focuses on individual structure hazards and requires a spatial approach to assessing and mitigating wildfire hazards around existing structures. It also includes ignition-resistant requirements for new construction. It is used by planners and developers in areas that are threatened by wildfire and is commonly applied in the development of Firewise Communities/USA (Firewise 2006).

The assessments were conducted in May and June 2016, and they rated WUI areas based on conditions within the communities and immediately surrounding structures, including access, adjacent vegetation (fuels), defensible space, adjacent topography, roof and building characteristics, available fire protection, and placement of utilities. Some areas were not incorporated communities but were instead transport corridors or areas with similar environmental characteristics and hazards (Figure 4.3-Figure 4.5). Where a range of conditions was less easily parsed out, a range of values was assigned on a single assessment form. One limitation of the assessment strategy is that some homes are difficult to access or view from the road, sometimes reducing the accuracy of the rating. In these circumstances every effort was made to base ratings on as large a sample of homes as possible. Each score was given a corresponding descriptive rating of low, moderate, high, or extreme. An example of the assessment form used in this plan can be found in Appendix F.

Table 4.2. District Community Hazard Ratings

Community/WUI Planning Area	2016 NFPA 1144 Risk Rating	2008 NFPA 1144 Risk Rating	Composite GIS Risk Rating	Positive	Negative
Forest Road 422	103 (High)	103.5 (High)	High	• Sparsely populated	• Poor ingress/egress • Narrow road width with limited turnaround space • Poor signage • Utilities are above ground • No water available • Limited defensible space: >30 feet of defensible space around most homes, but <100 feet around many • >5 miles from fire station
Manzano Land Grant	83 (High)	91.5 (High)	High	• Manzano Lake provides a source of water • Recent thinning projects above the community • Fuel break work has been done in some areas • Metal Roofs have been installed on some homes	• Poor ingress/egress • Narrow road width with limited turnaround space • Poor signage • Utilities are above ground • Limited defensible space: >30 feet of defensible space around most homes, but <100 feet around many • >5 miles from fire station
Punta de Agua	72 (High)	84.0 (High)	Moderate	• Surfaced/maintained roads • Well signposted • Metal roofs have been installed on some homes • Mowing occurs on some of the private lands.	• Utilities are above ground • Limited defensible space: >30 feet of defensible space around most homes, but <100 feet around many • >5 miles from fire station • Lots of flashy fuels
Loma Parda	93 (High)	83.5 (High)	High	• More than one access road • Low slope in most areas, some steep sections • Roofs tend to be of low combustibility	• Narrow road width with limited turnaround space • Poor signage • Utilities are above ground • Limited defensible space: >30 feet of defensible space around most homes, but <100 feet around many • Limited water availability • >5 miles from fire station
Deer Canyon Preserve	80 (High)	82.0 (High)	High	• Excellent signage • Fuel break work has been done adjacent to Preserve on State Lands • Homes are made of low-combustibility materials • Some water available • Below ground utilities • Property owners have implemented some defensible space work and fuel reduction • Fuel break project completed on adjacent State Lands	• Poor ingress/egress, with one road in and out • Narrow road width with limited turnaround space • >5 miles from fire station • Surrounded by dense fuels on public lands • Limited water

Community/WUI Planning Area	2016 NFPA 1144 Risk Rating	2008 NFPA 1144 Risk Rating	Composite GIS Risk Rating	Positive	Negative
Game Road	71 (High)	81.0 (High)	Moderate	• Fuel loads have decreased since 2008 due to the Ojo Peak fire	• Poor ingress/egress • Narrow road width with limited to no turnaround space • Poor signage • Utilities are above ground • Limited defensible space: >30 feet of defensible space around most homes, but <100 feet around many • Heavy vegetation regrowth following Ojo Peak Wildfire • Limited water availability • >5 miles from fire station • Dense fuels due to regrowth after Ojo Peak Wildfire
Corona	90 (High)	79.5 (High)	High	• Well signposted • Surfaced/maintained roads	• Poor ingress/egress • Narrow road width with limited turnaround space • Poor signage • Utilities are above ground • Limited defensible space: >30 feet of defensible space around most homes, but <100 feet around many • Limited water availability • Access issues if train stopped in town • Structures built against the slopes
Mountainair	65 (moderate)	63.0 (Moderate)	Moderate	• Surfaced/maintained roads • Well signposted • Adjacent fuels are light • Surfaced roads and adequate width and turnaround • Low slope in most areas, some steep sections • Adjacent wildland to west and north are grass • Limited recent fire history	• Limited defensible space: >30 feet of defensible space around most homes, but <100 feet around many • Mix of construction types. Building construction includes wood siding, wooden decks, and fences that can act as fuses from vegetation to homes. • Utilities are above ground • CVAR: Historic Shaffer Hotel

Figure 4.3. Game Road.

Figure 4.4. Loma Parda.

Figure 4.5. Lots of dead fuels within Deer Canyon Preserve, however strict building codes are enforced.

Camps

A number of summer camps in the District have unique fire hazards. These camps are the Manzano Retreat, Inlow Youth Camp, SUFI camp, I00F Camp, and Whirling Winds Ranch. These camps were not readily accessible and were therefore not included in the formal assessment process. General characteristics, however, are as follows:

- Many of the camps have poor ingress and egress (i.e., Fourth of July campground) and are usually occupied by large numbers of individuals (most often children) with limited available transport for emergency evacuation.
- The camps tend to be located in remote, forested vegetation with higher fire hazard.
- The camps are usually occupied during the height of fire season, during the early summer months.
- Many occupants are from outside areas and are therefore difficult to reach through District and County fire education efforts.
- Large concentrations of people may increase the probability for human-ignited fires.

Because of the fire hazards associated with these camps, proactive measures to implement defensible space as well as comprehensive programs of fire education, emergency evacuation, and fire safety for camp staff and participants is critical. An excellent example of the benefits of defensible space was demonstrated by the Manzano Retreat during the Trigo fire (Figure 4.6 and Figure 4.7). These actions should serve as examples to others on how to reduce the impact of wildfire in these forested camp communities.

Figure 4.6. Defensible space that prevented the Trigo fire impacting structures at the Manzano Retreat. *Source: Manzano Retreat*

Figure 4.7. Thinning treatments that reduced burn severity resulting from the Trigo fire in stands neighboring structures at the Manzano Retreat. *Source: Manzano Retreat*

The community risk assessments and input from the public and from the Core Team was used to compile a table of communities at risk as required by the NM-FPTF. A copy of this list can be found in Appendix G. Note: The risk assessment and communities at risk list does not discriminate between communities based on the value of homes or land.

4.4.1 COMMUNITY VALUES AT RISK

Earlier compilation of the critical infrastructure in the planning area coupled with the community assessments, public outreach, and Core Team input helped in the development of a list of CVARs from wildland fire. The WUI boundary was developed and expanded to encompass these CVARs. It is important to note that although an identification of CVARs can inform treatment recommendations, in order to fully prioritize areas for treatment a number of considerations are important, including appropriateness of treatment, landownership constraints, locations of ongoing projects, available resources, and other physical, social, or ecological barriers to treatment.

The scope of this report does not allow determination of the absolute natural, socioeconomic, and cultural values that could be impacted by wildfire in the planning area. In terms of socioeconomic values, the impact due to wildfire would cross many scales and sectors of the economy and would call upon resources locally, regionally, and nationally. To understand the breadth of such an impact, land-managing agencies and local communities may guide efforts towards completing a comprehensive economic and demographic analysis in relation to wildfire impacts. This CWPP may be used to identify priority areas and communities that could experience the greatest economic strain. To achieve a finer-grained analysis of the smaller jurisdictional and community wildfire concerns, it is suggested that communities included in the CPCWPP pursue further funding to complete a community-level CWPP.

Natural Community Values at Risk

The public outreach efforts have emphasized the importance of natural and ecological values to the general public. Examples of natural values identified by the public and the Core Team include:

- Manzano Spring and Lake
- riparian areas
- maple trees
- the ponderosa pine ecosystem
- native species
- wildlife habitat and wildlife preserves
- habitat for endangered species
- water resources
- wetlands
- air quality
- scenery

Socioeconomic Community Values at Risk

Socioeconomic values include population, recreation, infrastructure, agriculture, and the built environment. Examples of socioeconomic CVARs that lie within the WUI zones of the CPCWPP include:

- wood cutting
- grazing
- livestock economy
- livestock tanks
- water wells
- Manzano State Park
- Red Canyon
- Manzano Retreat, Inlow Youth Camp, SUFI Camp, I00F Camp, and Whirling Winds Ranch
- utilities (e.g., power and communication)
- Capilla Peak
- water supply
- acequias
- bridges
- Burlington Northern Santa Fe Railroad
- trails and access roads
- residences
- community facilities (e.g., fire departments, community centers, senior's centers, businesses, hospitals, schools, churches)
- agricultural land
- signage
- livestock and fodder
- security and privacy
- heavy equipment
- parks and recreational areas

Cultural Community Values at Risk

A large number of historical resources are present in the planning area, including churches, agricultural structures, village sites, and many historic civic and private buildings. Many of these historic cultural resources maintain their use and purpose within the neighborhoods that surround them; they also may be recognized as critical social infrastructure. The Core Team has helped to generate a list of cultural CVARs that should be protected in the event of a wildfire, including:

- Historic Shaffer Hotel in Mountainair
- Salinas Pueblo Missions (National Park Service): Gran Quivira (Figure 4.8), Quarai, and Abo
- Catholic churches in mountain communities (Figure 4.9)
- Cemeteries
- Downtown Mountainair and associated buildings
- Dr. Saul Ross Community Center
- schools
- historical cabins
- continuing ways of life
- recreation
- hunting

Figure 4.8. Gran Quivira.

Figure 4.9. Manzano Church with the Dog Head Fire burning in the background.
Source: Cody Stropki

5.0 RECOMMENDATIONS AND ACTION ITEMS

This section addresses four types of recommendations: (1) public education and outreach, (2) actions homeowners and communities can take to reduce structural ignitability, (3) actions to improve firefighting capability, and (4) fuels-reduction projects. These recommendations are based on Core Team input, public outreach, the GIS risk assessment, and the community risk assessments. The recommendations are general in nature to provide maximum flexibility in implementation. Potential funding opportunities that may be used for implementation of the recommendations are found in Appendix H.

5.1 PLANS AND PROJECTS THAT GUIDE AND RELATE TO THE CPCWPP

Many guidance documents and projects are already in place in the CPCWPP planning area. Future fuels treatments within the District should be carried out in conjunction with ongoing treatments and projects to improve efficiency and effectiveness. The following is a summary of projects that have been or are being carried out throughout the planning area. This list is by no mean exhaustive, but it highlights some of the major projects related to this CWPP.

Claunch Pinto Soil and Water Conservation District Land Use Plan (Completed)

In 2015-2016, the CPSWCD updated their land use and management plan. This plan is an executable policy for natural resource management and land use on the lands within the District. It adheres to the legislative purpose of the Act and for those measures will serve to conserve and develop the natural resources, provide for flood control, preserves wildlife, protect the tax base and promote the health, safety and general welfare of the people of this District. It provides a scientifically and culturally sound framework for resource planning objectives. There is an identified need to promote public understanding that land and water is the most important resource within CPSWCD, and that, as such, it must be used in a sustainable way.

Socorro County Community Wildfire Protection Plan (Completed)

In 2006, Socorro County, in collaboration with various stakeholders including fire managers and land management agencies, developed a countywide CWPP. This document endeavored to "ensure that the health, safety, and welfare of the citizens of Socorro County remain secure from the threat of wildfire in the urban interface" (Socorro County 2007).

Village of Corona Fire Plan (Completed)

In 2004, the Village of Corona produced its own plan to reduce the potential for and the consequences of wildfire within the community. As part of the process, each structure within the village was assigned a fire hazard rating and was included in a list that detailed the particular hazards at each site. Evacuation routes and water sources were also assessed. A map of large stock tanks was included in the plan as possible back-up water sources. Based on recommendations outlined in the plan, the village now has a dedicated pond that can be used for helicopter dipping or drafting in the event of a large wildfire. Addresses have also been established and marked. Several fuels reduction projects were recommended as part of the plan, but implementation of them has been slow.

Torrance County WUI Area Inventory Assessment (Completed)

The Torrance County WUI Assessment (2003) identified areas of WUI within the County. Information was gathered for the report by Torrance County government officials, the National Park Service, the USFS, and the State of New Mexico's Southwest Areas Wildland Fire Operations Group.

The Interagency Fire Protection Association was also used as a resource for the plan, and it assigned hazard ratings for properties across the County. Although many properties were rated as low-hazard, several residential developments were considered high-hazard and in immediate need of mitigation. The plan also identified the limited water supplies for fighting fire as a widespread and crucial issue.

Torrance County Emergency Operations Plan

This 2006 document details the processes and procedures in case of an emergency in Torrance County. The Plan was developed through the Torrance County Emergency Services Director's Office with the cooperation and assistance of the Torrance County Local Emergency Planning Committee. The Plan applies only to response within the unincorporated portions of Torrance County. However, mutual aid agreements exist between the municipalities of the City of Moriarty, Town of Estancia, Town of Mountainair, Village of Encino, and Village of Willard and were considered in the preparation of the Plan. This plan identifies the existing natural and human-made emergency hazards having the potential of causing a disaster affecting a portion, or all of the population and area of Torrance County. The Plan addresses hazard mitigation, disaster planning, preparation, response, and recovery. It provides for an overall coordinated and integrated countywide disaster management organization with each incorporated community providing initial response and disaster management within its own jurisdiction.

Torrance County Hazard Mitigation Plan

Updated in 2015, this plan identifies and profiles the natural and human-caused hazards that can affect Torrance County, assesses the County's vulnerability to these hazards, and identifies alternative mitigation actions. The Plan also includes an implementation strategy for preferred mitigation actions as selected and prioritized by a multi-jurisdictional, community-based planning team. The Plan was created using support from the New Mexico Office of Emergency Management and the Federal Emergency Management Agency (FEMA). The document identifies relevant hazards and provides guidelines to avoid or minimize vulnerability to these hazards (Torrance County 2007, 2015).

New Mexico Non-native Phreatophyte/Watershed Management Plan

This plan was developed in 2005 based on consultation with the State of New Mexico's SWCDs and through the efforts of an interagency workgroup composed of members of numerous state agencies: the New Mexico Department of Agriculture; the New Mexico Energy, Minerals, and Natural Resources Department; the New Mexico Environment Department; the New Mexico Indian Affairs Department; and the New Mexico Office of the State Engineer. The purpose of the collaborative plan is to provide guidance for control of non-native phreatophytes and to set forth methods for monitoring, revegetation, rehabilitation, and long-term watershed management activities (New Mexico Department of Agriculture 2005). The District's Abo Arroyo Program has

been developed in compliance with this plan and is actively implementing the recommendations locally. The District has partnered with numerous land management agencies to develop the Abo Arroyo Program whose goal is the extensive eradication of saltcedar, a non-native plant that has invaded the riparian areas throughout the region (Natural Resources Conservation Service [NRCS] 1998). The program is unique in its watershed approach, tackling the saltcedar infestation from the headwater seed source at Gyp Spring and along miles of channel downstream.

5.2 PUBLIC EDUCATION AND OUTREACH AND COMMUNITY PREPAREDNESS

Needs for public education and outreach have been emphasized throughout the CPCWPP process by all participating parties. Many of the survey respondents felt that community education and communication were some of the most important actions to make the community better prepared for wildfire. Table 5.1 lists recommendations for improving public education and outreach.

The biggest challenge in increasing public understanding of wildfire issues in this area is reaching community members. One theme that came up repeatedly was that many local residents do not consider themselves a part of any particular community. It is difficult to communicate with a large but diffuse population that is generally not organized into units such as townships or even neighborhood associations. Furthermore, many of the grassland communities appear to perceive themselves as living in areas of low risk of fire. This was evident from poor attendance at public meetings designed to accommodate grassland areas of the District and County. The local SWCDs are currently the most active conduits at reaching the diverse population. Land grant associations, churches, and schools may be other possible targets to help reach out to community members. The recruitment of volunteer neighborhood leaders to participate in planning efforts or attend workshops on fire behavior and defensible space may provide another option to disseminate the available information.

Overall, public perception of risk in the CPCWPP area has changed significantly since 2008 when only 15% of the survey respondents rated the chances of losing their property to wildfire as high. Survey results from 2016 show that over 64% of the survey respondents are extremely concerned about wildfire in the area, and 31% are moderately concerned. The wildfires that happened in 2007-2008 likely had a lot to do with people changing their sentiment on wildfire. Also during the 2008 plan there was a large active group that opposed any treatments done for fire protection, however, a majority of that group lost homes and relocated to other areas following the Trigo Fire. Although the risk may be low in some parts of the planning area like in 2008, the results of the 2016 comprehensive hazard assessment conducted for the CPCWPP still indicated pockets of high or extreme risk throughout the planning area. The community assessments also indicated extreme or high levels of risk for many neighborhoods. Without an understanding of fire behavior and/or suppression tactics, homeowners often lack the knowledge to accurately assess risk (Donovan et al. 2007). Based on the feedback received from local partners and the on the ground community assessments, many homes that are vulnerable to wildfire could be better protected with the adoption of basic defensible space practices.

Much of the public education about wildfire risk and mitigation is provided by the media through newspapers, radio, or television. The type of coverage and the level of detail provided by these sources influence how and what people choose to do. By sponsoring a regular column in a local newspaper or public service announcement (PSA) on local radio on fire management, the fire

message could be consistently delivered throughout the year. This effort would help to keep wildfire on people's radar even when it is raining outside. The column or PSA could provide information on fire behavior principles and local fire management activities, as well as guidance on creating household emergency plans and defensible space.

Perhaps the single most critical need for wildfire education and outreach in the CPCWPP area is regarding the importance of defensible space. The widespread lack of defensible space across the CPCWPP area indicates that more attention is needed to communicate the defensible space message and facilitate implementation of the practices. Efforts to improve defensible space will therefore require a two-pronged approach that facilitates both education and implementation. More discussion of defensible space implementation is provided under Section 5.5 in this document. Although information on defensible space and Firewise principles is widely available, it often fails to reach the intended audience or is ineffective once it gets there (McCaffrey 2004). The development of a local defensible space checklist and homeowner's guide (see Appendix I) would ensure that the information addresses the on-the-ground situations.

Researchers have also found that the public perceives wildfire as a large catastrophic event beyond their control and immune to their mitigation efforts (Winter and Fried 2000). Local residents may have recently developed this attitude as they watched the extreme fire behavior exhibited during the Ojo Peak, Trigo, Big Springs and Dog Head fires. In the wake of those events, it is crucial that defensible space education begin as quickly as possible and reach as many homeowners as possible. An excellent model for reaching homeowners who perceive wildfire as an uncontrollable risk is provided by the Los Alamos County Defensible Space Project, which helped to educate residents and implement hazardous fuels reduction for residences that had not been impacted by the Cerro Grande Fire. The multifaceted approach included logo development, neighborhood informational events, school educational programs, and the use of thinning contractors to implement mitigation work on private property. In three years of program implementation, the project helped to protect more than 2,000 residences from the threat of future wildfires and educated thousands of residents about defensible space concepts.

Local teachers are already engaged in some ecological monitoring and education related to fire and fuels management. Targeting students across all grade levels with fire education increases student understanding of real-world natural resource management issues and broadens the general audience for fire education. Although only a portion of the residents have school-aged children, school programs have been highly effective in other regions for helping to educate residents about fire management (McCaffrey 2004). The FireWorks curriculum, developed by fire scientists at the Missoula Fire Science Lab, is a well-designed program that has an excellent track record. Providing local trainings for teachers to implement and customize curriculum would increase application of this existing system. Funding for the purchase of the FireWorks box would provide local teachers with existing activities and tools to use in the lessons. See http://www.firelab.org/project/fireworks-educational-program for more details.

It has been clear in developing the CPCWPP and during the recent wildfires (Trigo and Dog Head) that many homeowners do not understand emergency response procedures and have not communicated with family members or neighbors about what to do in the event of a wildfire. Education regarding the preparation of a household emergency plan is frequently provided by the American Red Cross and other fire preparedness organizations like Ready, Set, Go, Firewise and

Fire Adapted Communities. This information could be improved through participation of local fire departments to help residents understand what happens before, during, and after a fire. Using worksheets and facilitating the development of these plans at community meetings would help to ensure that the plans get created and do not remain abstract ideas. This activity can be conducted at a minimal cost and would serve to increase preparedness and reduce panic during a wildland fire event.

In many fire-prone areas, the majority of homeowners are insured against wildfire losses. In many of the high-risk areas identified in this CPCWPP, however, homeowners are unable to obtain insurance for losses related to wildfire. The dearth of suppression resources and water supplies coupled with the remote location of many residences across the region mean that homeowners have no safety net in the event of a wildfire. As a case in point, local residents who suffered losses from the Ojo Peak, Trigo, Big Springs and Dog Head fires carried no insurance for wildfire and are ineligible for federal assistance, so their ability to rebuild their homes will depend entirely on private fundraising. With an even larger wildfire and greater number of home losses, the local economy could be devastated by this situation. Oversight for private insurance companies is provided by the New Mexico Public Regulation Commission. By bringing representatives of that agency together with fire and emergency personnel and local community members in a concerted effort, it is possible that barriers to coverage and possible solutions could be identified. More widespread insurance coverage would greatly improve the capacity of local communities to prepare for and recover from wildfire losses in the WUI.

Table 5.1. Recommendations for Improving Public Education and Outreach

Project	Project Description	Presented by	Target Date	Resources Needed	Serves to
Mobile Wildland Fire Workshop	Have a mobile display that can be used to present fire awareness at community and partner events.	SWCDs	2016	Funding is secured and a mobile display should be developed and in use by August 2016.	Educate general public on what can be done before a fire to keep property and life protected.
Media involvement	Develop a local newspaper column that provides fire safety information, promotional information for volunteer fire departments, fire announcements, and emergency planning.	Community fire representative or agency outreach personnel	Annually	Columns, information, and articles to be provided by fire departments, city, county, state representatives.	Protect communities and infrastructure through increasing public awareness and providing a channel for information regarding emergency fire response.
Homeowner's guide	Develop a handbook that gives locally relevant and detailed information to help residents be more prepared for wildfire, including a defensible space checklist specific to local structural and wildland fuel considerations.	SWCDs, local fire departments, State Cooperative Extension agents	Within 2 years	Funding to develop and print copies of the handbook. Volunteers to help distribute and explain the document.	Give residents detailed and locally-specific tools that they can use to improve preparedness.
Educational curriculum	Continue to work with the local schools to provide support to local teachers on fire and watershed curriculum.	Local schools	Annually	Development of curriculum.	Educate youth in grades 8–12 about forest ecology and restoration and fire ecology and management.
Defensible space workshops	Hold annual workshops at the District office aimed at the education of homeowners about why and how to create effective defensible space including the different funding sources available.	SWCDs, Community fire representative or agency outreach personnel	Annually	Written materials, trained personnel.	Empower homeowners to make affordable and effective changes to reduce the vulnerability of individual homes.
Targeted wildfire info sessions	Review existing programs (Ready, Set, Go!; Firewise) for suitability of existing fire prevention materials and where necessary fund development of unique adapted materials and presentations to highlight how a fire might affect particular groups in the community.	Community fire representative or agency outreach personnel	Within 2 years	• Funding for research, writing, and presentation of detailed information on how large-scale wildfire would affect the target audience and the measures that could be taken to reduce the threat. • Flyers could be send out to district and partners mailing lists	Deliver a clear and consistent message that impacts of wildfire are far-reaching and that it is in the best interest of a diverse set of stakeholders to become involved in planning and preparing for fire.
Homeowner's insurance task force	Invite Insurance Brokers to speak to groups regarding ways to improve insurance ratings in the community.	Insurance agencies, State Public Regulation Commission, county fire departments, and community representatives	2 years	Resources provided by Insurance Services Office. Venue provided by fire department.	Communities can learn how to improve their insurance ratings, which will reduce insurance costs in their community by implementing wildfire prevention measures.

Project	Project Description	Presented by	Target Date	Resources Needed	Serves to
Implement Firewise Communities programs	Work with communities to participate in Firewise Communities and prepare for fire events. Hold Firewise booths at local events for example during the October Fire Awareness Week each year.	SWCDs, Community fire representative or agency outreach personnel	2 years	Firewise Communities educational materials.	Protect communities and infrastructure through increased awareness and defensible space.
Increase signage regarding fire danger. Consider installing electronic sign in high-risk areas that can have updated messages.	Add additional fire signage throughout the community to spread message of fire danger and reduce human ignitions.	SWCD, USFS, County's	2 years	Cost of signs and installation.	Protect communities and infrastructure by raising awareness of local citizens and those travelling in the area about actions to prevent wildfire ignitions.
Promote and increase the use of prescribed burning as a fuels reduction method	Gain more public support for the use of prescribed fire to reduce heavy fuel accumulations on public lands. Consider developing informational material for distribution to local residents. Locate mobile display at Ranger Stations and SWCD centers.	SWCD, USFS, County's	2 years	Prescribed burn prescriptions, type 6 engines, hand crews, equipment. Research and costs of producing printing and distributing informational flyer.	Protect communities and infrastructure by reducing fuel loads.
Plan livestock evacuation routes and inform communities	Work with emergency management officials to plan evacuation of livestock and pets and then develop into an informational brochure that could be appended to the CWPP and posted on County Emergency Management websites.	Emergency Management officials, livestock agencies.	1 year	Labor time for research and development of brochure.	Protect communities, livestock and infrastructure through increased awareness. Expedites evacuation of residents in event of mandatory evacuation.

5.3 IMPROVING FIREFIGHTING CAPABILITIES

Improving community preparedness for wildfire calls for greater collaboration among emergency responders, emergency managers, and fire departments. Fire departments often have limited resources, particularly in high fire years; therefore, gaining funding to strengthen these services is critical. Throughout the CWPP planning area, volunteer fire departments provide the first line of defense against wildfire. Increasing staffing and improving equipment for these departments is crucial. Educating the public so they can reduce their dependence on fire departments is also essential. Greater emergency planning for communities is necessary, particularly those communities in areas where response times for emergency services may be greater than in municipal zones.

The availability of water is an important firefighting capability component in the area. Most fire departments in the area have metal roofs and large water storage tanks. The installation of gutter and pump systems to harvest rainwater would augment the supply for the stations and reduce competition with other water users. Many fire departments in the area could utilize tenders that could maintain significant volumes of water closer to a fire. The CWPP surveys included questions about water supplies. A few new sources were identified by fire personnel through the survey process. Additionally, more detailed mapping of water sources throughout the area would improve response and turnaround times for fire trucks. Table 5.2 provides recommendations for improving firefighting capabilities.

Table 5.2. Recommendations for Improving Firefighting Capabilities

Project	Fire Department	Possible Solution	Timeline	Contact
Overhaul maps used by fire responders across county jurisdictions	Torrance County, Socorro County, Lincoln County,	Seek funding to aid the overhaul of county maps and make them available in GIS and global positioning system (GPS) data for fire responders. Update home occupancy information on an annual basis, and input information on maps.	2 years	County managers and rural addressing
Increase volunteer fire department recruitment (diversify age classes)	Torrance County, Socorro County, Lincoln County	Target fire education in schools to encourage younger generations to become interested in firefighting. Carryout recruitment drives through open house and mailings.	Annually	County fire marshals
Increase funds for volunteer fire department	Torrance County, Socorro County, Lincoln County	Maintain contact with state fire marshals and regularly seek grant money. Introduce a fire district tax levy. Implement regular evaluations of resource needs for each volunteer fire department and make available to public to raise awareness of shortages. Use local media to inform public of fire resources situation. Work with editor to have a year-round column that documents fire department activities.	Annually	County emergency managers and county managers to approach county commissioners to raise the issue in commissioner meetings
Train volunteer firefighters	Torrance County, Mountainair, Lincoln County, Socorro County	Provide stipend to volunteer firefighters to improve participation in 3-week training course.	2 years	County fire marshals
Increase volunteer fire department water supplies	Priority is Torrance County as closest responders for the District	Seek funding to implement rain water harvesting on all volunteer fire department buildings and other county properties. Need to ensure that water supply for volunteer fire department does not impinge on municipal supply.	2 Years	Fire department chiefs
Map suppression water sources	Torrance County, Socorro County, Lincoln County	Seek funding to identify stock tanks, water storage tanks, and hydrants, as well as funding to provide upkeep for these suppression sources and to provide retrofitting to allow utilization by fire departments. Important to differentiate between ephemeral and perennial water supply. Add water resources to the GIS maps so dispatchers can direct fire crews to available supplies.	2 Years	SWCDs, Farm Service Agency, NRCS, NMSF
Install more road signs	Priority is Torrance County	Continue efforts to improve road signage and coordinate with mapping efforts to ensure consistent naming conventions.	2 years	Torrance County, New Mexico Association of Counties funding
Install high visibility road markers	Priority is Torrance County	Seek funding to install road markers that would illuminate major roads in the event of heavy smoke.	2 years	Torrance County
Predetermine shelter for public in event of evacuation	Torrance County, Valencia County, Socorro County, Lincoln County, Guadalupe County	Work with local schools, community groups, and neighboring counties to establish a preplan in the event of large-scale evacuation.	2 years	County emergency planners
Preplan staging areas	Torrance County, Valencia County, Socorro County, Lincoln County, Guadalupe County	Work with local schools, community groups, and neighboring counties to establish a preplanned staging area for suppression sources and crews.	2 years	County emergency planners
Improve agency and public coordination	Torrance County, Lincoln County, Socorro County, Guadalupe County	Identify local figureheads and form an emergency planning and fire management task force to establish better coordination among the District, counties, agencies, and the public in the event of a large wildfire. Use local experience and established community networks to improve relationship between stakeholders.	Annually	All SCWDs, fire departments, USFS Mountainair District, National Park Service, NMSF

Project	Fire Department	Possible Solution	Timeline	Contact
S130-190 Basic Wildland Fire Training	Torrance County, Socorro County, Valencia County, Guadalupe County, Lincoln County	Provide free training program for public and local heavy equipment contractors to generate greater recruitment in volunteer fire departments and to make available local personnel and equipment to use in fire suppression activities.	Annually	NMSF, USFS
Increase fire management awareness to the public	Torrance County, Socorro County, Valencia County, Guadalupe County, Lincoln County	Provide open-house days at volunteer fire department and Firewise events that increase public awareness of the processes involved in fire management in each county. This would provide a avenue through which to disseminate information regarding evacuation procedures.	Annually	District, NMSF, USFS
Increase inventory of 4×4s and brush trucks	Torrance County as closest responders	Continue to seek grant money to purchase vehicles and increase communications with the state regarding lack of inventory.	Annually	Torrance County
Provide personal protective equipment for all firefighters	Torrance County as closest responders	Focus future funds and grant requests on purchasing personal protective equipment for all volunteer firefighters.	Annually	Torrance County

5.4 REDUCING STRUCTURAL IGNITABILITY

Homes and structures throughout the CWPP planning area are vulnerable to wildfire. The Community Hazard/Risk Assessments revealed a number of common problems on private land:

- Poor defensible space. Few homes had greater than 30 feet of clearance
- Poor building construction with combustible siding and decks
- Limited access and few adequate turnarounds
- Structures built mid-slope and with limited setback, particularly in Deer Canyon Preserve
- Limited water availability and limited water storage
- Distance from fire station (for some communities)
- Empty lots and limited yard maintenance
- Density of homes and adjacency, specifically in Corona
- Blocked driveways and locked gates
- Poor signage and no driveway markers
- Un-surfaced and narrow roads

Table 5.3 provides a list of community-based recommendations that should be implemented throughout the CPCWPP planning area to address the issues revealed by the Community Hazard/Risk Assessment. For the purposes of this document, actions to reduce structural ignitibility are focused primarily on the 30- to 100-foot radius zones closest to the house (Figure 5.1). Treatments farther than 100 feet from the house are discussed in Section 5.5 Hazardous Fuels Reduction Treatments.

Reduction of structural ignitability depends largely on public education that provides homeowners the information they need to take responsibility for protecting their own property. Section 5.4.1 provides a list of action items that individual homeowners can follow. Carrying out fuels reduction treatments on public lands may only be effective in reducing fire risk to some communities; however, if homeowners have failed to provide mitigation efforts on their own land, the risk of home ignition remains high, and firefighters' lives are put at risk when they carry out structural defense. Firefighting resources in these rural areas are minimal and are likely to be stretched thin across the County during a widespread wildfire; this situation highlights the importance of educating homeowners on mitigation efforts they can take to protect themselves and their property. Preparing for wildland fire by creating defensible space around the home is an effective strategy for reducing structural ignitability. Studies have shown that burning vegetation beyond 120 feet of a structure is unlikely to ignite that property through radiant heat (Cohen and Butler 1996), but fire brands that travel independently of the flaming front have been known to destroy houses that had not been impacted by direct flame impingement. Education about managing the landscape around a structure, such as removing weeds and debris within this 30-foot radius and keeping the roof and gutters of a home clean are two methods for creating defensible space. Educating people about the benefits of cutting trees and using Firewise landscaping methods on properties is also essential for successful household protection.

It is important to note that no two properties are the same. Homeowners and communities are encouraged to research which treatments would have the most effect for their properties. Owners of properties on steep slopes, for example, should be aware that when constructing defensible space they have to factor in slope and topography, which would require extensions to the conventional 30-foot recommendations. A number of educational programs are now available to homeowners and are available through local fire departments or NMSF; Firewise Communities/USA is one example of such a scheme (www.firewise.org).

Since the development of the 2008 Plan, the CPSWCD has moved into a new building located just outside Mountainair on xx acres. This new facility allows the District to accept slash from homeowners that maybe generated during fuel-reduction projects that are looking to reduce structural ignitability. The District also owns two chippers that are commonly used on fuel-reduction projects as well as at the local transfer stations. The District also rents the chippers to private landowners for a nominal fee.

Table 5.3 provides ideas for community projects to reduce structural ignitability. This is followed by a list of action items for individual homeowners to follow.

Table 5.3. Actions to Reduce Structural Ignitability

Project	Private Lands / Homeowner	Public Lands	Programs Available	Description	Contact	Priority
Strengthen building codes	Torrance County, Socorro County, Valencia County, Lincoln County	None	International Wildland Urban Interface Code	ICC code enforces building codes and ordinances for new development in the WUI.	State fire marshal	M
Construct defensible space	All residents would be encouraged to participate	None	Firewise Communities/USA, NMSF, local fire department liaison	Educate homeowners about defensible space practices. Remove all but scattered trees within 30 feet of structures. Keep grass mown and green within 100 feet of structure. Keep flammable materials at least 30 feet from structure. Surround foundations with rocks or gravel to a width of 1 feet.	www.firewise.org or local NMSF Firewise-trained personnel. Possible land ownership assistance program through Socorro County. NMSF-sponsored program. Requires preparation of a Wildfire Mitigation Cost Share Assistance Application. Refer to Socorro County CWPP (2007).	H
Participate in defensible space cost-sharing programs	All private land within the CPCWPP area would be eligible	None	SWCDs already offering these programs	This project would provide additional funding to SWCDs to expand existing program and target new participants.	SWCD managers (Dee Tarr–District) (Cheri Lujan-–East Torrance SWCD) (Brenda Smythe–Edgewood SWCD)	H
Implement community chipper days	All residents would be encouraged to participate	None	District	A chipper and operator would be provided free of charge in a central location for residents to bring small trees and brush. Chips could remain at chipper location or be utilized by participants.	Dee Tarr (The District has a chipper that is rented out to community members in the District).	H
Offer fire protection workshops	All residents would be encouraged to participate	None	Community fire liaison, agency outreach personnel, District Partners	Offer hands-on workshops to highlight individual home vulnerabilities and teach how-to techniques to reduce ignitability of common structural elements. Examples include installing metal flashing between house and fence or deck, and installing wire mesh over eaves, vents, and under decks.	State Firewise personnel, USFS, Mountainair District liaison	H
Assess and improve accessibility to property	All residents would be encouraged to participate	None	Fire departments, code enforcement officers	Inform homeowners about the importance of keeping driveways accessible to fire trucks and emergency responders.	Local fire departments	M
Implement rural addressing	All residents would be encouraged to participate	None	County Rural Addressing Department	Inform homeowners about the availability of rural addressing signs.	Torrance County Rural Addressing	M

Project	Private Lands / Homeowner	Public Lands	Programs Available	Description	Contact	Priority
Provide a list of mitigation measures to homeowners with different scales of actions	All residents would be encouraged to participate	None	Fire departments, Firewise Communities/USA, NMSF literature, USFS literature, academic and peer-reviewed literature	See list of action items below (Section 5.4.1).	SWCDs, NMSF, fire departments	H
Encourage Backyard Tree Farm Activities	All residents would be encouraged to participate	None	SWCDs	Educate and share information between homeowners on fire hazard reduction and land management techniques	SWCDs	H

M = Moderate; H = High

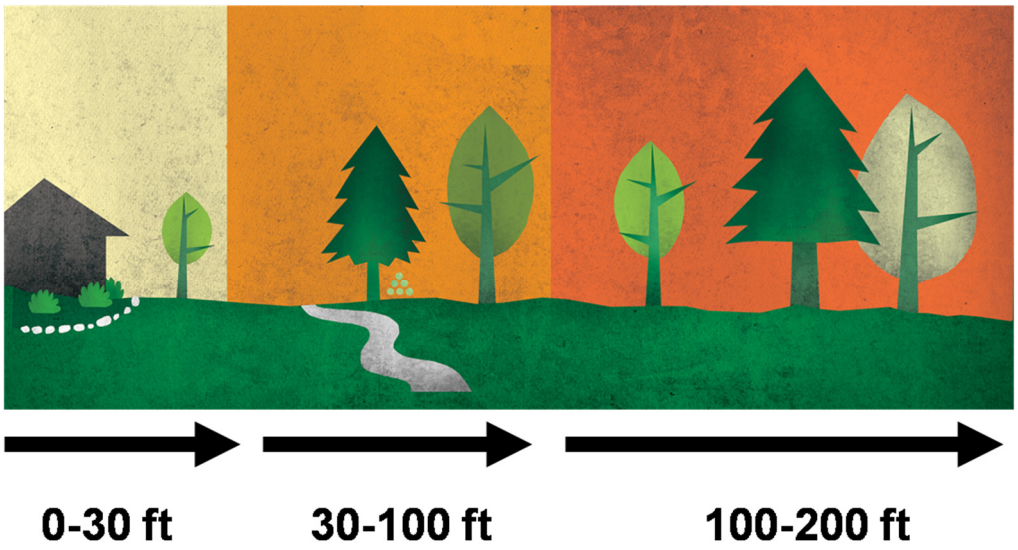


Figure 5.1. Defensible space zones. *Source: www.firewise.org*

5.4.1 Action Items for Homeowners to Reduce Structural Ignitability

Low or No Cost Investment (<$50)

- Regularly check fire extinguishers and have a 100-foot hose available to wet perimeter.
- Maintain defensible space for 30 feet around home (see Figure 5.1). Work with neighbors to provide adequate fuels mitigation in the event of overlapping property boundaries.
- Make every effort to keep lawn mowed and green during fire season.
- Screen vents with noncombustible meshing with mesh opening not to exceed nominal ¼-inch size.
- Ensure that house numbers are easily viewed from the street.
- Keep wooden fence perimeters free of dry leaves and combustible materials. If possible, noncombustible material should link the house and the fence.
- Keep gutters free of vegetative litter. Gutters can act as collecting points for fire brands and ashes.
- Store combustible materials away from the house; maybe in shed, if available.
- Clear out materials from under decks and/or stacked against the structure. Stack firewood at least 30 feet from the home, if possible.
- Reduce your workload by considering local weather patterns. Since the prevailing winds in the area are often from the southwest, consider mitigating hazards on the southwest corner of your property first, then work around to cover the entire area.
- Seal up any gaps in roofing material and enclose gaps that could allow fire brands to enter under the roof tiles or shingles.
- Remove flammable materials from around propane tanks.

Minimal Investment (< $250)

- When landscaping in the Home Ignition Zone (approximately 30 feet around the property) select noncombustible plants, lawn furniture, and landscaping material. Combustible plant material like junipers and ornamental conifers should be pruned and kept away from siding. If possible, trees should be planted in islands and no closer than 10 feet to the house. Tree crowns should have a spacing of at least 18 feet when within the Home Ignition Zone. Vegetation at the greatest distance from the structure and closest to wildland fuels should be carefully trimmed and pruned to reduce ladder fuels, and density should be reduced with approximately 6-foot spacing between trees crowns.
- Box in eaves, attic ventilation, and crawl spaces with noncombustible material.
- Work on mitigating hazards on adjoining structures. Sheds, garages, barns, etc., can act as ignition points to your home.
- Enclose open space underneath permanently located manufactured homes using noncombustible skirting.
- Clear and thin vegetation along driveways and access roads so they can act as a safe evacuation route and allow emergency responders to access the home.
- Purchase or use a National Oceanic and Atmospheric Administration weather alert radio to hear fire weather announcements.

Moderate to High Investment (> $250)

- Construct a noncombustible wall or barrier between your property and wildland fuels. This could be particularly effective at mitigating the effect of radiant heat and fire spread where 30 feet of defensible space is not available around the structure.
- Construct or retrofit overhanging projections with heavy timber or noncombustible material.
- Replace exterior windows and skylights with tempered glass or multilayered glazed panels.
- Invest in updating your roof to noncombustible construction. Look for materials that have been treated and given a fire-resistant roof classification of Class A. Wood materials are highly combustible unless they have gone through a pressure-impregnation fire-retardant process.
- Construct a gravel turnaround in your driveway to improve access and mobilization of fire responders.
- Treat construction materials with fire-retardant chemicals.
- Install a roof irrigation system.
- Replace wood or vinyl siding with nonflammable materials.
- Install an independent water supply that can be run for 24 hours or more.
- Relocate propane tanks underground.

5.5 HAZARDOUS FUELS REDUCTION TREATMENTS

Wildfire hazard can be thought of as the potential fire behavior and effects based on the existing fuel condition (Hunter et al. 2007). As described by Cram et al. (2006) the fire behavior triangle states fuel, weather and topography combine to determine fire behavior. Results from a study of thinned versus unthinned stands throughout New Mexico and Arizona found that in mid-elevation southwestern montane coniferous forests (6,400–9,100 feet), fire severity was lowered when the fuel leg of the triangle was reduced by silvicultural activities (e.g., thinning, pruning, etc.) (Cram et al. 2006). Treatments to mitigate fuel accumulation and fire hazard have long been advocated (Martinson and Omi 2002). Crown fire initiation and spread depends on the vertical and horizontal continuity of fuels (Van Wagner 1977). The purpose of any fuels reduction project is to reduce this continuity with the intent of protecting life and property and restoring landscapes to a sustainable and healthy condition. In a New Mexico and Arizona study of treated versus untreated stands that subsequently burned, Cram et al. (2006) found every treated stand experienced less severe crown fire damage as compared to the adjacent untreated stand. Untreated stands were found to be more susceptible to complete crown consumption than untreated stands (Cram et al. 2006). Crown damage and fireline intensity were found to be positively related to basal area and density and negatively related to tree diameter (Cram et al. 2006). Similar findings were reported by McHugh and Kolb (2003). Four years after the Oso Fire in the Santa Fe National Forest, grass cover remained greater in treated versus untreated stands, while bare soil remained higher in untreated stands (Cram et al. 2006). The same was true following the Rodeo-Chediski fire in Arizona (Cram et al. 2006).

Finney and Cohen (2003) point out that silvicultural thinning treatments can only be expected to change fire behavior within the limits of their prescription. Fuels treatments are not expected to eliminate fire but are designed to mitigate fire behavior to the extent that firefighters can safely suppress the fire (Finney and Cohen 2003). Under extreme conditions, such as drought, extreme weather and topography, fuels treatment may mitigate some crown fire potential, but treated areas may still burn with a stand replacing regime (Cram et al. 2006). Despite the limitations, endeavoring to moderate extreme fire behavior is a land manager's best chance of saving life and property during catastrophic wildfire. Using multiple methods often magnifies the benefits. Within and immediately around communities, these goals may or may not be compatible with ecosystem restoration. Natural ecosystem form and function should always guide treatments, but, in interface areas, protecting life and property should be a primary objective.

When implementing fuels reduction projects, it is important to be clear of the treatment objectives as well as the spatial and temporal goals of the treatment. On a stand level, prescriptions are often designed to prevent potential crown fire initiation, i.e., reducing surface, ladder, and canopy fuels. On a landscape scale, fuels treatments need to be strategically placed to protect values at risk from catastrophic fire (Hunter et al. 2007), such as placing overlapping treatments on the southwest edge of a community. Furthermore, in order that treatments maintain effectiveness over time, it is important that long-term planning managers and homeowners recognize the importance of regular monitoring and maintenance. Research has shown that in forest types of the Southwest that were historically subject to frequent fire regime (e.g., ponderosa pine) fuels treatment maintenance is required every 3 to 10 years in order to retain effectiveness (Harrington and Sackett 1990; Hunter et al. 2007; Sackett et al. 1996).

In order to maintain and build trust from the public, land managers need to actively differentiate between fuels treatments that are designed to reduce fire impact on communities and forest restoration treatments that are designed to restore large-scale forest health. These latter projects consider stand structure, seral stage, density, insect infestations, disease, mortality, and wildlife habitat, among other issues. For a CWPP, the primary goal of fuels reduction is to protect life, property, and critical infrastructure from severe wildfire, and treatments are often recommended independent of forest health because the scale of the treatment is small (e.g., the creation of defensible space). Restoration treatments, however, are closely dictated by forest health parameters that consider historical stand structure and impacts to the wider ecosystem and watershed. Because this planning area has a number of communities that abut USFS land, both hazardous fuels reduction treatments and forest restoration treatments are important practices to consider for wildfire protection planning. Planning treatments on a landscape level is important because many wildfires dwarf individual fuel treatment projects (Sisk et al. 2004). Given the huge scope of forest restoration, however, the greatest emphasis in this plan will be on hazardous fuels reduction treatments that can occur on private lands and within the boundaries of public lands, as well as by individual landowners and agencies.

Each land management agency has a different set of policies governing the planning and implementation of fuels reduction projects. For example, treatments on federal land require intensive National Environmental Policy Act (NEPA) analysis, and many treatments may be carried out with wildlife habitat objectives as a primary goal. A thorough assessment of current fuel loading is an important prerequisite for any fuels prescription, and all treatment prescriptions should be based on the best possible science. It is recommended that any treatment with the goal of forest restoration follow the established New Mexico Forest Restoration Principles (NMFRP) (2006), which is a collaborative document developed with participation from numerous land management agencies throughout the state including the Nature Conservancy, Forest Guild, Forest Guardians, the USFS, Sierra Club, NRCS, BLM, BIA, NMSF, New Mexico State Land Office, Public Service Company of New Mexico (PNM), and the Center for Biological Diversity and Restoration Solutions, LLC. The principles can be found at http://www.fs.fed.us/r3/spf/nm-restor-principles-122006.rtf. The principles were developed for designing projects that have a primary goal of ecological restoration in conjunction with economic and social benefit. The principles highlight that, when possible, simultaneously planning for the management of multiple resources, while reducing fuels will ensure that the land remains viable for multiple uses in the long term. Furthermore, they highlight that the effectiveness of any fuels reduction treatment depends on the degree of maintenance and monitoring that is employed. Monitoring will also ensure that objectives are being met in a cost-effective manner.

Sections 5.5.1 and 5.5.2 summarize the types of fuels treatments recommended throughout the planning area. The majority of the treatments are focused on high-risk or extreme-risk areas, as defined by the Composite Hazard/Risk Assessment, Core Team collaboration, and public input. The treatment timeline is obviously dependent upon available funding and resources, and on NEPA protocols. Treatment areas covering public and private land are illustrated in Figure 5.2.

5.5.1 Fuel Treatment Types

Fire management cannot be a "one-size-fits-all" endeavor; this plan is designed to be flexible. Treatment approaches and methods will be site-specific and should be adapted to best meet the needs of the landowner and the resources available. It is the intent of this plan to be an evolving document that will incorporate additional projects in the District over time. Since specifics of the treatments are not provided in detail in the tables, different fuels reduction methods are outlined in Section 5.5.1 Fuel Treatment Types.

Strategic timing and placement of fuels treatments is critical for effective fuels management practices and should be prescribed based on the conditions of each particular treatment area. Some examples of this would be to place fuel breaks in areas where the fuels are heavier and in the path of prevailing winds and to mow grasses just before they cure and become flammable. Also, burning during the hotter end of the prescription is important since hotter fires are typically more effective at reducing heavy fuels and shrub growth. In areas where the vegetation is sparse and not continuous, fuels treatments may not be necessary to create a defensible area where firefighters can work.

Several fuel reduction treatment methods are commonly used, including manual treatments, mechanized treatments, and prescribed fire (Table 5.4). This brief synopsis of treatment options is provided for general knowledge; specific projects will require further planning. The appropriate treatment method and cost will vary depending on factors such as the following:

- Diameter of materials
- Proximity to structures
- Acreage of project
- Fuel costs
- Steepness of slope
- Area accessibility
- Density of fuels
- Project objectives

It is imperative that long-term monitoring and maintenance of all treatments is implemented. Post-treatment rehabilitation such as seeding with native plants and erosion control may be necessary.

Table 5.4. Summary of Fuels Treatment Methods

Treatment	Comments
Mechanized Treatments	
Machine mowing	Appropriate for large, flat, grassy areas on relatively flat terrain.
Brush mastication	Brush species (oak in particular) tend to re-sprout vigorously after mechanical treatment. Frequent maintenance of treatments are typically necessary. Mastication tends to be less expensive than manual (chainsaw) treatment and eliminates disposal issues.
Timber mastication	Materials up to 10 inches in diameter and slopes up to 30% can be treated. Eliminates disposal issues. Environmental impact of residue being left on-site is still being studied.
Feller Buncher	Mechanical treatment on slopes more than 30% or of materials more than 10 inches in diameter may require a feller-buncher rather than a masticator. Costs tend to be considerably higher than masticator.
Manual treatment with chipping or pile burning	Utilizing hand crews cutting with chainsaws. Requires chipping, hauling, pile burning of slash in cases where lop and scatter is inappropriate. Pile burning must comply with smoke management policy.
Prescribed fire	Can be very cost effective. Ecologically beneficial. Can be used as training opportunities for firefighters. Prescribed fires help local populations get familiar with fire and foster trust and support May require manual or mechanical pretreatment. Carries risk of escape, which may be unacceptable in some WUI areas. Unreliable scheduling due to weather and smoke management constraints.
Thinning and Prescribed Fire Combined	Can be used in areas where fuel loading is too high to implement prescribed fire without pre-treatment. Ecologically beneficial. Can create fuel breaks to reduce risk of escape.

Mechanized Treatments

Mechanized treatments include mowing, mastication (ground-up timber into small pieces), and whole tree felling. These treatments allow for more precision than prescribed fire and are often more cost effective than manual treatment.

Mowing, including all-terrain vehicle (ATV) and tractor-pulled mower decks, can effectively reduce grass fuels adjacent to structures and along highway rights-of-way and fence lines. For heavier fuels, a number of different masticating machines can be used, including drum- or blade-type masticating heads mounted on machines and ranging in size from a small skid-steer to large front-end loaders. Some masticators are capable of grinding standing timber up to 10 inches in diameter. Other masticators are more effective for use in brush or surface fuels. Mowing and mastication do not actually reduce the amount of on-site biomass, but alter the fuel arrangement to a less combustible profile.

In existing fuel break areas maintenance is crucial especially in areas of encroaching shrubs or trees. In extreme risk areas more intensive fuels treatments may be necessary to keep the fire on the ground surface and reduce flame lengths. Within the fuel break, shrubs should be removed, and the branches of trees should be pruned from the ground surface to a height of 4 to 8 feet, depending on the height of the fuel below the canopy, and thinned with a spacing of at least two to three times the height of the trees to avoid movement of an active fire into the canopy.

Mechanical shears mounted on feller bunchers are used for whole tree removal. The stems are typically hauled off-site for utilization while the limbs are discarded. The discarded material may be masticated, chipped, or burned in order to reduce the wildfire hazard and to speed the recycling of nutrients.

Although the cost of mechanical techniques may exceed that of prescribed burning, there are several reasons why mechanical techniques may be optimal. First, the density of fuels in many areas precludes the use of fire without pretreatment. Second, mechanical techniques are often preferred by community members and treatments can proceed without major public opposition. Third, mechanical treatments can be accomplished over a wide range of weather conditions and with whatever personnel is available.

Mechanical treatments allow a forest manager to be more precise in creating a specific stand structure. Because individual trees and shrubbery can be targeted by chainsaws or machinery, a specific stand density is relatively easy to achieve. Restoration goals can also be met in, for example, the retention of old growth trees, the selective removal of non-native species, and the preservation of wildlife habitat. Due to the cost of and opposition to mechanical treatments on public lands, in areas at some distance from communities, treatment should follow a "thin-from-below" approach. This method focuses on the removal of small trees from the lower crown classes. Where appropriate, removal would concentrate on non-native species or removal of small and suppressed individuals. Prudent thinning can have numerous benefits: the growth rate of the remaining trees usually improves significantly; a more open canopy allows better growth of grasses, forbs, and shrubs, which help maintain soils; the open forest provides improved aesthetics; and, in terms of fire threat, the overall result of reducing ladder fuels is a reduction of passive and active crown fire potential. In some areas, small trees that are removed could also be made available to the public.

Closer to communities, heavier thinning may be needed for protection of life and property. Removal of small trees and shrubs can help to reduce the vertical continuity that aids in the propagation of a crown fire, but overstory density is also a concern in areas where crown continuity creates the potential for wildland fires to become active crown fires. Removal of larger trees to increase crown spacing could help to mitigate this potential crown fire activity. Although specific thinning prescriptions are beyond the scope of this plan, for ponderosa pine the NMFRP recommend favoring the abundance of large-diameter trees (>16 inches diameter at breast height) and retaining appropriate distributions of age classes across the landscape. Landowners should endeavor to create clumps of 6 to 12 mature trees that are surrounded by areas of lower tree density to protect against crown fire spread. Wildlife habitat requirements should be followed, particularly in areas of known goshawk habitat. Density and basal area targets should reflect the local site history, but the NMFRP suggest 40 to 100 trees per acre in ponderosa pine forest as a range for target density. This density should be contingent on distance from roads and communities. Wherever possible, old snags should be retained as they are important wildlife habitat components.

Manual Treatments

Manual treatment refers to crew-implemented cutting with chainsaws. Although it can be more expensive than mechanized treatment, crews can access many areas that are too steep or otherwise inaccessible with machines. Treatments can often be implemented with more precision than prescribed fire or mechanized methods allow. Merchantable materials and firewood can be removed while non-merchantable materials are often lopped and scattered, chipped, or piled and burned on-site. Care should be exercised to not increase the fire hazard by failing to remove or treat discarded material in a site-appropriate manner.

Prescribed Burning

Prescribed burning is also a useful tool to reduce the threat of extreme fire behavior by removing excessive standing plant material, litter, and woody debris while limiting the encroachment of shrubby vegetation. Where possible, prescribed fire could occur on public lands since fire is ecologically beneficial when applied to fire-adapted vegetation communities and wildlife habitat.

Prescribed burning should only be implemented by properly qualified personnel. All prescribed fire operations will be conducted in accordance with federal and state laws and regulations. Public safety would be the primary consideration in the design of any prescribed burn plan so as to not negatively impact the WUI. Pre-fire vegetation sampling would be carried out during planning to ensure resource protection. The areas to be burned would occur within fuel breaks or appropriate fire lines. Agency use of prescribed fire on public lands would be carried out within the confines of the agency's fire management planning documents and would require individual prescribed burn plans that are developed for specific burn units and consider smoke management concerns and sensitive receptors within the WUI.

Following any type of fuels reduction treatment, post-treatment monitoring should continue to ensure that management actions continue to be effective throughout the fire season. Vegetation can change rapidly in response to drought or moisture from year to year and during the course of the season, so fuels treatments should be adjusted accordingly.

Prescribed Burning in Timber

Given the current structure of ponderosa pine forests in the District, widespread prescribed burning without prior thinning could pose a threat to WUI communities. Prescribed burning would be most applicable in areas, therefore, that have already undergone a thin-from-below treatment. In some areas where tree density allows, prescribed fires could be conducted along roads bordering the WUI in order to lower potential fire behavior along these evacuation routes.

The goal of conducting a prescribed burn in forested areas is to select weather conditions that, in combination with fuel loading, generate a fire that burns cool, remains mainly on the surface, and consumes understory vegetation. The desired outcome of a low-intensity prescribed fire is to create a mosaic of vegetation structure across the landscape. Currently, prescribed fire in the national forest is often limited to burning of slash piles during appropriate burn windows, usually during the early spring or late fall months. Burn windows are based upon fuel moistures, weather, phenological state of vegetation, and adequate on-site and contingency resources.

Prescribed Burning in Grass and Shrublands

Grass and shrubland areas have evolved with frequent disturbance by fire. Prescribed burning is also a useful tool to reduce the threat of extreme fire behavior by removing excessive standing plant material, litter, and woody debris while limiting the encroachment of shrubby vegetation into the grasslands, such as broom snakeweed, piñon pine, juniper, and other woody species. Similar to mowing, prescribed fires should be conducted along roads surrounding the WUI and around the particular areas at risk, but it should take place on a larger scale beyond the road and WUI corridors since fire is ecologically beneficial to the grassland community and wildlife habitat. Some areas, particularly along roadsides, may be susceptible to the invasion of exotic species, so this practice should be carried out with management of invasive species in mind. Cheatgrass is adapted to fire

and will easily regenerate at the site following a fire. Other methods of control of cheatgrass will be necessary if a large amount of cheatgrass is present at the site. Prescribed fires within the grassland ecosystem should be implemented when the conditions are dry enough for the fine fuels to carry a fire but not so dry that fire containment is difficult.

Following a fire, grasses will often be the first plants to sprout from the charred soil, followed by flowering annuals and perennials. Again, the timing of prescribed burning is critical. Also, burning at the hotter end of the prescription is important because hotter fires are typically more effective at reducing heavy fuels and shrub growth. Vegetation in a grassland community can change rapidly in response to drought or moisture from year to year and during the course of the season, so fuels treatments should be adjusted accordingly.

One factor to take into consideration when using prescribed fire is that generally less predictability exists in post-treatment stand structure than with mechanical thinning. However, prescribed fire can effectively influence fuel bed characteristics by reducing fine fuel loading, large woody fuels, rotten material, and certain overstory components, thus eliminating a large component of the materials that act as fuel to a wildfire (Graham et al. 2004). Prescribed fire is also often far more economical, acre for acre, than mechanical thinning, but, in this ecosystem, its use may have to be confined to areas at the greatest distance from communities.

Thinning and Prescribed Fire Combined

Combining thinning and prescribed fire can be the most effective treatment (Graham et al. 2004). In forests where fire exclusion or disease has created a buildup of hazardous fuels, prescribed fire cannot be safely applied and pre-burn thinning is required. The subsequent use of fire can further reduce residual fuels and reintroduce this ecologically imperative process.

Management of Non-native Plants

Like many ecosystems throughout New Mexico, the landscape throughout the District is undergoing gradual degradation as a result of infestation by non-native species (Parker et al. 2005). These species have contributed to changing fire regimes in the District that have heightened the risk of fire. A number of methods have been developed for removal of non-natives; the appropriate technique will depend on the infestation density, management objectives, environmental concerns, costs, and social considerations (Parker et al. 2005). The USDA maintains a list of noxious weeds rated from A to C based on the current degree of infestation of the species and the potential for eradication (http://plants.usda.gov).

Treatments for Saltcedar (*Tamarix* Spp.) Infestation

Many riparian areas throughout the District have become overrun by saltcedar. The eradication and control of saltcedar have many challenges. Long-term commitment and multiple techniques are required to reduce its extent and minimize its spread. Techniques that are used for the management of saltcedar include mechanical, chemical, and biological methods.

Mechanical treatments, such as hand-pulling and cutting, can be used for smaller stands of young saltcedar saplings, but these treatments become expensive and ineffective within large stands of shrub-sized individuals. Root cutting and bulldozing can be effective, but the benefits may not outweigh the problems resulting from soil damage and the expense of this method. Fire has been

used with some success, but because saltcedar is fire-adapted, they readily resprout. Resprouting is likely to occur after using any of these methods, so it is highly recommended to combine methods and follow-up treatments to continue control of this species. Treatments using application of deep mulch have been successful in the Middle Rio Grande at reducing the growth ability of invasive plants (Finch et al. 2008).

Chemical control is typically the most effective method used for saltcedar; however, application of herbicides should be site specific. Aerial applications of imazapyr or an imazapyr and glyphosphate mixture should occur from late August through September. This method is slow-acting, and treated trees should not be removed for up to three years after the treatment to ensure root kill. It is important to only use herbicides that are approved for application near water. Biological control methods have also shown some success. One such method is the use of saltcedar leaf beetle (*Diorhabda elongate)* that asserts physiological stress on the tree through defoliation. This treatment coupled with burning in the summer months under intense prescribed fire prescription has been found to be successful in some saltcedar stands. Significant damage to the root crown is required for high mortality; this may require supplementing fuel loading, particularly around the root crown. The combination of cutting and/or chemical application to cut stumps or small-diameter whips is one of the most common management techniques used for saltcedar. The methods used will depend on the size of the saltcedar stand, the characteristics of the riparian area, and the distance to a community. Mechanical root crown extraction, combined with chipping and removal of biomass has been accomplished in the Abo arroyo in an ongoing project led by the District. The project could act as a template for future treatments.

5.5.2 FUEL BREAKS

Fire behavior in the CWPP planning area has been modeled using FlamMap (see Section 4.2.2). This assessment provides estimates of flame length and rate of spread; the information should be used by land managers when prescribing treatments. Land managers are cautioned, however, that fuel breaks will not always stop a fire under extreme fire behavior or strong winds; these should only be seen as a mitigating measure and not a fail-safe method for fire containment.

Within a fuel break, shrubs should be removed where they would generate high severity fire behavior. It is not possible to provide a standard treatment prescription for the entire landscape because fuel break dimensions should be based on the local fuel conditions and prevailing weather patterns. For example, in some areas, clearing an area too wide could open the landscape to strong winds that could generate more intense fire behavior and/or create wind throw.

Strategic placement of fuel breaks is critical to prevent fire from moving from wildland fuels into adjacent neighborhoods. A fuel break of 100 to 300 feet should modify fire behavior significantly enough to allow suppression by firefighters. It is important to note, however, that forest and woodland fuels often replaced by grassland fuels in fuel breaks; flame lengths and rates of spread could be faster in these grassland fuels, but fireline intensity (heat produced per fireline foot per second) will be reduced, allowing more effective suppression. For effective management of most fuels, fuel breaks should be prescribed based on the conditions in each particular treatment area. Some examples of this would be to place fuel breaks in areas where fuels are heavier or in areas with easy access for fire crews. In areas where the vegetation is discontinuous, fuel treatments may

not be necessary. In this situation it is best to leave the site in its current condition to avoid the introduction of more flammable, exotic species, which may respond readily following disturbance.

Overall, whatever fuels reduction technique is employed, a great deal of preparation and planning must go into the project, and site-specific plans should be developed. Having a plan in place will ensure that the project will operate as smoothly, efficiently, and cost effectively as possible. Following any type of fuels-reduction treatments, post-treatment monitoring should be employed to ensure that management actions continue to be effective throughout the fire season and following years.

Slash Management

In proximity to communities, reducing the total fuel loading must occur in addition to breaking up fuel continuity. Mechanical fuel treatment of the stand only rearranges the fuel complex. The local community has repeatedly stressed their need for fuel wood from the forest. Much of the wood that is considered slash by a commercial logger may be treasured by the community as manageable firewood that fits into small woodstoves. Creative ways to allow for utilization of small diameter timber will help to remove the fuel from the forest and serve the needs of the community.

Even with strong utilization, some residuals will remain from the thinning. The options for treating slash produced by thinning activities are burning, scattering, and mechanical reduction. Burning of slash piles requires specific weather conditions, or burn windows. If the right set of conditions is not met, piles can sit for multiple seasons waiting to be burned and contributing to the overall fuel loading of the site. Many private landowners in the planning area have expressed frustration over never getting the green light from local officials and their resulting inability to get piles burned.

Traditionally, the most widely used slash treatment method in many areas has been lop-and-scatter (Windell and Bradshaw 2000). In lop-and-scatter treatments, the slash is manually distributed across the treated area. Although positive ecological benefits have been measured (Hastings et al. 2003; Jacobs and Gatewood 1999), lop-and-scatter is only appropriate for treated areas with light fuel accumulations (Wakimoto et al. 1988) and is not recommended within WUI treatments. As a result, lop-and-scatter techniques are not permitted for private landowners who participate in local SWCD cost-share programs. Public land projects bordering private land should also avoid lop-and-scatter techniques. Currently, the best option for treating slash in and around communities is to physically reduce the material using equipment such as a grinder, masticator, or chipper. Outputs from the various types of equipment differ in terms of particle size and dimensions, but, generally, wood chips are produced that can then be spread on-site or transported. When the boles and large branches have been removed for firewood, the remaining biomass volume is relatively small and a layer of material less than 2 inches thick can be spread on-site. It is important to avoid depths of material exceeding 4 inches, which can happen readily in areas such as non-native-dominated riparian systems where little material is removed from the site. If left on-site, wood chips should not be piled against the trunk of remaining trees or placed near homes or outbuildings. In areas where bark beetles are a concern, chipping and masticating should not be conducted in peak summer months.

Management of Piñon-juniper Woodlands

Piñon-juniper forests have very diverse structures and fire histories and for these reasons it is difficult to develop a prescription unless specific site conditions are known. It is important that land managers pay attention to the category under which the piñon-juniper woodland falls when developing treatment plans for restoration. Piñon-juniper savanna types have low tree density and are most likely to have experienced low-intensity, high-frequency fires. In these ecosystems, reintroduction of prescribed burning is recommended to maintain the open structure. Piñon-juniper shrublands have higher tree densities than piñon-juniper savannas, and, although there is debate regarding the fire regime, it is thought these savannas have undergone moderate-frequency, mixed-severity fires that are highly patchy. Savage et al. (2008) recommend that these communities should be thinned and the slash scattered on the ground to protect soil from erosion. The final piñon-juniper type, persistent piñon-juniper woodland, is made up of older denser stands of piñon-juniper that are likely to have experienced long fire-return intervals of centuries.

Sustainability Challenge

Well-managed fuels reduction projects often result in ecological benefits to wildlife and watershed health. Simultaneously, planning and resource management efforts should occur when possible while reducing fuels to ensure that the land remains viable for multiple uses in the long term.

Fuel break and fuel treatment utility is contingent upon regular maintenance, as regrowth in a treated area can quickly reduce its effectiveness. Input provided during public outreach activities identified a need for maintenance of existing fuel breaks that have become overgrown. Maintenance of existing breaks could be more cost efficient than installation of new features.

The effectiveness of any fuels reduction treatment will increase over time with a maintenance and monitoring plan. Monitoring will also ensure that objectives are being met in a cost-effective manner. For information on monitoring and sustainability for CWPP projects, please see Section 6.0.

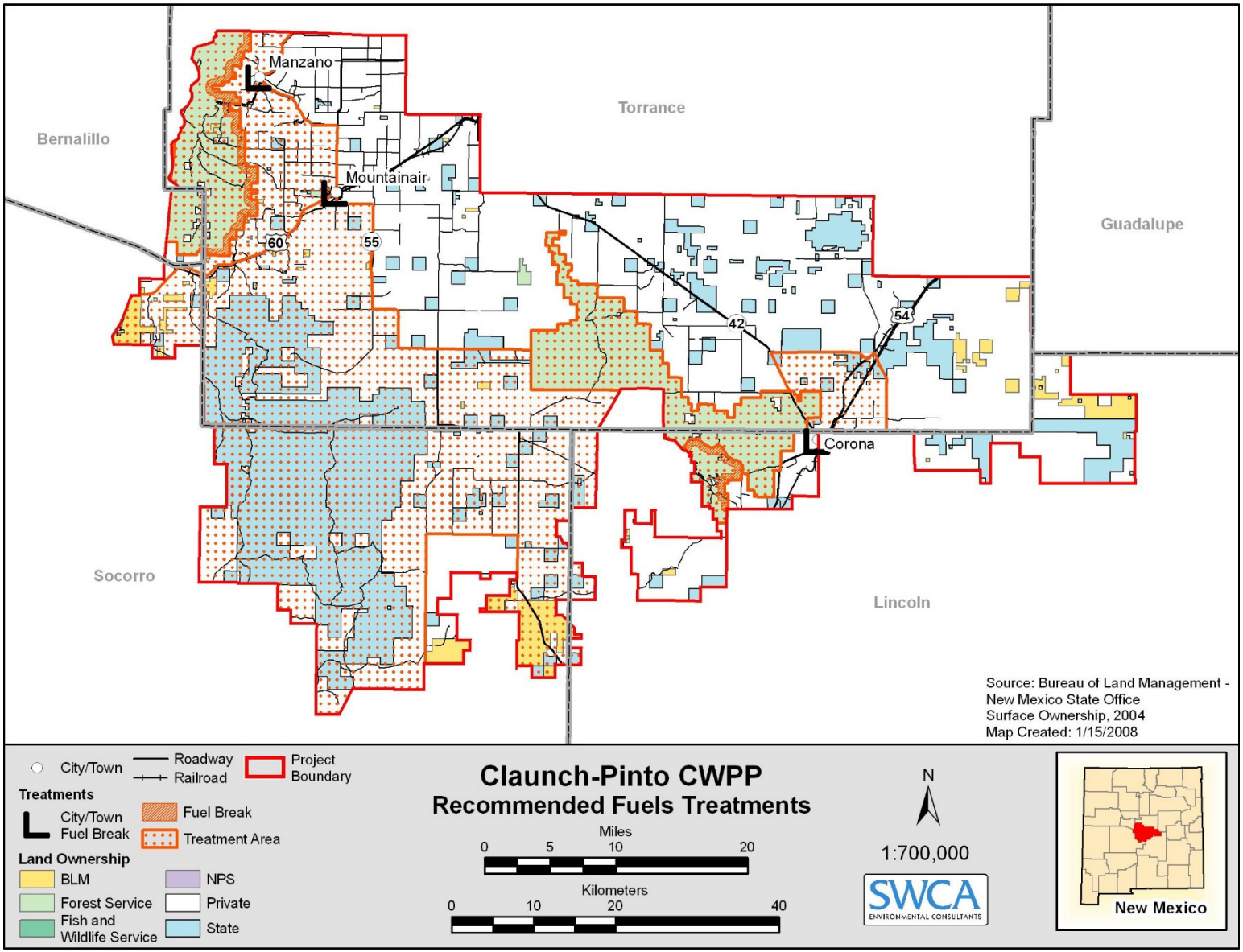


Figure 5.2. Fuels treatment recommendations.

5.5.3 TREATMENTS ON PRIVATE LAND

A general lack of fire preparedness on private land was observed throughout the CWPP planning area as discussed in Section 5.4 Reducing Structural Ignitibility. In addition to treatments focused on defensible space within 100 feet of the home, additional treatments may be called for at larger scales to address tree density, crown fire potential, ingress/egress issues, and infrastructure protection. Table 5.5 summarizes fuels treatments on private lands that extend beyond the immediate vicinity of the home.

The SWCDs all currently offer cost-share programs to conduct thinning on private land. Popularity for these programs has increased, and there are consistently more applications than available funding. Increased funding for these existing programs to improve defensible space on private land would be efficient and effective in reducing hazardous fuels. One of the challenges in administering these programs has been the annual funding cycle and the lack of guarantied funding since all of the funding is a competitive process. The administrators recognize the benefit of more coordinated and strategic placement of treatments but have difficulty implementing these goals without long-range budgets to allow for planning across multiple fiscal years.

In recommending prioritized treatment on private lands, the community hazard table (see Table 5.5) should be used to identify the community hazard rating. Those communities rated at extreme or high risk, those located adjacent to extreme or high-risk areas (as classified in the Composite Hazard/Risk Assessment [see Figure 4.2]), and those at the greatest distance from fire stations (as depicted) should be prioritized for treatment.

Table 5.5. Private Land Fuels Treatment Recommendations

Project	Location	Land Ownership/ Management	Method	Serves to:	Timelines for Implementation	Priority (H, M, L)	Monitoring	Contact
Developed Private Parcels Less than 2 Acres								
Apply for defensible space cost-sharing programs	All private land within CPCWPP planning area would be eligible	Private	Selective thinning of trees to lower density around homes; crown spacing adjusted for slope; pruning (to about 25% of tree/shrub ht); chip and/or remove debris; provide adequate defensible space.	Protect life and property by reducing crown fire potential; improve vehicle access; increase tree health/vigor. Gives firefighters margin of safety.	Yearly	H	Conduct on-site inspections with owners; consider photo documentation pre- and post-treatment; apply adaptive management from best available information; determine if Firewise techniques are being applied.	SWCDs already offer related programs. Additional funding for existing programs or a new program with a focus on defensible space would expand implementation.
Assess defensible space	All private land within CPCWPP planning area would be eligible.	Private	Firewise-based assessments of individual homes. The professional assessment would help to identify the most critical actions that an individual could take. Assessments could also include marking of trees suggested for removal.	Protect life and property by reducing risk of home ignitions. Empower homeowners to make the most effective actions. Allows funding to address a larger number of homes.	2 Years	H	Conduct on-site inspections with owners; identify and mark trees for removal within the 100-foot safety zone.	NMSF, New Mexico Association of Counties
Undeveloped Private Parcels Greater than 2 Acres								
Maintain access areas and roads	All private land within CPCWPP planning area.	Private	Keep roadways clear of vegetation using mechanical means.	Protect life and property by improving available ingress/egress for firefighters and residents.	2 Years	M	Regular maintenance needed to ensure access is clear of vegetation or obstructions. Monitoring should occur prior to fire season (February) and in the fall (October).	NMSF, USFS, SWCD, fire departments
Protect power lines and communication lines	All private land within CPCWPP planning area.	Utilities company/ private	Maintain clearance under power lines and around posts.	Protect life and property by preventing destruction of energy or communications infrastructures in event of fire.	Yearly	H	Regular maintenance needed to ensure lines are clear of vegetation. Monitoring should occur prior to fire season (February) and in the fall (October).	Utility companies

Project	Location	Land Ownership/ Management	Method	Serves to:	Timelines for Implementation	Priority (H, M, L)	Monitoring	Contact
Undeveloped Private Parcels Greater than 2 Acres, continued								
Create fuel breaks on the southwest edge of communities	All private land within CPCWPP planning area. Priorities: Corona, Mountainair, Manzano, and Deer Canyon Preserve	Private	Strategic placement of treatments on private land will improve effectiveness. Fuel break prescriptions should be site-specific depending upon fuel type, topography, soils, and adjacent land management practices.	Protect life and property by helping to mitigate extreme fire behavior and provide an area from which firefighters can suppress a fire.	Yearly, as funding available	H	Regular maintenance needed to ensure the fuel break remains clear of vegetation. Monitor for erosion and invasive species. Monitoring should occur prior to fire season (February) and in the fall (October).	NMSF, SWCD
Begin thin-from-below treatments in ponderosa pine	Private land adjoining forested public land. Private in-holdings surrounded by USFS land. Focus on southwest edge of community or structure.	Private	Selective thin-from-below treatment to reduce crown fire transmission from high-flame-length predictions.	Lower the potential for surface-to-crown transmission of fire in ponderosa pine.	Yearly, as funding available	H	Monitor effects on wildlife populations, soils, understory vegetation, invasive species, and water yield. Potential for community monitoring programs that include schools and youth groups. Monitoring should occur in spring and summer months when vegetation can be identified prior to curing and wildlife are most active.	SWCDs already offer related cost-share programs. Additional and consistent funding is needed to meet the growing demand for these programs. Strategic and coordinated treatments could improve effectiveness.
Thin shrubland with mechanical treatment	Private land adjoining forested public land. Private in-holdings surrounded by USFS land. Focus on southwest edge of community or structure.	Private	Reduce shrub density and continuity; create patchy structure with openings to promote herbaceous vegetation.	Protect life and property by slowing the rate of spread of fire in shrubland fuels, and lower flame length and fireline intensity.	Yearly, as funding available	H	Monitor effects on wildlife populations, soils, understory vegetation, invasive species, and water yield. Potential for community monitoring programs that include schools and youth groups. Monitoring should occur in spring and summer months when vegetation can be identified prior to curing and wildlife are most active.	SWCDs already offer related cost-share programs. Additional and consistent funding is needed to meet the growing demand for these programs. Strategic and coordinated treatments could improve effectiveness.

Project	Location	Land Ownership/ Management	Method	Serves to:	Timelines for Implementation	Priority (H, M, L)	Monitoring	Contact
Undeveloped Private Parcels Greater than 2 Acres, continued								
Reduce crown bulk density in ponderosa pine	Private land adjoining forested public land. Private in-holdings surrounded by USFS land. Focus on southwest edge of community or structure.	Private	Selective thinning to increase crown spacing between trees.	Protect life and property by lowering the potential for crown fire spread.	Yearly, as funding available	H	Monitor effects on wildlife populations, soils, understory vegetation, invasive species, and water yield. Potential for community monitoring programs that include schools and youth groups. Monitoring should occur in spring and summer months when vegetation can be identified prior to curing and wildlife are most active.	SWCDs already offer related cost-share programs. Additional and consistent funding is needed to meet the growing demand for these programs. Strategic and coordinated treatments could improve effectiveness.
Begin Corona fuels treatments	Demarcated by Highway 42 to the west, CR013 to the north, and CR022 to the east.	Private/state	Reduce shrub density and continuity; create patchy structure with openings to promote herbaceous vegetation.	Protect life and property by slowing the rate of spread of fire in shrubland fuels, and lower flame length and fireline intensity.	Yearly, as funding available	H	Monitor effects on wildlife populations, soils, understory vegetation, invasive species, and water yield. Potential for community monitoring programs that include schools and youth groups. Monitoring should occur in spring and summer months when vegetation can be identified prior to curing and wildlife are most active.	SWCDs already offer related cost-share programs. Additional and consistent funding is needed to meet the growing demand for these programs. Strategic and coordinated treatments could improve effectiveness

5.5.4 TREATMENTS ON PUBLIC LANDS

Although survey responses indicated widespread support for treatments on private land, respondents disagreed about the importance of fuel treatments on public land. 45% of people thought that fuels treatments on public land were important, but 36% thought they were not important. Within the group that supported hazardous fuels treatments, all respondents stressed the importance of a focus on community protection but expressed less support for treatments that focus upon forest restoration (Table 5.6). Recommendations for fuels reduction projects are outlined in Figure 5.2. These treatment recommendations are based upon areas deemed at high risk by the risk assessments and by public and Core Team input. In recognition of the complexity of fuels treatment project planning among various agencies, many more public land treatments have been recommended than can feasibly be implemented within a short time frame. The goal of the list is to provide a wide range of options that directly relate to community protection. Prioritizing among these treatments should consider protection of the maximum number of Community Values at Risk, as described in Section 4.4.1.

Table 5.6. Public Land Fuels Treatment Recommendations

Project	Location	Land Ownership/ Management	Method	Serves to:	Timelines for Implementation	Priority (H, M, L)	Monitoring	Contact
Southern Manzano Thinning Project	Cibola National Forest. Unburned watersheds located between the Trigo and Ojo Peak burn scars	USFS	Thin-from-below, limb trees to a CBH of 8 feet, increase crown spacing where needed. Slash will be chipped, removed, or piled and burned.	Protect watershed health and restore one of the last remaining unburned watershed in the Manzano Mountains	2 years	H	Monitor effects of treatments on stand dynamics and species composition. Monitor regrowth and erosion, and maintain clearance. Monitoring and maintenance should occur prior to fire season (February) and in the fall (October).	USFS, District, NMSF
Corona well head protection project	Cibola National Forest.	USFS	Thin-from-below, limb trees to a CBH of 8 feet, increase crown spacing where needed. Slash will be chipped, removed, or piled and burned.	Project the watershed that contains the source water wells for the Village of Corona as well as improve overall watershed health and functioning	3 years	H	Monitor effects of treatments on stand dynamics and species composition. Monitor regrowth and erosion, and maintain clearance Monitoring and maintenance should occur prior to fire season (February) and in the fall (October).	USFS, District, NMSF
Continue to construct shaded fuel break along forest service boundary within ponderosa pine and mixed conifer	Cibola National Forest north-south- oriented boundary.	USFS/private	Thin-from-below, limb trees to a CBH of 8 feet, increase crown spacing where needed. Slash will be chipped, removed, or piled and burned.	Protect life and property by preventing crown fire by limiting ladder fuels that transmit surface fire into canopy. Assist fire crews in suppression by slowing passage of fire from national forest lands to adjoining communities in the WUI.	Ongoing	H	Monitor effects of treatments on stand dynamics and species composition. Monitor regrowth and erosion, and maintain clearance. Refer to Monitoring and maintenance should occur prior to fire season (February) and in the fall (October).	CPSWCD, USFS Mountainair District, NMSF

Project	Location	Land Ownership/ Management	Method	Serves to:	Timelines for Implementation	Priority (H, M, L)	Monitoring	Contact
Continue to construct a fuel break along forest service boundary within piñon-juniper and shrubland cover type	Cibola National Forest north-south-oriented boundary.	USFS/private	Thin shrubland fuels, increase spacing and reduce shrub height. Remove invasive species. Chip, lop and scatter or remove all slash produced by project.	Protect life and property by mitigating extreme fire behavior predicted in shrubland fuels. Assist fire crews in suppression by slowing passage of fire from national forest lands to adjoining communities in the WUI.	Spring 2017	H	Monitor effects of treatments on stand dynamics and species composition. Monitor regrowth and erosion, and maintain clearance. Monitoring and maintenance should occur prior to fire season (February) and in the fall (October).	CPSWCD, USFS Mountainair District, NMSF
Continue to construct a fuel break along Deer Canyon boundary within piñon-juniper and shrubland cover type	State Land	State Land Office/Private	Thin shrubland fuels, increase spacing and reduce shrub height. Remove invasive species. Chip, lop and scatter or remove all slash produced by project.	Protect life and property by mitigating extreme fire behavior predicted in shrubland fuels. Assist fire crews in suppression by slowing passage of fire from national forest lands to adjoining communities in the WUI.	2 Years	H	Monitor effects of treatments on stand dynamics and species composition. Monitor regrowth and erosion, and maintain clearance. Monitoring and maintenance should occur prior to fire season (February) and in the fall (October).	CPSWCD, State Land Office, NMSF
Mow around fence lines on ranchland prior to early fire season.	Grassland areas on state land.	Public and private leased	Mow a 70-foot buffer around ownership boundary.	Protect life and property by slowing the rate of spread to adjoining grasslands and communities in event of grassland fire.	Annually	H	Monitor effects of treatments on species dynamics and species composition, particularly invasion of exotic species. Monitor regrowth and erosion, and maintain clearance. Monitoring and maintenance should occur prior to fire season (February) and in the fall (October).	State Land Office

Project	Location	Land Ownership/ Management	Method	Serves to:	Timelines for Implementation	Priority (H, M, L)	Monitoring	Contact
Mow and remove invasive species along roads prior to early fire season	All state and federal highways.	NMDOT	Mow a 70-foot buffer along edge of road and, where possible, extend mowed area to fence lines. Regularly remove invasive species and shrub encroachment.	Protect ranchland and communities from potential ignition from roads.	Annually	L	Monitor effects of treatments on stand dynamics and species composition. Monitor regrowth and erosion, and maintain clearance. Monitoring and maintenance should occur prior to fire season (February) and in the fall (October).	NMDOT
Mow and remove invasive species along railroad prior to early fire season	Railroad throughout extent of the District.	Private, state, and BLM	Mow a 70-foot buffer along edge of railroad. Regularly remove invasive species and shrub encroachment.	Protect ranchland and communities from potential ignition from railroad.	Annually	H	Monitor for regrowth, and maintain clearance. Monitoring and maintenance should occur prior to fire season (February) and in the fall (October).	Burlington Northern Santa Fe Railway
Clear roadsides along forest roads prior to early fire season	USFS and private in-holdings.	USFS/private	Maintain suitable clearance along forest service roads that act as evacuation routes for private in-holdings. Thin tree density within 100 feet of the road, and mow grass verges. Remove dense understory that could transmit surface fire into crowns.	Protect life and property by maintaining safe evacuation routes.	Annually	H	Regular upkeep of cleared and thinned areas. Monitoring and maintenance should occur prior to fire season (February) and in the fall (October).	USFS, District, NMSF
Create fuel break around southern and western edges of grassland communities	Loma Parda, Claunch.	BLM and State Land Office	Chisel the ground to mineral soil to limit erosion potential in sandy soils. Preplan areas that would be suitable for a fuel break/fire break so that in the event of a fire; this could be a preplanned reactive measure to prevent fire spread.	Protect life and property by providing a fire break in grassland fuels from which firefighters could suppress fire close to communities.	Annually	H	Monitor effects of treatments on species dynamics and species composition, particularly invasion of exotic species. Monitor regrowth and erosion, and maintain clearance Monitoring and maintenance should occur prior to fire season (February) and in the fall (October).	BLM, State Land Office

Project	Location	Land Ownership/ Management	Method	Serves to:	Timelines for Implementation	Priority (H, M, L)	Monitoring	Contact
Remove saltcedar from riparian areas	All infested areas.	SWCDs, BLM, and State Land Office	Remove saltcedar using chemical and mechanical means. Experiment with the use of biological control for saltcedar leaf beetle.	Protect watershed health and invasive species.	Ongoing annual funding cycles	M	Monitor effects of treatments on species dynamics and species composition, particularly invasion of exotic species. Monitor regrowth and erosion, and maintain clearance. Monitoring and maintenance should occur prior to fire season (February) and in the fall (October).	SWCDs Claunch-Pinto SWCD already involved in Abo Arroyo Program
Plan prescribed burn in grass and piñon-juniper shrub savanna	Cibola National Forest west of Highway 42 and north of Corona.	USFS/private	Develop burn plan for areas of thinned piñon-juniper. Should lop and scatter before burn to provide fuels to carry. Burn under strict prescriptions with head fire and containment using fireline. Ensure smoke management provisions are met.	Protect life and property by improving rangeland health; reduce fuel loading to reduce rate of spread and flame lengths in grass and shrublands.	Add to FS Fire Management Plan and institute maintenance burns.	M	Long-term monitoring program to assess fire effects on vegetation, fuels, soils, wildlife, and invasive species. Work in collaboration with local school monitoring programs. Monitoring and maintenance should occur prior to fire season (February) and in the fall (October).	SWCDs, USFS, NMSF
Plan prescribed burns on national forest lands	Cibola National Forest on western boundary of the District.	USFS	Develop a burn plan to carry out a series of prescribed burns in ponderosa pine and mixed conifer in pretreated stands. Burn under low intensity burn prescription, create patchy mosaic of mortality, and remove surface understory and ladder fuels.	Protect life and property by reducing fuel loading to mitigate predicted fire behavior and limit potential fire spread to the east that could impact communities along the Highway 337 corridor.	Add to FS Fire Management Plan and institute maintenance burns.	M	Long-term monitoring program to assess fire effects on vegetation, fuels, soils, wildlife, and invasive species. Work in collaboration with local school monitoring programs. Monitor during summer months to make use of schools programs.	SWCDs and State Land Office

Project	Location	Land Ownership/ Management	Method	Serves to:	Timelines for Implementation	Priority (H, M, L)	Monitoring	Contact
Plan prescribed burns on state/private lands	South of Highway 60 and west of Highway 55, demarcated by Route 41, CR208 and State Route 14 and CR190 as the southern boundary.	State Land Office	Develop a burn plan to carry out a series of prescribed burns in piñon-juniper savanna and short grass prairie. Burn under low intensity burn prescription to protect soils and encourage grass regeneration. Create patchy mosaic of mortality in shrublands.	Protect life and property by reducing fuel loading to mitigate predicted fire behavior and limit potential fire spread to the northeast that could impact Mountainair, Deer Canyon Preserve, Loma Parda, and new subdivisions southwest of Mountainair.	Add to Fire Management Planning and institute maintenance burns.	M	Long-term monitoring program to assess fire effects on vegetation, fuels, soils, wildlife, and invasive species. Work in collaboration with local school monitoring programs. Monitor during summer months to make use of schools programs.	State Land Office, Farm Service Agency, NRCS
Monitor fire effects	CPCWPP planning area.	Private and public	Carry out fuels monitoring and fire effects monitoring following wildfire and/or prescribed fire.	Improve understanding of the effectiveness of fuels treatments on fire behavior as well as providing an inventory of fuels loading to direct treatment.	Ongoing	H	Monitoring should be carried out for multiple years (>3 years) after burn (both prescribed fire and wildfire) to assess vegetation response, wildlife response, soils, and hydrology. Monitor during summer months to make use of schools programs,	USFS, BLM, SWCDs, New Mexico Association of Counties, Youth Conservation Corps, local high schools, NMSF

6.0 MONITORING AND EVALUATION

All stakeholders and signatories to this CWPP desire worthwhile outcomes. We also know that risk reduction work on the ground, for the most part, is often not attainable in a few months—or even years. The amount of money and effort invested in implementing a plan such as this requires that there be a means to describe, quantitatively or qualitatively, if the goals and objectives expressed in this plan are being accomplished according to expectations.

This section will present a suite of *recommended* CWPP monitoring strategies intended to help track progress, evaluate work accomplished, and assist planners in adaptive management.

Strategies outlined in this section take into account several variables:

- Do the priorities identified for treatment reflect the goals stated in the plan? For example, do projects for fuels reduction along public roads meet objectives for safe evacuation routes in identified high-risk areas? Monitoring protocols can help address this question.
- Can there be ecological consequences associated with fuels work? We may be concerned about soil movement and/or invasive species encroachment post-treatment. Relatively cost-effective monitoring may help clarify changes.
- Vegetation will grow back. Thus, fuel-break maintenance and fuels modification in both the home ignition zone and at the landscape scale all require periodic assessment. Monitoring these changes can help decision makers identify appropriate treatment intervals.
- What can a monitoring plan do to assist the Core Team/decision makers in assessing the extent to which the CWPP prevention and outreach program objectives are being met? Tracking program benefits in a qualitative way can increase understanding and support from communities.
- As the CWPP evolves over time, there may be a need to track changes in policy, codes, requirements, stakeholder changes, and levels of preparedness. These can be significant for any future revisions and/or addendums to the CWPP.

Table 6.1 identifies recommended monitoring strategies, both quantifiable and non-quantifiable, for assessing the progress of the CWPP action plan. It must be emphasized that these strategies are 1) not exhaustive (new strategies and protocols can evolve with new CWPP action items), and 2) dependent on available funds and personnel to implement them.

Table 6.1. Recommended Monitoring Strategies

Strategy	Task/Tool	Lead	Remarks
Photo record (documents pre- and post-fuels reduction work, evacuation routes, workshops, classes, field trips, changes in open space, treatment type, etc.)	Establish field global positioning system (GPS) location; photo points of cardinal directions; keep photos protected in archival location	Core Team member	Relatively low cost; repeatable over time; used for programs, and tracking objectives
Number of acres treated (by fuel type, treatment method)	GPS/GIS/fire behavior prediction system	Core Team member	Evaluating costs, potential fire behavior
Number of home ignition zones/defensible space treated to reduce structural ignitability	GPS	Home-owner	Structure protection
Number of residents/citizens participating in any CWPP projects and events	Meetings, media interviews, articles	Core Team member	Evaluate culture change objective
Number of homeowner contacts (brochures, flyers, posters, etc.)	Visits, phone	Agency representative	Evaluate objective
Number of jobs created	Contracts & Grants	Core Team member	Evaluate local job growth
Education outreach: number, kinds of involvement	Workshops, classes, field trips, signage	Core Team member	Evaluate objectives
Emergency management: changes in agency response capacity	Collaboration	Agency representative	Evaluate mutual aid
Codes and policy changes affecting CWPP	Qualitative	Core Team	CWPP changes
Number of stakeholders	Added or dropped	Core Team	CWPP changes
Wildfire acres burned, human injuries/fatalities, infrastructure loss, environmental damage, suppression and rehabilitation costs	Wildfire records	Core Team	Compare with 5- or 10-year average

6.1 IDENTIFY TIMELINE AND OPPORTUNITIES FOR UPDATING THE CWPP

The CWPP, as an evolving document, will be reviewed annually by the Core Team. The Core Team should decide the most effective way to accomplish this task, given the varying interests represented and personnel time constraints. An example would be canvassing each member for input, generating a list of priority recommendations. Topics may include, but not be limited to, action items and priorities, budgets, changes in agency policies, laws and ordnances affecting safety and fire management operations, new fuels projects, and other modifications to the existing CWPP.

The CWPP review could include a meeting open to the public and affected CWPP communities. Recommendations would be presented, input solicited, and results in the form of documented changes will be attached as amendments to the CWPP.

A primary purpose of the CWPP review and update will be to engage additional parties and stakeholders in the CWPP planning process. Annual reviews and updates provide for engagement of additional entities so that the document can serve a wider network of land management agencies and land managers and thereby provide opportunities for increased collaboration across the District. The CWPP Core Team should continue to outreach to interested stakeholders and invite them to be part of the Core Team.

A formal revision to this CWPP should be made on the fifth anniversary of signing and every 5 years following.

6.2 CONCLUSION

The Claunch-Pinto Community Wildfire Protection Plan has been updated to meet the requirements of a CWPP as specified in the HFRA. The update of the CPCWPP plan addresses how to prepare for wildland fire throughout the District and assesses the risk of this type of fire event creating damage to communities in WUI areas. The planning area is made up of diverse fuels, topography, and community structure, and it crosses multiple county boundaries. For these reasons, a comprehensive assessment was made to meet the requirements of the many stakeholders. The planning process has emphasized public participation and collaborative planning among federal, state, county, and local governments and other contributing agencies. Organizations and stakeholders have been contacted through local mailings and have been encouraged to participate in the development of the plan by submitting comments at one of the public meetings or by mail. A number of local residents have also been active Core Team members. The document makes recommendations for fuels reduction treatments, educational outreach activities, firefighting capabilities, and reduction of structural ignitability. The recommendations are based on a Composite Hazard/Risk Assessment, individual community hazard/risk assessments, identification of CVARs, and comments from Core Team and community members. The recommendations are general in nature to provide high levels of flexibility in the implementation phase. The goal of the CPCWPP is to reduce the risk for catastrophic wildfire throughout the District by providing specific information regarding what is most at risk and how to protect these places and community values from future fires. The protection strategy focuses on the importance of treatments on private lands and the creation of defensible space using public outreach and education practices. The plan also includes treating adjacent USFS, BLM, and State Land Office lands.

This CPCWPP is a living document and should be revised as environmental conditions change or social issues arise. The wildfires that occurred during the 2007-2008 season as well as the recent Dog Head fire have illustrated the devastation to communities that can result from wildland fire. Fires are going to continue to happen on a regular basis and having a thorough and current fire planning document for the District is critical so that the negative effects of these future fires are mitigated and have less impact on these rural communities.

This page intentionally left blank

7.0 REFERENCES

Agee, J.K. 1993. *Fire Ecology of Pacific Northwest Forests*. Washington, D.C.: Island Press.

———. 1998. The landscape ecology of western forest fire regimes. *Northwest Science* 72 (special issue 1):24–34.

———. 2004. The Complex Nature of Mixed Severity Fire Regimes. Conference Proceedings of the Mixed Severity Fire Regimes: Ecology and Management. Spokane, Washington, November 17–19, 2004.

Agee, J.K., and C.N. Skinner. 2005. Basic principles of fuel reduction treatments. *Forest Ecology and Management* 211:83–96.

Alexander, L.V., X. Zhang, T.C. Peterson, J. Caesar, B. Gleason, A.M.G. Klein Tank, M. Haylock, D. Collins, B. Trewin, F. Rahimzadeh, A. Tagipour, K. Rupa Kumar, J. Revadekar, G. Griffiths, L. Vincent, D. B. Stephenson, J. Burn, E. Aguilar, M. Brunet, M. Taylor, M. New, P. Zhai, M. Rusticucci, and J. L. Vazquez-Aguirre. 2006. Global observed changes in daily climate extremes of temperature and precipitation. *Journal of Geophysical Research* 111:D05109.

Allen, C.D., and D.D. Breshears. 1998. Drought-induced shift of a forest-woodland ecotone: rapid landscape response to climate variation. *Ecology* 95:14839–14842.

Allen, C.D., M. Savage, D.A. Falk, K.F. Suckling, T.W. Swetnam, T. Schulke, P.B. Stacey, P. Morgan, M. Hoffman, and J.T. Klingel. 2002. Ecological restoration of southwestern ponderosa pine ecosystems: A Broad Perspective**.** *Ecological Applications* 12:1418–1433.

Baisan, C.H., and T.W. Swetnam. 1997. *Interactions of Fire Regimes and Land Use in the Central Rio Grande Valley.* Research Paper RM-RP-330. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station.

Baker, W.L., and D.J. Shinneman. 2004. Fire and restoration of pinon-juniper woodlands in the western United States: a review. *Forest Ecology and Management* 189:1–21.

Betancourt, J.L. 1987. Paleobotany of pinyon-juniper woodlands: summary. In *Proceedings - Pinyon-Juniper Conference,* pp. 129–140. General Technical Report No. GTR-INT-215. U.S. Department of Agriculture, Forest Service.

Biswell, H.H. 1973. Fire ecology in ponderosa pine grassland. *Proceeding of the Tall Timbers Fire Ecology Conference* 12:69–96.

Brotherson, J.D., and D. Field. 1987. Tamarix: impacts of a successful weed. *Rangelands* 9(3):110–112.

Brotherson, J.D., and V. Winkel. 1986. Habitat relationships of saltcedar (*Tamarix ramosissima*). *The Great Basin Naturalist* 46(3):535–541.

Brown, J.K. 1995. Fire regimes and their relevance to ecosystem management. In *Proceedings of Society of American Foresters National Convention, Sept. 18–22, 1994, Anchorage, Alaska*, pp. 171–178. Washington D.C.: Society of American Foresters.

Brown, R., J.K. Agee, and J.F. Franklin. 2004. Forest restoration and fire principles in the context of place. *Conservation Biology* 18:903–912.

Brown, R.D., and P.W. Mote. 2009. The response of Northern Hemisphere snow cover to a changing climate. *Journal of Climate* 22 (8):2124–2145.

Burgess, T.L. 1995. Desert grassland, mixed shrub savanna, shrub steppe, or semidesert scrub? The dilemma of coexisting growth forms. In *The Desert Grassland,* pp. 31–67. Tucson: University of Arizona Press.

Busch, D.E. 1995. Effects of fire on southwestern riparian plant community structure. *The Southwestern Naturalist* 40(3):259–267.

Busch, D.E., and S.D. Smith. 1993. Effects of fire on water and salinity relations of riparian woodland taxa. *Oecologia* 94:186–194.

Campbell, C.J., and W.A. Dick-Peddie. 1964. Comparison of phreatophyte communities on the Rio Grande in New Mexico. *Ecology* 45(3):492–502.

Claunch-Pinto Soil and Water Conservation District. 2016. Claunch-Pinto Soil and Water Conservation District Website. Available at: http://claunchpinto.org. Accessed June 2016.

Clifford, M.J., M.E. Rocca, R. Delph, P.L. Ford, and N.S. Cobb. 2008. Drought induced tree mortality and ensuing bark beetle outbreaks in southwestern pinyon-Juniper woodlands. In *Ecology, Management, and Restoration of Piñon-juniper and Ponderosa Pine Ecosystems: Combined Proceedings of the 2005 St. George, Utah and 2006 Albuquerque, New Mexico Workshops*, edited by G.J. Gottfried, J.D. Shaw, and P.L. Ford, pp. 39–51. Proceedings RMRS-P-51. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Cohen, J.D., and B.W. Butler. 1996. Modeling Potential Structure Ignitions from Flame Radiation Exposure with Implications for Wildland/Urban Interface Fire Management. Lorne, Australia: 13th Fire and Forest Meteorology Conference.

Cooper, C.F. 1960. Changes in vegetation, structure, and growth of southwestern pine forests since white settlement. *Ecological Monographs* 30:129–164.

Covington, W.W., and M.M. Moore. 1994. Southwestern ponderosa forest structure: changes since Euro-American settlement. *Journal of Forestry* 92(1):39–47.

Cram, D. S., T. Baker, and J. Boren. 2006. *Wildland Fire Effects in Silviculturally Treated Versus Untreated Stands of New Mexico and Arizona*. Research Paper RMRS-RP-55. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Della Sala, D.A., J.A. Williams, C.D. Williams, and J.E. Franklin. 2004. Beyond smoke and mirrors: a synthesis of fire policy and science. *Conservation Biology* 18:976–986.

Dick-Peddie, W.A. 1993. *New Mexico Vegetation, Past, Present, and Future.* Albuquerque: University of New Mexico Press.

Donovan, G.H., P.A. Champ, and D.T. Butry. 2007. Measuring the efficacy of a wildfire education program in Colorado Springs. *Journal of Emergency Management* 5:33–37.

Ellis, L. M. 2001. Short-term response of woody plants to fire in a Rio Grande riparian forest, central New Mexico, USA. *Biological Conservation* 97:159–170.

Finch, D.M., H. Bateman, A. Chung-MacCoubrey, D. Hawksworth, R. Jemison, B. Johnson, D. Merritt, D. Max Smith, and B. Thomson. 2008. Pentimento: fuels reduction and restoration in the bosque of the Middle Rio Grande. *Fire Science Brief* 7.

Finney, M.A., and J.D. Cohen. 2003. Expectation and evaluation of fuel management objectives. In:. technical editors. In *Fire, Fuel Treatments and Ecological Restoration: Conference Proceedings, 2002 April 16–18*, edited by P.N. Omi and L.A. Joyce, pp. 353–366. RMRS-P-29. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Firewise. 2016. Assessing Wildfire Hazards in the Home Ignition Zone, Student Workbook, Firewise Communities, National Wildland Urban Interface Program. Available at: www.firewise.org. Accessed May 2016.

Fitzhugh, E.L., W.H. Moir, J.A. Ludwig, and F. Ronco, Jr. 1987. *Forest Habitat Types in the Apache, Gila, and Part of the Cibola National Forests, Arizona and New Mexico.* General Technical Report RM-145. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station.

Fulé, P.Z., J.E. Crouse, T.A. Heinleins, M.M. Moore, W,W, Covington, and G. Verkamp. 2003. Mixed-severity fire regime in a high-elevation forest of Grand Canyon, Arizona, USA. *Landscape Ecology* 18:465–486.

Gorte, R.W., and Bracmort, K. 2012. Forest Fire/Wildfire Protection. Congressional Research Service. CRS Report for Congress. 7-5700, RL 30755.

Gaylord, M.L. 2014. *Impact of Forest Restoration Treatments on Southwestern Ponderosa Pine Tree Resistance to Bark Beetles*. ERI Working Papers. Ecological Restoration Institute and Southwest Fire Science Consortium, Northern Arizona University.

Gaylord, M.L, T.E. Kolb, W.T. Pockman, J.A. Plaut, E.A. Yepez, A.K. Macalady, R.E. Pangle, and N.G. McDowell. 2013. Drought predisposes pinon-juniper woodlands to insect attacks and mortality. *New Phytologist* 1–12.

Gottfried, G. 2004. Silvics and silviculture in the southwestern pinyon-juniper woodlands. In *Silviculture in Special Places: Proceedings of the 2003 National Silviculture Workshop*, edited by W.D. Shepperd and L.G. Eskew, pp. 64–79. U.S. Department of Agriculture, Forest Service Proceedings RMRS-P-34.

Graham, R., S. McCaffrey, and T. Jain. 2004. *Science Basis for Changing Forest Structure to Modify Wildfire Behavior and Severity.* General Technical Report RMRS-GTR-120. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Gray, S. T., J. L. Betancourt, C. L. Fastie, and S. T. Jackson. 2003. Patterns and sources of multidecadal oscillations in drought-sensitive tree-ring records from the Central and Southern Rocky Mountains. *Geophysical Research Letters* 30(0).

Gutzler, D. S. (2013). Regional climatic considerations for borderlands sustainability. *Ecosphere*, 4(1), 1-12.

Gutzler, D. S., & Robbins, T. O. (2011). Climate variability and projected change in the western United States: regional downscaling and drought statistics. *Climate Dynamics*, 37(5-6), 835-849.

Hann, W.J., and D.L. Bunnell. 2001. Fire and land management planning and implementation across multiple scales. *International Journal of Wildland Fire* 10(4):389–403.

Hann, W.; Shlisky, A.; Havlina, D.; Schon, K.; Barrett, S.; DeMeo, T.; Pohl, K.; Menakis, J.; Hamilton, D.; Jones, J.; Levesque, M.; Frame, C. 2008. Interagency fire regime condition class guidebook. Version 1.3.0. [Homepage of the Interagency and The Nature Conservancy Fire Regime Condition Class website, USDA Forest Service, U.S. Department of the Interior, The Nature Conservancy, and Systems for Environmental Management]. 119 p. Online: www.frcc.gov. Accessed May 2016.

Hardy, C.C., K.M. Schmidt, and J.P. Menakis. 2001. Spatial data for national fire planning and fuel management. *International Journal of Wildland Fire* 10:353–372.

Harrington, M.G., and S.S. Sackett. 1990. Using fire as a management tool in southwestern ponderosa pine. In *Effects of Fire Management in Southwestern Natural Resources, Proceedings of the Symposium*, edited by J.S. Krammes. General Technical Report RM-191. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station.

Hastings, B.K., F.M. Smith, and B.F. Jacobs. 2003. Rapidly eroding pinon-juniper woodlands in New Mexico: response to slash treatment. *Journal of Environmental Quality* 32(4):1290–1298.

Hunter, M.E., W.D. Sheppard, J.E. Lentile, J.E. Lundquist, M.G. Andreu, J.L. Butler, and F.W. Smith. 2007. *A Comprehensive Guide to Fuels Treatment Practices for Ponderosa Pine in the Black Hills, Colorado Front Range and Southwest*. General Technical Report RMRS-GTR-198. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Hurd, B.H., and J. Coonrod. 2008. *Climate Change and its Implications for New Mexico's Water Resources and Economic Opportunities*. Technical Report 45. Las Cruces, New Mexico: New Mexico State University Agricultural Experiment Station.

Ivey, J.E. 1988. *In the Midst of a Loneliness: The Architectural History of the Salinas Missions*. Professional Papers No. 15. Santa Fe, New Mexico: Southwest Cultural Resources Center, Southwest Regional Office, National Park Service.

Jacobs, B.F., and R.G. Gatewood. 1997. Restoration studies in degraded pinon-juniper woodlands of north-central New Mexico. In *Proceedings: Ecology and Mangement of Pinon-Juniper Communities within the Interior West*, edited by S.B. Monsen and R. Stevens. Proc. RMRS-P-9. Ogden, Utah: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Johnson, M. 1994. Changes in southwestern forests: stewardship implications. *Journal of Forestry* 92:16–19.

Kaye, M.W., and T.W. Swetnam. 1999. An assessment of fire, climate, and Apache history in the Sacramento Mountains, New Mexico. *Physical Geography* 20(4):305–330.

Kurz, W.A., C.C. Dymond, G. Stinson, G.J. Rampley, E.T. Neilson, A.L. Carroll, T. Ebata, and L. Safranyik. 2008. Mountain pine beetle and forest carbon feedback to climate change. *Nature* 452:987–990.

Leopold, A. 1924. Grass, brush, timber and fire in southern Arizona. *Journal of Forestry* 22:1–10.

LANDFIRE 2014. . LANDFIRE 2014 Update. Available online at http://www.landfire.gov/lf_130.php. Accessed June 2016.

Llewellyn, D., & Vaddey, S. (2013). West-wide Climate Risk Assessment: Upper Rio Grande Impact Assessment: Report. US Department of the Interior, Bureau of Reclamation, Upper Colorado Region, Albuquerque Area Office.

Martinson, E.J., and P.N. Omi. 2003. *Performance of Fuel Treatments Subjected to Wildfires*. U.S. Department of Agriculture, Forest Service Proceedings, RMRS-P-29.

McCaffrey, S.M. 2004. Fighting fire with education: what is the best way to reach out to homeowners? *Journal of Forestry* 102:12–19.

McHugh, C.W, and T.E. Kolb. 2003. Ponderosa pine mortality following fire in northern Arizona. *International Journal of Wildland Fire* 12:7–22.

McPherson, G.R. 1995. The role of fire in desert grasslands. In *The Desert Grassland,* pp. 130–151. Tucson: University of Arizona Press.

Mid-Region Council of Governments of New Mexico (MRCOG). 2007. Torrance County. Available at: http://www.mrcog-nm.gov/. Accessed May 2016

National Fire Protection Association (NFPA). 2008, 2013. *Standard for Reducing Structure Ignition Hazards from Wildland Fire.*

National Interagency Fire Center (NIFC). 2016. Wildland Fire Statistics. Available at: http://www.nifc.gov/fireInfo/fireInfo_statistics.html. Accessed June 2016.

National Wildfire Coordinating Group. 1998. *Fireline Handbook*. NWCG Handbook 3. PMS 410-1. NFES 0065. Boise, Idaho: National Interagency Fire Center.

Natural Resources Conservation Service (NRCS). 1998. Abo Arroyo Watershed Health Plan.

Neilson, R. 2004. Cited in Rapp, V. 2004. Western Forests, Fire Risk and Climate Change. PNRS-Science Update- Issue 6. Available at: http://www.fs.fed.us/pnw/pubs/science-update-6.pdf Accessed June 2016.

New Mexico Department of Agriculture. 2005. *New Mexico Non-Native Phreatophyte/ Watershed Management Plan*. Available at: http://www.nmda.nmsu.edu/wp-content/uploads/2012/06/2005_nmnpwmp.pdf. Accessed June 2016.

New Mexico Drought Task Force. 2006. *New Mexico Drought Plan*. Available at: http://courses.washington.edu/cee576/Drought_Planning/NewMexico2003-drought-plan.pdf. Accessed June 2016.

New Mexico Forest Restoration Principles (NMFRP). 2006. Available at: http://www.nature.org/wherewework/northamerica/states/newmexico/files/principles_2006_11_01.pdf. Accessed June 2016.

New Mexico State Forestry (NMSF). 2015. New Mexico Communities at Risk Assessment Plan. Energy, Minerals and Natural Resources Department Forestry Division 69pgs.

Omi, P.N., and K.D. Kalabokidis. 1991. Fire damage on extensively versus intensively managed forest stands within the North Fork fire, 1988. *Northwest Science* 65:149–157.

Parker, D.L., M. Renz, A. Fletcher, F. Miller, and J. Gosz. 2005. *Strategy for Long-Term Management of Exotic Trees in Riparian Areas for New Mexico's Five River Systems, 2005–2014*. U.S. Department of Agriculture, Forest Service and New Mexico Energy, Minerals and Natural Resources Department, Forestry Division Publication.

Pollet, J., and P.N. Omi. 2002. Effect of thinning and prescribed burning on crownfire severity in ponderosa pine forests. *International Journal of Wildland Fire* 11:1–10.

Pyne, S.J. 2001. The fires this time, and next. *Science* 294(2):12–17.

Raffa, K.F., B.H. Aukema, B.J. Bentz, A.L. Carroll, J.A. Hicke, M.G. Turner, and W.H. Romme. 2008. Cross-scale drivers of natural disturbances prone to anthropogenic amplification: the dynamics of bark beetle eruptions. *BioScience* 58:501–517.

Richardson, D.M. 1998. *Ecology and Biogeography of Pinus*. Cambridge: Cambridge University Press.

Rogers, T.J. 1995. Insect and disease associates of the pinon-juniper woodlands. In *Desired Future Conditions for Pinonjuniper Ecosystems*, edited by D.W. Shaw, E.F. Aldon, and C. LoSapio, pp. 107–108. General Technical Report RM-GTR-258. Fort Collins, Colorado: U.S. Department of Agriculture Forest Service, Rocky Mountain Forest and Range Experiment Station.

Romme, W.H., C.D. Allen, J. Bailey, W.L. Baker, B.T. Bestelmeyer, P. Brown, K. Eisenhart, L. Floyd-Hanna, D. Huffman, B.F. Jacobs, R. Miller, E. Muldavin, T. Swetnam, R. Tausch and P. Weisberg. 2007. *Historical and Modern Disturbance Regimes of Pinon-juniper Vegetation in the Western U.S*. Colorado Forest Restoration Institute and The Nature Conservancy.

Rothermel, R.C. 1983. *How to Predict the Spread and Intensity of Forest and Range Fires*. General Technical Report INT-143. Ogden, Utah: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station.

Sackett, S.S., S.M. Hasse, M.G. Harrington. 1996. Lessons learned from fire use for restoring southwestern ponderosa pine ecosystems. *Conference on Adaptive Ecosystem Restoration and Management: Restoration of Cordilleran conifer landscapes of North America*, edited by W.W. Covington and M.R. Wagner. General Technical Report RM-GTR-278. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station.

Savage, M. 1991. Structural dynamics of a southwestern ponderosa pine forest under chronic human influences. *Annals of the Association of American Geographers* 81:271–289.

Savage, M., T. Derr, A. Evans, E. Krasilovsky, K. Smith, and H.Carey. 2008. *Short Guide for Developing CFRP Restoration Prescriptions*. New Mexico Forest Restoration Series, Working Paper 1.

Schmidt, K.M., J.P. Menakis, C.C. Hardy, W.J. Hann, and D.L. Bunnell. 2002. *Development of Coarse-scale Spatial Data for Wildland Fire and Fuel Management*. General Technical Report, RMRS-GTR-87. Fort Collins, Colorado: U.S. Department of Agriculture, U.S. Forest Service, Rocky Mountain Research Station.

Schoennagel, T., T.T. Veblen, and W.H. Romme. 2004. The interaction of fire, fuels, and climate across Rocky Mountain Forests. *Bioscience* 54(7):661–676.

Schubert, G.H. 1974. *Silviculture of Southwestern Ponderosa Pine: The Status of Our Knowledge*. Research Paper RM-RP-123, Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Range and Experiment Station.

Scott, J.H., and R.E. Burgan. 2005. *Standard Fire Behavior Fuel Models: A Comprehensive Set for Use with Rothermel's Surface Fire Spread Model.* General Technical Report RMRS-GTR-153. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Scurlock, D. 1998. *An Environmental History of the Middle Rio Grande Basin*. General Technical Report RMRS–GTR–5. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service.

Shaw, J.D. 2008. Assessment of drought related mortality in pinyon-juniper and ponderosa pine forests using Forest Inventory and Analysis data. In *Ecology, Management, and Restoration of Pinon-juniper and Ponderosa Pine Ecosystems: Combined Proceedings of the 2005 St. George, Utah and 2006 Albuquerque, New Mexico Workshops*, edited by G.J. Gottfried, J.D. Shaw, and P.L. Ford, p. 208. Proceedings RMRS-P-51. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Sheppard, P.R., A.C. Comrie, G.D. Packin, K. Angersbach, and M.K. Hughes. 2002. The climate of the US Southwest. *Climate Research* 21: 219–238.

Sisk, T.D., H.M. Hampton, J.W. Prather, E.N. Aumak, Y. Xu, M.R. Loeser, T. Munoz-Erikson, B. Dickson, J. Palumbo. 2004. *Forest Ecological Restoration Analysis (Forest ERA) Project Report 2002–2004*. Flagstaff, Arizona: Center for Environmental Sciences and Education, Northern Arizona University.

Smith, D.M., J.F. Kelly, and D.M. Finch. 2006. Wildfire, exotic vegetation, and breeding bird habitat in the Rio Grande bosque. In *Aguirre-Bravo*, edited by C. Patrick, J. Pellicane, D.P. Burns, and S. Draggan, pp. 230–237. Monitoring Science and Technology Symposium: Unifying Knowledge for Sustainability in the Western Hemisphere Proceedings RMRS-P-42CD. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Smith, J.K. (ed.) 2000. *Wildland Fire in Ecosystems: Effects of Fire on Fauna*. Vol. 1. General Technical Report RMRS-GTR-42. Ogden, Utah: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Smith, S.D., A. Dale, A. Devitt, J.R. Sala, Cleverly, and D.E. Busch. 1998. Water relations of riparian plants from warm desert regions. *Wetlands* 18(4):687–696.

Society of American Foresters (SAF). 2004. *Preparing a Community Wildfire Protection Plan: A Handbook for Wildland Urban Interface Communities*. Sponsored by Communities Committee, National Association of Counties, National Association of State Foresters, Society of American Foresters, and Western Governors' Association. Available at: http://www.na.fs.fed.us/fire/cwpp/guidance/preparing_cwpp.pdf. Accessed June 2016.

Socorro County. 2007. *Socorro County Community Wildfire Protection Plan*. Multiple contributors. Funded by New Mexico Association of Counties in partnership with Bureau of Land Management, Socorro Office.

State of New Mexico. 2008. *Joint Powers Agreement Between the Energy, Minerals and Natural Resources Department, Forestry Division and the United States Departments of Agriculture, Energy and Interior for Interagency Wildland Fire Protection*. Available at: http://www.emnrd.state.nm.us/SFD/FireMgt/documents/FINAL-DFA2008-2013JPAWildlandFireMgmt03-18-08.pdf. Accessed June 2016.

Seager, R., M. Ting, I. Held, Y. Kushnir, J. Lu, G. Vecchi, H.-P. Huang, N. Harnik, A. Leetmaa, N.-C. Lau, C. Li, J. Velez, and N. Naik. 2008. Model projections of an imminent transition to a more arid climate in southwestern North America. *Science* 316:1181–1184.

Stephens, S.L., and L.W. Ruth. 2005. Federal forest-fire policy in the United States. *Ecological Applications* 15(2):532–542.

Swetnam, T.W., C.D. Allen, and J.L. Betancourt. 1999. Applied historical ecology: using the past to manage for the future. *Ecological Applications* 9(4):1189–1206.

Swetnam, T.W., C.H. Baisan, A.C. Caprio, R. Touchan, and P.M. Brown. 1992. *Tree-ring Reconstruction of Giant Sequoia Fire Regimes*. Final report to Sequoia, Kings Canyon and Yosemite National Parks, Laboratory of Tree-Ring Research, Tucson, Arizona.

Swetnam, T.W., and J.L. Betancourt. 1990. Fire-southern oscillation relations in the southwestern United States. *Science* 249(4972):1017–1020.

———. 1998. Mesoscale disturbance and ecological response to decadal climatic variability in the American Southwest. *Journal of Climate* 11(12):3128–3147.

Torrance County. 2007. *Torrance County Hazard Mitigation Plan*. Torrance County, New Mexico.

———. 2015. *Torrance County Hazard Mitigation Plan*. Torrance County, New Mexico

Touchan, R., C.D. Allen, and T.W. Swetnam. 1996. Fire history and climatic patterns in ponderosa pine and mixed-conifer forests of the Jemez Mountains, northern New Mexico. In *Fire Effects in Southwestern Forests: Proceedings of the Second La Mesa Fire Symposium,* edited by C.D. Allen, pp. 179–195. General Technical Report RM-286. Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service.

U.S. Census Bureau. 2010. American factfinder. Available at: http://factfinder.census.gov. Accessed May 2016.

U.S. Department of the Interior and U.S. Department of Agriculture (USDA). 2001. Urban Wildland Interface Communities within Vicinity of Federal Lands that are at High Risk from Wildfire. *Federal Register* 66(3):751–777.

U.S. Geological Survey (USGS). 2007. Southwest Regional Gap Analysis Project: Land Cover Dataset. Available at: http://www.gapserve.ncsu.edu/swgap/swgap/. Accessed June 2016.

U.S. Government Accountability Office (GAO). 2009. *Report to Congressional Requesters. Climate Change- Agencies Should Develop Guidance for Addressing the Effects on Federal Lands and Water Resources*. GAO-07-863.

Van Wagner, R. 1977. Conditions for the start and spread of crown fire. *Canadian Journal of Forest Research* 7:23–34.

Wakimoto, R.H., R.D. Pfister, and K.D. Kalabokidis. 1988. Evaluation of alternative fire hazard reduction techniques in high-hazard high-value, and high-use forests. In *Proceedings - Future Forests of the Mountain West: A Stand Culture Symposium,* pp. 401–402. General Technical Report INT-243. U.S. Department of Agriculture, Forest Service.

Wase, C.L., M.E. Brown, and R.L. Wessel. 2003. *Buckman Water Diversion Environmental Impact Statement Project: Cultural Resources Survey.* Albuquerque, New Mexico: SWCA Environmental Consultants.

Weaver, H. 1947. Fire, nature's thinning agent in ponderosa pine stands. *Journal of Forestry* 45:437–444.

West, N.E. 1984. Successional patterns and productivity potentials of pinyon-juniper ecosystems. In *Developing Strategies for Rangeland Management*, pp. 1304–1332. National Research Council/National Academy of Sciences. Boulder, Colorado: Westview Press.

Westerling, A.L., H.G. Hidalgo, D.R. Cayan, and T.W. Swetnam. 2006. Warming and earlier spring increase in western U.S. forest wildfire activity. *Science* 313(5789):940–943.

Western Governors' Association. 2006. *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: A 10-year Comprehensive Strategy*. Available at: https://www.forestsandrangelands.gov/resources/plan/documents/10-yearstrategyfinal_dec2006.pdf. Accessed June 2016.

Western Regional Climate Center (WRCC). 2016. New Mexico Climate Summaries. Western Regional Climate Center. Available at: http://www.wrcc.dri.edu/. Accessed June 2016.

Wildland Fire Leadership Council. 2012. Implementation of the national cohesive wildland fire management strategy. http://www.wildlandfire.com/docs/2012/federal/1-wflc-letter-of-support-for-cohesive-strategy-docx.pdf. Accessed June 2016.

Windell, K., and S. Bradshaw. 2000. *Understory Biomass Reduction Methods and Equipment*. Technical Report 0051-2828-MTDC. Missoula, Montana: U.S. Department of Agriculture, Forest Service, Missoula Technology and Development Center.

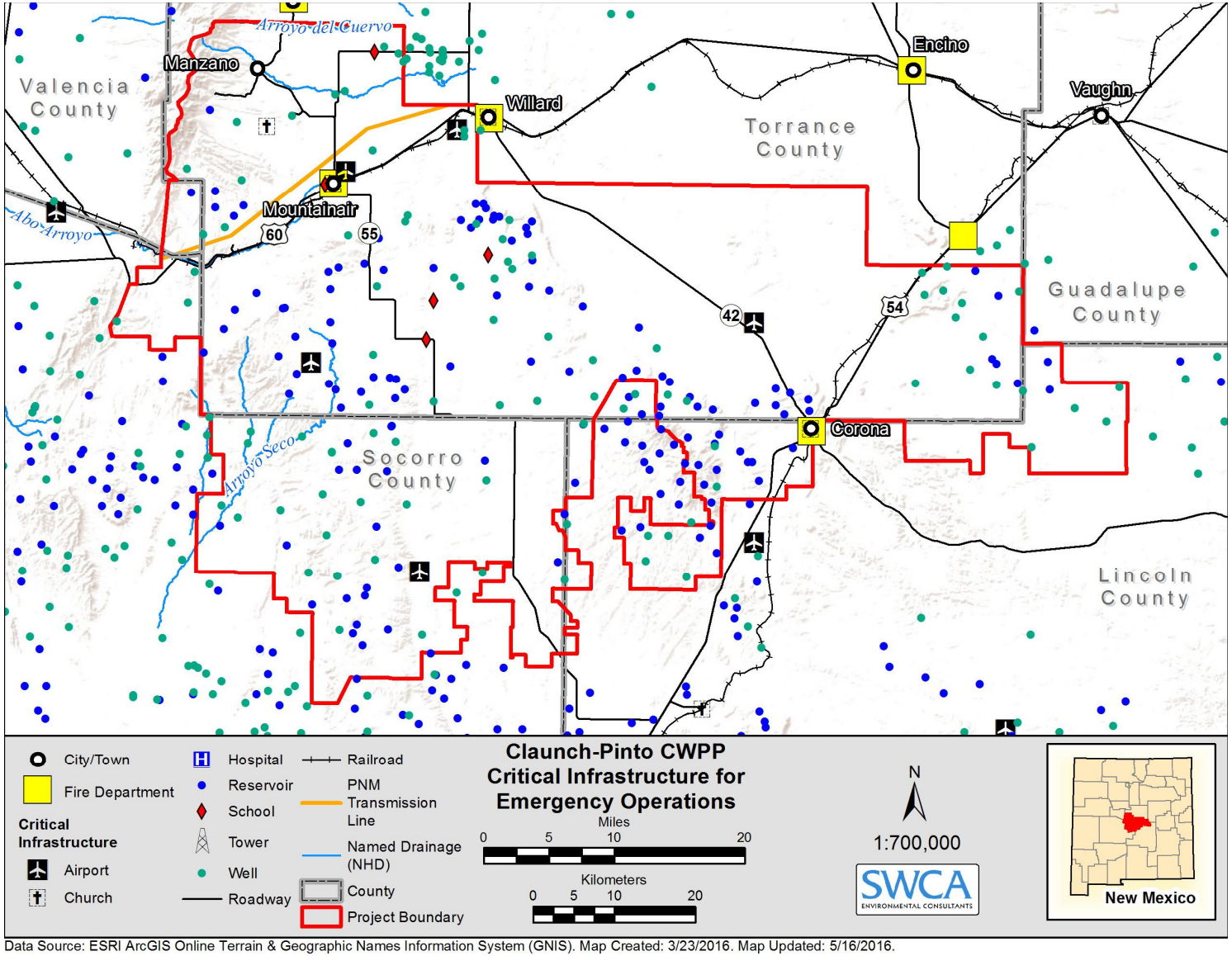
Winter, G., and J.S. Fried. 2000. Homeowner perspectives on fire hazard, responsibility, and management strategies at the wildland-urban interface. *Society & Natural Resources* 13:33–49.

Zausen, G.L., T.E. Kolb, J.D. Baley, and M.R. Wagner. 2005. Long-term impacts of stand management on ponderosa pine physiology and bark beetle abundance in northern Arizona: A replicated landscape study. *Forest Ecology and Management* 218:291–305.

This page intentionally left blank

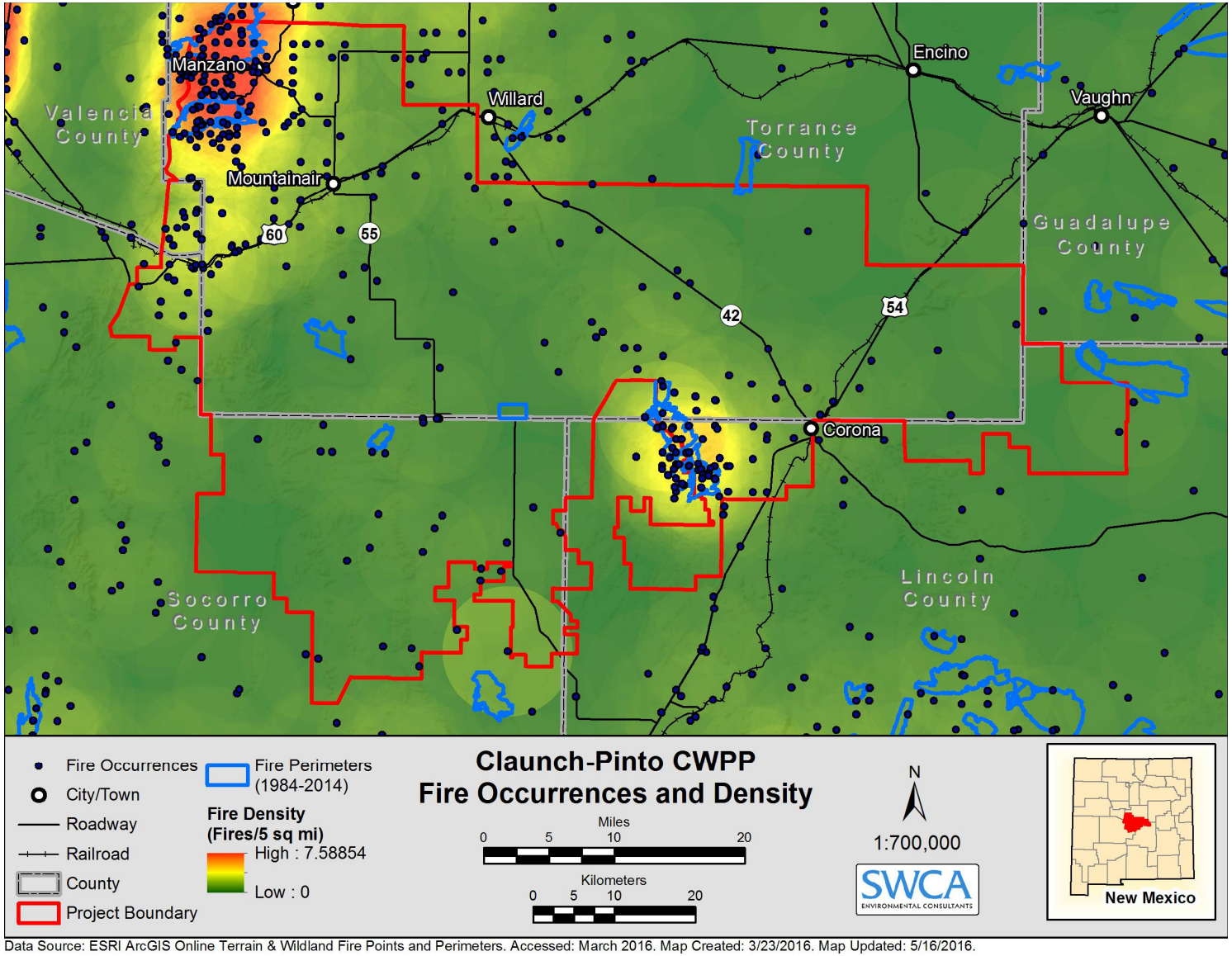
APPENDIX A.
BASE MAPS

This page intentionally left blank



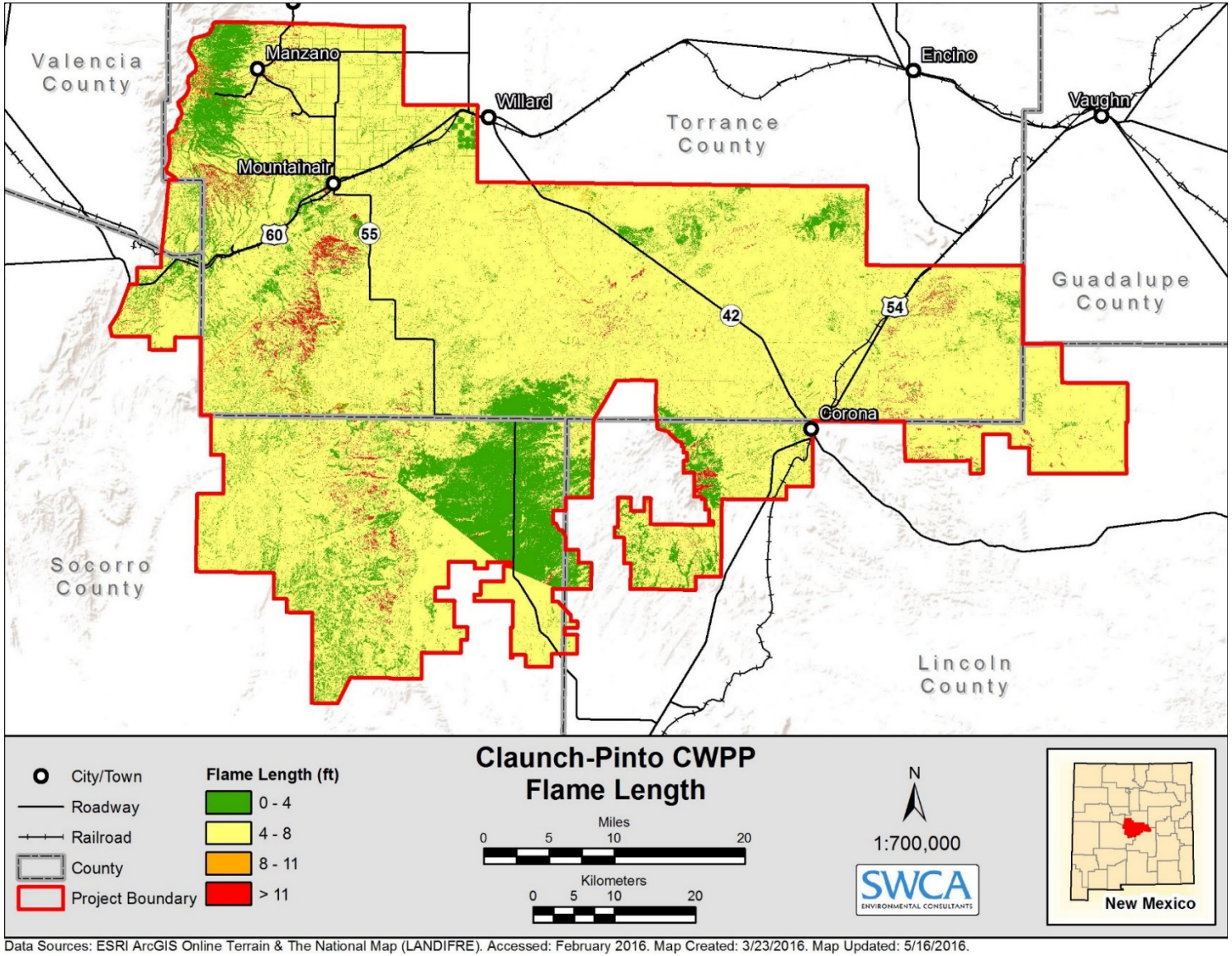
Data Source: ESRI ArcGIS Online Terrain & Geographic Names Information System (GNIS). Map Created: 3/23/2016. Map Updated: 5/16/2016.

Map 1. Claunch-Pinto SWCD critical infrastructure.



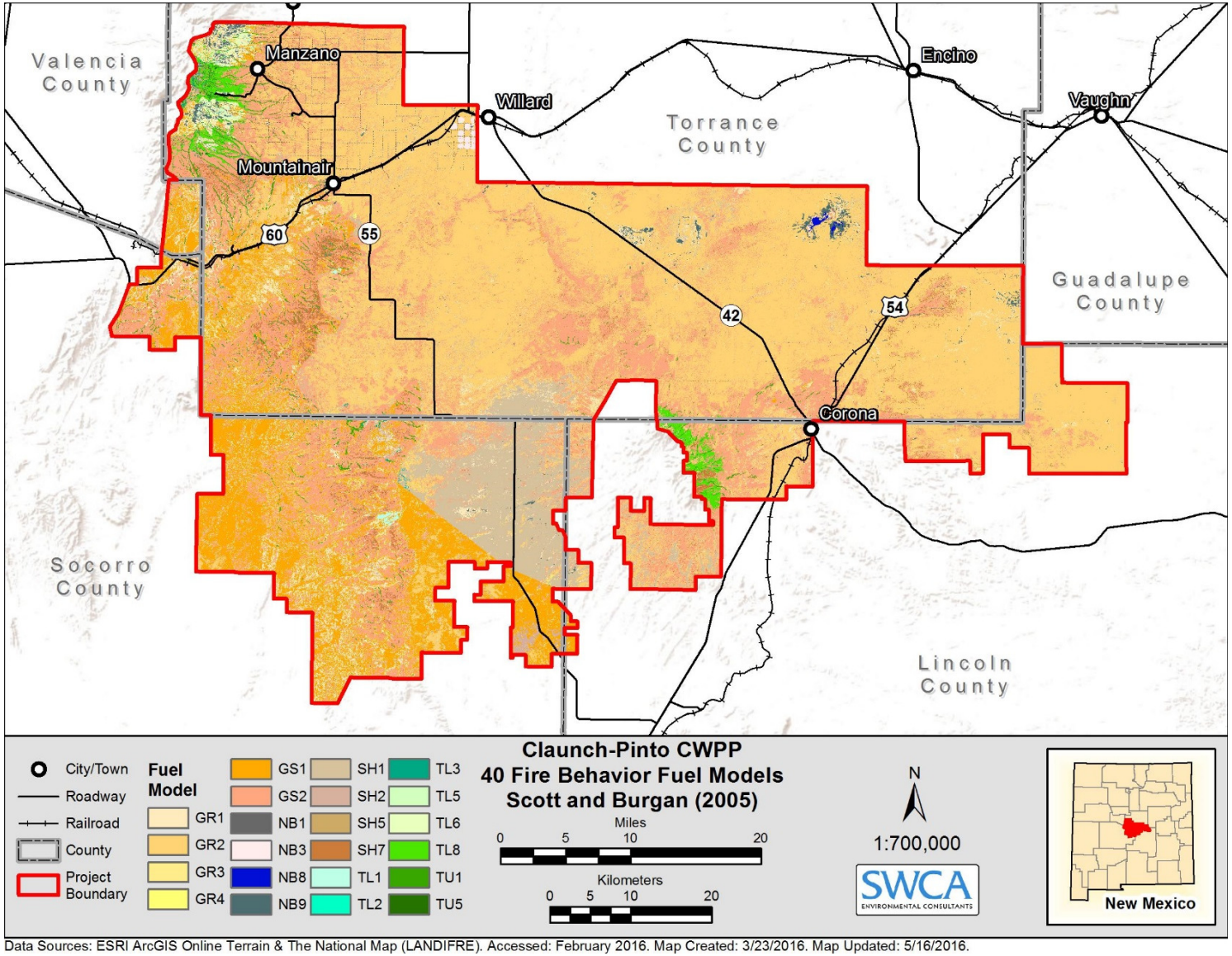
Data Source: ESRI ArcGIS Online Terrain & Wildland Fire Points and Perimeters. Accessed: March 2016. Map Created: 3/23/2016. Map Updated: 5/16/2016.

Map 2. Claunch-Pinto SWCD fire occurrence and density.



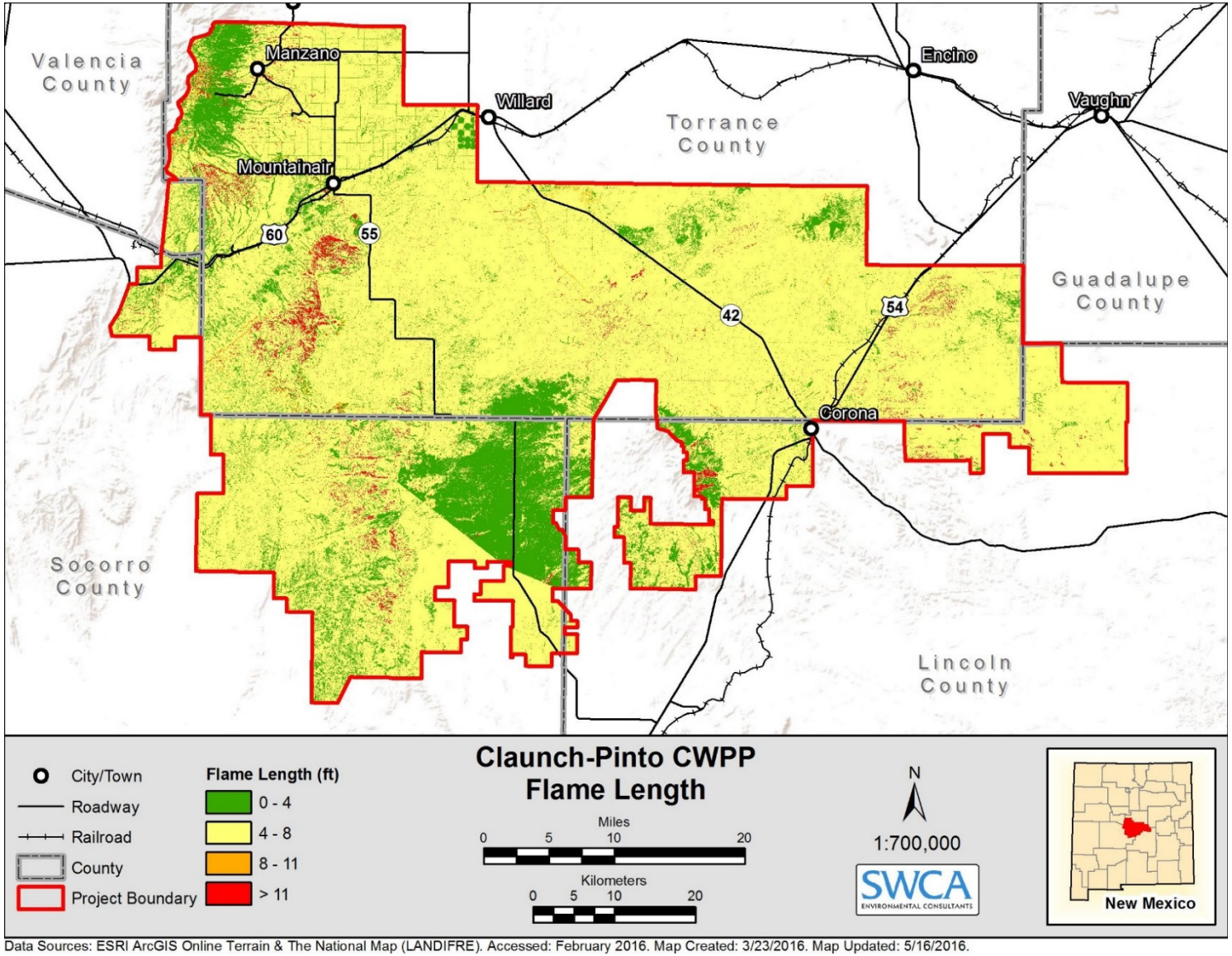
Data Sources: ESRI ArcGIS Online Terrain & The National Map (LANDIFRE). Accessed: February 2016. Map Created: 3/23/2016. Map Updated: 5/16/2016.

Map 3. Claunch-Pinto SWCD Flame length.



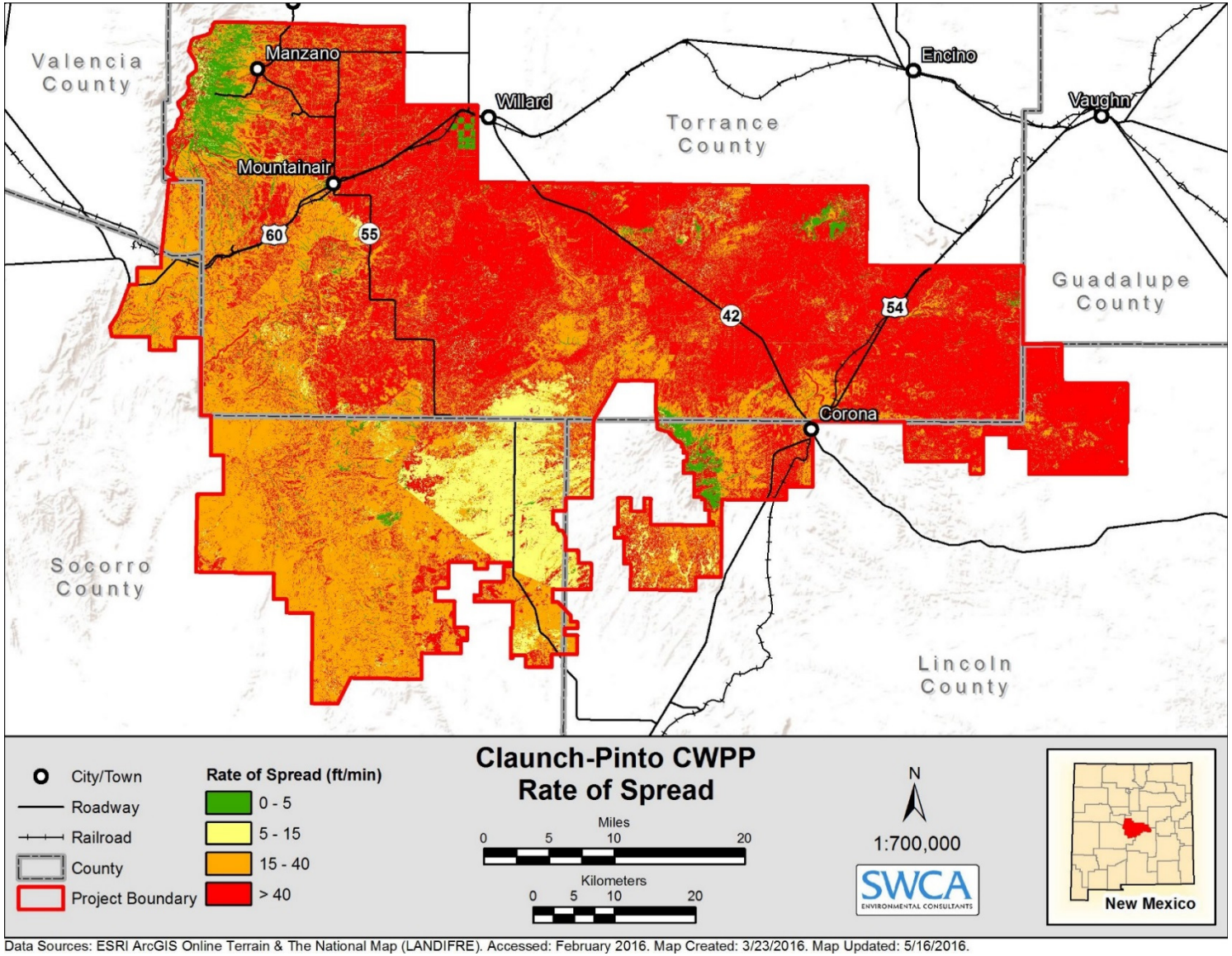
Data Sources: ESRI ArcGIS Online Terrain & The National Map (LANDIFRE). Accessed: February 2016. Map Created: 3/23/2016. Map Updated: 5/16/2016.

Map 4. Claunch-Pinto SWCD fuels classification.



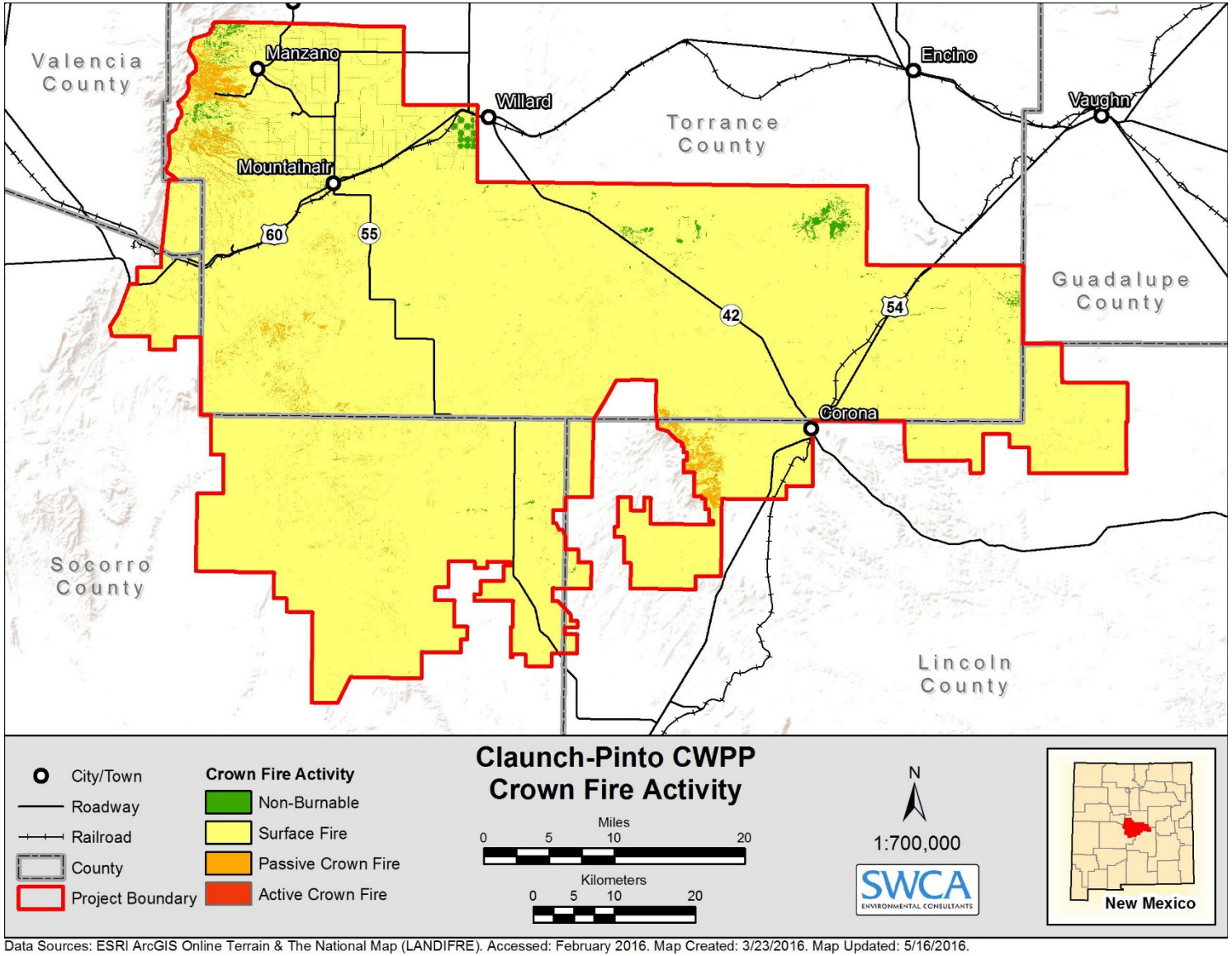
Data Sources: ESRI ArcGIS Online Terrain & The National Map (LANDIFRE). Accessed: February 2016. Map Created: 3/23/2016. Map Updated: 5/16/2016.

Map 5. Claunch-Pinto SWCD flame length.



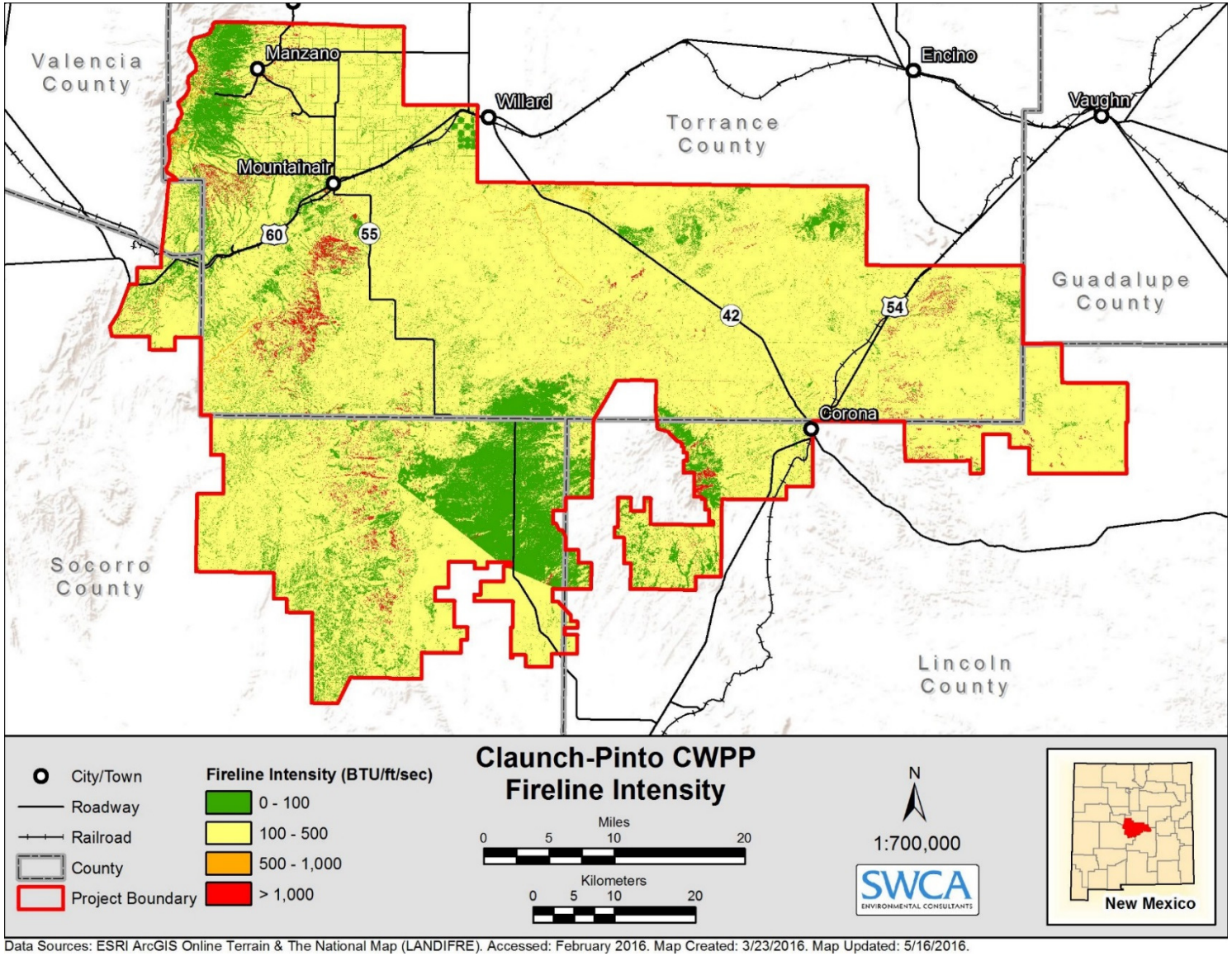
Data Sources: ESRI ArcGIS Online Terrain & The National Map (LANDIFRE). Accessed: February 2016. Map Created: 3/23/2016. Map Updated: 5/16/2016.

Map 6. Claunch-Pinto SWCD rate of spread.



Data Sources: ESRI ArcGIS Online Terrain & The National Map (LANDIFRE). Accessed: February 2016. Map Created: 3/23/2016. Map Updated: 5/16/2016.

Map 7. Claunch-Pinto SWCD potential crown fire activity.



Data Sources: ESRI ArcGIS Online Terrain & The National Map (LANDIFRE). Accessed: February 2016. Map Created: 3/23/2016. Map Updated: 5/16/2016.

Map 8. Claunch-Pinto SWCD fireline intensity.

APPENDIX B.
CORE TEAM LIST

This page intentionally left blank

Claunch-Pinto SWCD and Torrance County CWPP Core Team List

Name	Organization	Position
Cody Stropki	SWCA Environmental Consultants	Planning Lead
Victoria Amato	SWCA Environmental Consultants	Planner
Dierdre Tarr	Claunch-Pinto Soil and Water Conservation District	District Manager
Vernon Kohler	Claunch-Pinto Soil and Water Conservation District	Field Tech
Javier Sanchez	Torrance County	Emergency Manager
Jay Turner	Mountainair Ranger District	District Ranger
Anthony Martinez	Mountainair Ranger District	District FMO
Adrian Padilla	Mountainair Ranger District	Assistant FMO
Arlene Perea	Mountainair Ranger District	Rec. Tech
Karlyn Bates	Edgewood Soil and Water Conservation District	Admin Assistant
Cheri Lujan	East Torrance Soil and Water Conservation District	District Manager
Todd Hanies	State Forestry Bernalillo District	District Forester
Mark LeFrancois	Salinas Pueblo Mission National Park	Chief of Resources
Carol Glade	Deer Canyon	Resident/Board of Directors
Jim McGovern	Deer Canyon	ResidentChairman of Safety Committee
Tom Perkins	State Land Office	District Resource Manager

This page intentionally left blank

APPENDIX C.
OUTREACH SURVEY

This page intentionally left blank

Claunch Pinto SWCD and Torrance County CWPP Survey

CWPP Update

A Community Wildfire Protection Plan (CWPP) is a way for communities to address their wildfire risk by promoting collaboration and local action through comprehensive planning and prioritization. A custom online survey has been designed to help gather the perspectives of residents on wildfire risk and hazard within your community.

Your input via this survey will help us ensure that we have a clear idea of the range and prevalence of activities and concerns across the District and County. Responses from the survey will help identify areas of particular concern to residents, ascertain resident's priorities for actions to reduce wildfire hazard, identify mitigation activities residents are undertaking, and determine what tools you or your community need in order to undertake further mitigation actions. Your response is anonymous although we are asking for general information of your location so we can identify activities and concerns specific to your area.

We thank you for providing your input through this community survey (it should take around 20 minutes). We can't guarantee you will see all your perspectives represented in the final CWPP, but we can guarantee they will all be considered in developing the suite of wildfire mitigation projects.

1. How concerned are you about wildfire in your area?

- ◯ Not at all concerned
- ◯ Slightly concerned
- ◯ Moderately concerned
- ◯ Extremely concerned

2. How likely do you think it is that each of the following will occur during the next 5 years as a result of a wildfire in your area?

	Extremely Unlikely	Somewhat Unlikely	Neither Unlikely nor Likely	Somewhat Likely	Extremely Likely
My family's health and safety will be threatened.	◯	◯	◯	◯	◯

My home will be threatened.	○	○	○	○	○
Natural areas that I care about will be threatened.	○	○	○	○	○
Critical infrastructure (i.e. schools, grocery stores, water supply) will be threatened.	○	○	○	○	○

3. How much control do you have over your risk from wildfire?

- ○ No control
- ○ A little control
- ○ A great deal of control
- ○ Complete control

4. Reducing my personal wildfire risk is:

- ○ Very difficult
- ○ Difficult
- ○ Neither difficult nor easy
- ○ Easy
- ○ Very easy

5. In relation to wildfire, I feel the District and County are:

- ○ Well prepared for a fire
- ○ Adequately prepared but would like more done
- ○ Minimally prepared

- ◯ Not at all prepared

6. In relation to wildfire, I feel my property and family are:

- ◯ Well prepared for a fire
- ◯ Adequately prepared but would like to do more
- ◯ Minimally prepared
- ◯ Not at all prepared

7. Please indicate which, if any, of the following actions you have taken to manage the vegetation around your home.

	Have done within past 6 months	Have done within past 6 to 24 months	Have not done within past two years or at all	Not applicable to my home
Removed dead or dying vegetation around my home	◯	◯	◯	◯
Removed "ladder fuels" (low-level vegetation that allows the fire to spread from the ground to the tree canopy)	◯	◯	◯	◯
Trimmed tree canopies to keep their branches a minimum of 10 feet from structures and other trees	◯	◯	◯	◯
Removed leaf litter (dry leaves/pine needles) from yard, roof ,and rain gutters	◯	◯	◯	◯
Removed combustible				

material and vegetation from around and under decks	○	○	○	○
Removed or pruned vegetation near windows	○	○	○	○

8. For each structural element please indicate the response that best indicates the status of whether your home does or does not have that element in place If you are not sure whether or not your house has a certain feature, please indicate not sure.

	Existed when I purchased the home	Have Done since Purchased	Haven't done yet but plan to in future	Do Not Plan to Do	Not applicable to my home	Not sure
Roof is made of fire-safe material such as composition (e.g. asphalt, metal)	○	○	○	○	○	○
All vent openings are covered with 1/8-inch mesh (or smaller) that is not plastic or fiberglass	○	○	○	○	○	○
Exterior walls are covered with or made of fire-resistant materials	○	○	○	○	○	○
Eaves are boxed in with non-combustible materials	○	○	○	○	○	○
Underside of decks are enclosed with fire-resistant materials	○	○	○	○	○	○

9. Please indicate how strongly you agree or disagree with the following statements.

	Strongly disagree	Disagree	Neither Agree or Disagree	Agree	Strongly agree
My household needs to make changes to this property for my community to be better protected	○	○	○	○	○
Embers can ignite a fire up to 1.5 miles from the fire front	○	○	○	○	○
The members of my household can do a lot to increase the likelihood of our home surviving a wildfire	○	○	○	○	○
In a wildfire, most houses catch on fire as a result of embers	○	○	○	○	○
In bad conditions, a fire in my area can travel up to 3-4 miles/hour	○	○	○	○	○
My community as a whole needs to take more action to be protected from wildfire	○	○	○	○	○

10. The following statements reflect reasons why someone may or may not prepare their home or property to mitigate their wildfire risk. Please rate to what extent you agree or disagree with the following statements as they relate to why you have or have not mitigated your wildfire risk.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I know how to manage the vegetation around my home to decrease risks from wildfire.	○	○	○	○	○
I know how to make structural changes to my home to decrease risks from wildfire.	○	○	○	○	○
The cost of preparing my home or property prevents me from taking action.	○	○	○	○	○
There is no need to prepare my home or property because I have insurance that will cover any potential damage.	○	○	○	○	○
My physical abilities make it difficult to prepare my home or property.	○	○	○	○	○
It is difficult to find the time to prepare my home or property.	○	○	○	○	○
The recommended changes to my home or property interfere with how I want my property to be.	○	○	○	○	○

11. Which of the following best describes your household's current disaster/emergency plan in case of a wildfire?

- ◯ My household does not have a disaster plan
- ◯ My household has a plan, but it is not written
- ◯ My household has a written plan, but is not very detailed for wildfire, specifically
- ◯ My household has a detailed plan that is specific for a wildfire event

12. Has your household identified an emergency family meeting location well away from your home?

- ◯ Yes
- ◯ No

13. How important is it to you to receive information on the following topics in relation to the wildfire risk in the District and County?

	Not Important	Somewhat Unimportant	Somewhat Important	Very Important
Fire hazards/concerns	◯	◯	◯	◯
Evacuation planning	◯	◯	◯	◯
Hazardous fuels reduction on public lands (mechanical thinning and/or prescribed burning)	◯	◯	◯	◯
Defensible space/FIREWISE	◯	◯	◯	◯
Water supply improvements	◯	◯	◯	◯

14. People receive information about fire management from various sources. Please indicate whether you

have received information about wildfire from this source.

	Yes	No
Newspapers	○	○
Radio	○	○
Television	○	○
Family / Friends / Neighbors	○	○
Web	○	○
Twitter	○	○
Brochures	○	○
Facebook	○	○
Conversations with Local Government Representative (county, city, etc.)	○	○
Local Fire Department	○	○
Insurance Company	○	○
Homeowners Association	○	○

15. People receive information about fire management from various sources please indicate where you would like to get your wildfire information.

	Yes	No
Newspapers	○	○
Radio	○	○
Television	○	○
Family / Friends / Neighbors	○	○
Web	○	○

Twitter	○	○
Brochures	○	○
Facebook	○	○
Conversations with Local Government Representative (county, city, etc.)	○	○
Local Fire Department	○	○
Insurance Company	○	○
Homeowners Association	○	○

16. Please give us your opinion about how the fire agencies in your area interact with the local community.

	Strongly disagree	Disagree	Agree	Strongly agree	Don't know
The agencies are open to public input and uses it to shape management decisions	○	○	○	○	○
Agency managers usually create plans without input from local communities.	○	○	○	○	○
Agency managers build trust and cooperation with local citizens.	○	○	○	○	○
Managers do a good job of providing information about management activities.	○	○	○	○	○
I am skeptical of information from	○	○	○	○	○

fire agencies.

There are adequate opportunities for citizens to participate in the local agency planning process.	○	○	○	○	○

17. Recognizing that there are trade-offs in what can be accomplished given existing resources, how high a priority do you put on addressing the following concerns in relation to mitigating the wildfire risk?

	Not Important	Low Priority	Medium Priority	High Priority
Vegetation Management /Fuel Breaks on Public Lands (in general)	○	○	○	○
Mechanical thinning	○	○	○	○
Prescribed burning	○	○	○	○
Grazing	○	○	○	○
Improving fire department response time	○	○	○	○
Improving water supply	○	○	○	○
Helping private property owners mitigate fire risk on their property	○	○	○	○
Addressing Evacuation Issues (in general)	○	○	○	○
Evacuation- One way in and out	○	○	○	○
Evacuation- Narrow roads	○	○	○	○
Escape route signage	○	○	○	○

Evacuation drills	○	○	○	○
Large animal evacuation concerns (horse, cattle, etc)	○	○	○	○
Small animal evacuation concerns	○	○	○	○
Protection of specific values other than homes (in general)	○	○	○	○
Environmentally sensitive areas	○	○	○	○
Historic structures	○	○	○	○
Critical infrastructure	○	○	○	○

18. How acceptable do you find each of the following practices?

	Unacceptable	Somewhat Unacceptable	Neither acceptable or unacceptable	Somewhat Acceptable	Very Acceptable
Programs to assist with disposal of removed vegetation (chipping, etc.)	○	○	○	○	○
Structural ordinances for new buildings	○	○	○	○	○
One on one consultations	○	○	○	○	○
Structural ordinances to retrofit existing buildings	○	○	○	○	○
Cost-share programs for reducing vegetation on private property	○	○	○	○	○

(e.g. tree removal)

Vegetation management ordinances ○ ○ ○ ○ ○

19. If there are specific community values at risk (historic buildings, critical infrastructure, etc.) that you would like to see protected please describe the here:

20. What is your single biggest concern in relation to wildfire within the District and County?

Done

APPENDIX D.
COMMUNITY COMMENTS

This page intentionally left blank

COMPILATION OF COMMUNITY COMMENTS FROM OUTREACH SURVEY

The following is a compilation of comments made by community members on the outreach survey regarding the single biggest concern in relation to wildfire within the District. The Survey was open from April through the end of July and over 80 responses were received.

Q20 What is your single biggest concern in relation to wildfire within the District and County?

Answered: 57 Skipped: 17

#	Responses	Date
1	Continuing drought conditions that have resulted in a large amount of dead wood (piñons).	7/9/2016 8:02 AM
2	Preparedness	6/28/2016 8:34 PM
3	Ingress and egress. Notification	6/26/2016 1:25 PM
4	Lack of coordination.	6/24/2016 5:28 PM
5	Organized emergency evacuation requirements, vegetation management ordinances that mandate defensible space requirements for land use/homeowners. Less prescribed burns- and instead more programs that facilitate local communities where the NFS & Conservation Districts would oversee extensive firewood and wood repurposing schedules (within those previously prescribed burn areas).	6/24/2016 1:57 PM
6	Resources to extinguish or manage fires	6/18/2016 5:21 PM
7	It affecting our home.	6/17/2016 10:06 AM
8	Getting out alive!	6/13/2016 4:46 PM
9	Thinning along the one route out of the subdivision.	6/12/2016 7:33 PM
10	I have cleared vegetation and mow to keep fire away but I know not all homeowners have done so, and I believe them to be vulnerable.	6/9/2016 8:38 PM
11	Closing the forest in dry conditions AND making sure everyone stays out.	6/9/2016 6:09 AM
12	Lack of cooperation between agenties	6/8/2016 7:57 PM
13	I chose to move to the forest, it is not anyone's responsibility to protect me from a forest fire.	6/8/2016 2:03 PM
14	I have not moved to Mountainair yet but plan to do so in the future and hope that our community is very aware of the fire potential in Deer Canyon Preserve	6/8/2016 11:17 AM
15	Access to water for fire fighters.	6/8/2016 7:50 AM
16	Human health and safety.	6/7/2016 9:21 PM
17	Overgrown public land that badly needs thinning. I can control my own land, but not the state land next door.	6/7/2016 6:18 PM
18	defensive space, particularly trees.	6/7/2016 5:52 PM
19	Early warnings when fires occur so that evacuation can take place quickly.	6/7/2016 3:12 PM
20	Rapid and adequate response.	6/7/2016 12:47 PM
21	the fact that property owners have not been consistent in thinning, establishing fire safe perimeters.....if EVERYBODY doesn't participate, it's useless for the property owners who do.	6/7/2016 12:45 PM
22	Where to get information/who to call in the event of a fire.	6/7/2016 6:23 AM
23	Human caused wild fires	6/6/2016 2:02 PM
24	property owners in our area do no clear their land of vegetation and dead trees/slage. Since they don't have a home on the property and live elsewhere, they ignore the problem. The county and District should enforce and fine these absent land owners.	6/6/2016 1:38 PM
25	Forest fires that could get out of control and threaten homes and personal property.	6/6/2016 1:19 PM
26	The fire does not happen here	6/6/2016 1:07 PM

27	A couple of years ago Javier had a good program w/regular meetings and anyone could participate. Now it may not exist at all or may have been farmed out to a group that doesn't do squat in the land grants. Your program for thinning gave my neighbor big bucks but was not followed up on by the agency and he left all the dead trees upwind from my place -- nothing was mitigated when I complained about the danger your program left me in, so I find your programs fucked and unresponsive to long time locals. Read my answers to the survey understanding I have, and advocate for, goats, not cattle.	6/6/2016 11:59 AM
28	The actions of the local soil and water districts and the USFS. If they would keep thier hands out of our forest including eliminating grazing, fire risk would be reduced	6/6/2016 11:46 AM
29	mess-ups by government agencies and stupid people putting themselves and others at risk.	6/6/2016 11:14 AM
30	Our property is located within Deer Canyon Preserve. We only have one way to exit the community in the event of an emergency. The County should assist the HOA board in negotiating a second emergency exit.	6/5/2016 4:07 PM
31	my home	6/5/2016 1:08 PM
32	I have not built and live out of state so am not up on what the issues are here	6/4/2016 4:57 PM
33	STOP BEFORE THEY START	6/3/2016 12:42 PM
34	Loss of life and catastrophic loss of property; destruction of livestock and wildlife.	6/3/2016 11:49 AM
35	Water to fight fires and keep responders safe	6/2/2016 7:55 PM
36	N/A	6/2/2016 3:44 PM
37	The loss of the Pinons in Deer Canyon (and elsewhere and the large amount of dead vegetation.	6/2/2016 3:31 PM
38	Response time and availibility of resources.	6/2/2016 2:00 PM
39	Lack of alternative evacuation route from neighborhood.	6/2/2016 9:30 AM
40	Knowing where to go in case of evacuation.	6/2/2016 8:24 AM
41	A maintained and chip-sealed County road BO16 that can be used regardless of precipitation, for safe and efficient access by emergency responders and fire fighters as well as for safe egress if necessary	6/1/2016 5:30 PM
42	The many dead Pinon trees on Chupadera Mesa where I live.	6/1/2016 2:04 PM
43	Deer Canyon's overgrowth of dead pinon trees throughout the 9,000+ acres AND no emergency evacuation egress at the south end.	6/1/2016 1:21 PM
44	My biggest concern is that all my neighbors in Deer Canyon Preserve have not removed the dead trees or thinned living trees on their 20-acre lots which puts us all at high risk for wild fire. I myself have cleared some 14 acres of dead trees but my individual efforts are not enough when there are some 15,000 acres in the development.	6/1/2016 12:49 PM
45	Response time	6/1/2016 12:40 PM
46	Response time to Deer Canyon Preserve	6/1/2016 12:24 PM
47	I have only one road to my house. If there is a fire anywhere along the 8 miles+ that I travel to a main road, I am stuck behind the fire line. State/county has refused to give any other access.	6/1/2016 11:10 AM
48	Lack of access to water on our mesa top	5/31/2016 9:52 AM
49	too many dead or dead and down trees following the drought years, on land owned by absentee owners who may not understand the risks or have enough money to absorb the costs of clearing.	5/30/2016 6:58 PM
50	response time adequate escape routes	5/29/2016 5:05 PM
51	home safety	5/27/2016 3:58 PM
52	Equipment travel distances and poor road conditions for access and evacuation.	5/26/2016 9:22 AM
53	Personal Safety to my neighbors and me.	5/26/2016 8:24 AM
54	Evacuation route alternatives.	5/26/2016 6:32 AM
55	An actual escape/evacuation emergency plan that is developed and distributed to all residents that would be impacted.	5/25/2016 10:18 AM
56	ability to contain the wildfire	5/25/2016 9:58 AM
57	lack of recources	5/25/2016 9:25 AM

This page intentionally left blank

APPENDIX E.
FIREFIGHTING RESOURCES

This page intentionally left blank

TORRANCE COUNTY FIREFIGHTING RESOURCES

Torrance County Fire Departments are the departments that are closest to the District lands and as such any fires occurring on the District are likely to be responded to by the Torrance County departments. There are five Fire Districts in Torrance County and 17 fire stations in neighboring counties, which would respond to fires in both the Claunch-Pinto SWCD and Torrance County planning areas.

Fire Station List

City of Moriarty Fire Dept, Torrance County
Estancia Fire Dept, Torrance County
Mountainair Fire Dept, Torrance County
McIntosh Fire Dept, Torrance County
Corona Fire Dept, Lincoln County
San Antonia Fire Dept, Socorro County
Willard Fire Dept, Torrance County
Abeytas Fire Dept, Valencia County
Rio Grande Estates Fire Dept, Valencia County
Veguita Fire Dept, Socorro County
Midway Fire Dept, Socorro County
Duran Fire Dept, Torrance County
Encino Hills Fire Dept, Torrance County
Indian Hills Fire Dept, Torrance County
North East Torrance Fire Dept, Torrance County
Hills and Valleys substation, Torrance County
Torreon and Tajique Fire Dept, Torrance County

The following is a resources list for all five fire districts in Torrance County:

Torrance County District 1
1 – Engine 500-gallon tank
1 – Brush 200-gallon tank

Torrance County District 2
1 – Tender 2,000-gallon tank
1 – Brush 250-gallon tank
1 – Tender 1,500-gallon tank
1 – Engine 500-gallon tank
1 – Utility truck rehab, 3,000-watt generator

Torrance County District 3
1 – Engine 500-gallon tank
2 – Tender 3,000-gallon tank
1 – Quick attack 300-gallon tank
1 – Tender 2,000-gallon tank
1 – Brush 200-gallon tank
1 – Rescue 4X4

Torrance County District 4
1 – Tender 1,200-gallon tank
1 – Quick attack 300-gallon tank

Torrance County District 5
1 – Engine 1,000-gallon tank
1 – Tender 2,500-gallon tank
1 – Brush 300-gallon tank

Incident Management Protocol

This is a summary of a document entitled *Interagency Emergency Operations in Wildland Fire with NM State Forestry Division: Planning Projects and Incident Management*. This unpublished document was developed by Dave Bervin of New Mexico State Forestry (NMSF) to provide guidelines for emergency responders:

Three factors are always present in any emergency incident, and all jurisdictions responding to a fire in the CPCWPP planning area follow these three basic parameters:

- Life safety
- Incident stabilization
- Resource protection

There are a number of tiers to emergency management and emergency management planning. A Geographic Area Operations Plan is the overarching document that defines roles and responsibilities for the responders to an incident by jurisdiction and activity. The three levels to this plan are:

- State–Federal Geographic Area Operations Plan
- A local area operations plan
- Mutual aid plans

General Incident Operations

The following outlines the general set of procedures for wildland fire response:

1. Local resources (i.e., municipal, county, or volunteer fire departments) are often the first to be called and dispatched when there is a report of a fire. The dispatch office that has jurisdictional authority will activate the initial attack.
2. The initial attack provides dispatch with a size up for the fire in order to determine the need for additional resources.
3. An Incident Command (IC) post is established and staging areas set up.
4. Dispatched resources from all jurisdictions check in at staging area.
5. If the IC level changes (higher or lower), the IC holds a briefing to inform all concerned about any change of status or tactic.

For initial attack responders:

- No notification to NMSF is necessary for fires controlled at initial attack using municipal resources.
- For an initial attack on fires in a County response area, notification to NMSF is necessary.
- For an initial attack response by federal agencies responders or the BIA, notification must be made to the Geographic Area Interagency Dispatch (GAID) (e.g., Albuquerque Area Zone for Bernalillo County responders).
- For federal jurisdiction fires, notification must be made to NMSF about who will contact the GAID to confirm resource needs and act as liaison.

For fires that activate Mutual Aid Agreements
(e.g., spread potential, red flag warnings, values at risk):

- Municipal fire departments must notify NMSF if they respond.
- All requests for additional resources must be made through NMSF.
- For federal jurisdictions, NMSF will respond to all resource requests.
- For additional requests from federal jurisdictions, all additional requests must pass through GAID.

If the fire goes to extended attack, additional operation procedures are implemented:

- Dispatch responsibilities are transferred to GAID.
- Request activation of Type 3 Team.
- Establish IC post and unified command.
- Identify and establish a large staging area.
- Request activation of New Mexico resource mobilization plan.
- Request implementation of Emergency Preparedness Network.
- Notify the American Red Cross to set up rehab units.
- Begin collecting information for complexity analysis and wildland situation analysis.
- Notify Office of Emergency Management.
- Notify NMSF.
    - Type 3 Management Team
    - New Mexico resources mobilization plan
    - Air Attack Operations

This page intentionally left blank

APPENDIX F.
COMMUNITY HAZARD/RISK ASSESSMENT FORM

This page intentionally left blank

Wildfire Fire Risk and Hazard Severity Form NFPA 1144

Means of Access	
Ingress and Egress	**Points**
2 or more roads in and out	0
One road in and out	7
Road Width	
> 24 ft	0
> 20 ft < 24 ft	2
< 20 ft	4
Road Conditions	
Surfaced road, grade < 5%	0
Surfaced road, grade > 5%	2
Non-surfaced road, grade < 5%	2
Non-surfaced road, grade > 5%	5
Other than all season	7
Fire Access	
< 300 ft with turnaround	0
> 300 ft with turnaround	2
< 300 ft with no turnaround	4
> 300 ft with no turnaround	5
Street Signs	
Present – reflective	0
Present – non-reflective	2
Not present	5
Vegetation (fuel models)	
Predominant veg	
Light – 1,2,3	5
Medium – 5,6,7,8,9	10
Heavy – 4,10	20
Slash – 11,12,13	25
Defensible Space	
> 100 ft around structure	1
> 70 ft < 100 ft around structure	3
> 30 ft < 70 ft around structure	10
< 30 ft around structure	25
Topography Within 300 ft of Structures	
Slope	
< 9%	1
10% to 20%	4
21% to 30%	7
31% to 40%	8
>41%	10
Additional Rating Factors (rate all that apply)	
Additional Factors	
Topographic features	0-5
History of high fire occurrence	0-5
Severe fire weather potential	0-5
Separation of adjacent structures	0-5
Roofing Assembly	
Roofing	
Class A	0
Class B	3
Class C	15
Unrated	25

Building Construction	
Materials (predominant)	
Non-combustible siding, eaves, deck	0
Non-combustible siding/combustible desk	5
Combustible siding and deck	10
Building Set-back	
> 30 ft to slope	1
< 30 ft to slope	5
Available Fire Protection	
Water Sources	
Hydrants 500 gpm < 1000 ft apart	0
Hydrants 250 gpm < 1000 ft apart	1
Non-pressurized > 250 gpm/2 hrs	3
Non-pressurized < 250 gpm/2hrs	5
Water unavailable	10
Organized Response	
Station < 5 mi from structure	1
Station > 5 mi from structure	3
Fixed Fire Protection	
NFPA sprinkler system	0
None	5
Placement of Gas and Electric Utilities	
Utilities	
Both underground	0
One above, one below	3
Both above ground	5

Totals for Home or Subdivision

Hazard Rating Scale
< 40 Low
> 40 Moderate
> 70 High
> 112 Extreme

APPENDIX G.
COMMUNITIES AT RISK LIST

This page intentionally left blank

COMMUNITY AT RISK LIST

This Community at Risk list is developed for the New Mexico Fire Planning Task Force. The communities listed are based upon Core Team input and the Risk Assessment carried out as part of this CWPP.

The communities are rated as High, Moderate, Low or No Risk. Because this is plan covers multiple counties and jurisdictions, it is recommended that more detailed analysis be carried to identify to a subdivision level communities to be added to this Community at Risk list in the future.

Community	Hazard Rating
Forest Road 422	High
Manzano Land Grant	High
Punta de Agua	High
Loma Parda	High
Deer Canyon Preserve	High
Corona	High
Mountainair	Moderate

This page intentionally left blank

APPENDIX H.
FUNDING OPPORTUNITIES

This page intentionally left blank

The following section provides information on federal, state, and private funding opportunities for conducting wildfire mitigation projects.

I. Federal Funding Information

Source: Predisaster Mitigation Grant Program
Agency: Department of Homeland Security (DHS) Federal Emergency Management Agency (FEMA)
Website: http://www.fema.gov/government/grant/pdm/index.shtm
Description: The DHS includes FEMA and the U.S. Fire Administration. FEMA's Federal Mitigation and Insurance Administration is responsible for promoting predisaster activities that can reduce the likelihood or magnitude of loss of life and property from multiple hazards, including wildfire. The Disaster Mitigation Act of 2000 created a requirement for states and communities to develop predisaster mitigation plans and established funding to support the development of the plans and to implement actions identified in the plans. This competitive grant program, known as PDM, has funds available to state entities, tribes, and local governments to help develop multihazard mitigation plans and to implement projects identified in those plans.

Source: Section 319 Base Grant to State Entities and Indian Tribes
Agency: U.S. Environmental Protection Agency (EPA)
New Mexico State 319 Coordinator
David Hogge
New Mexico Environment Department
P.O. Box 26110
Santa Fe, NM 87502
Phone: (505) 827-2981
Fax: (505) 827-0160
david_hogge@nmenv.state.nm.us
Website: http://www.epa.gov
Description: Funding under this program is often used for reduction of nonpoint-source pollution; however, one community successfully used the grant to obtain funding to reduce hazardous fuels to protect the municipal watershed. For additional information on this success story, visit http://www.santafewatershed.com. To learn about obtaining this type of funding for your community, contact New Mexico's 319 Grant Coordinator, Dave Hogge, New Mexico Environmental Department at (505) 827-2981.

This funding opportunity is a Request for Proposals from state entities and Indian tribes for competitive grants under section 319 of the Clean Water Act (CWA). The purpose of this grant program is to provide funding to implement nonpoint-source management programs developed pursuant to CWA section 319(b). The primary goal of this management program is to control nonpoint-source pollution. This is done through implementation of management measures and practices to reduce pollutant loadings resulting from each category or subcategory of nonpoint-source identified in the grant recipient's nonpoint-source assessment report, which should be developed pursuant to CWA section 319(a). The EPA has set aside a portion of section 319 funds appropriated by Congress for competitive grant awards to tribes for the purpose of funding the development and implementation of watershed-based plans and other on-the-ground watershed projects that result in a significant step toward solving nonpoint-source impairments on a

watershed-wide basis. Please note that the funding opportunity described here is found in Section B of the full announcement. (Section A includes the EPA's national guidelines, which govern the process for awarding noncompetitive base grants to all eligible tribes.)

Source: Funding for Fire Departments and First Responders
Agency: DHS, U.S. Fire Administration
Website: http://www.usfa.dhs.gov/fireservice/grants/
Description: Includes grants and general information on financial assistance for fire departments and first responders. Programs include the Assistance to Firefighters Grant Program, Reimbursement for Firefighting on Federal Property, State Fire Training Systems Grants, and National Fire Academy Training Assistance.

Source: Conservation Innovation Grants (CIG)
Agency: National Resource Conservation Service
Website: http://www.nm.nrcs.usda.gov/programs/cig/cig.html
Description: CIG State Component. CIG is a voluntary program intended to stimulate the development and adoption of innovative conservation approaches and technologies while leveraging federal investment in environmental enhancement and protection, in conjunction with agricultural production. Under CIG, Environmental Quality Incentives Program (EQIP) funds are used to award competitive grants to non-federal governmental or nongovernmental organizations, tribes, or individuals. CIG enables the Natural Resources Conservation Service (NRCS) to work with other public and private entities to accelerate technology transfer and adoption of promising technologies and approaches to address some of the nation's most pressing natural resource concerns. CIG will benefit agricultural producers by providing more options for environmental enhancement and compliance with federal, state, and local regulations. The NRCS administers the CIG program. The CIG requires a 50/50 match between the agency and the applicant. The CIG has two funding components: national and state. Funding sources are available for water resources, soil resources, atmospheric resources, and grazing land and forest health.

Source: Volunteer Fire Assistance
Agency: U.S. Forest Service
Website: http://www.fs.fed.us/fire/partners/vfa/
Description: U.S. Forest Service funding will provide assistance, through the states, to volunteer fire departments to improve communication capabilities, increase wildland fire management training, and purchase protective fire clothing and firefighting equipment. For more information, contact your state representative; contact information can be found on the National Association of State Foresters website.

Source: Economic Action Programs
Agency: U.S. Forest Service
Website: http://www.fs.fed.us/spf/coop/programs/eap/index.shtml
Description: U.S. Forest Service funding will provide for Economic Action Programs that work with local communities to identify, develop, and expand economic opportunities related to traditionally under-utilized wood products and to expand the utilization of wood removed through hazardous fuel reduction treatments. Information, demonstrations, application development, and training will be made available to participating communities. For more information, contact a Forest Service Regional Representative.

Source: Collaborative Forest Restoration Program (CFRP)
Agency: U.S. Forest Service
Website: http://www.fs.fed.us/r3/spf/cfrp/index.shtml
Description: The Community Forest Restoration Act of 2000 (Title VI, Public Law 106–393) established a cooperative forest restoration program in New Mexico to provide cost-share grants to stakeholders for forest restoration projects on public land to be designed through a collaborative process (the CFRP). Projects must include a diversity of stakeholders in their design and implementation, and should address specified objectives including: wildfire threat reduction; ecosystem restoration, including non-native tree species reduction; reestablishment of historic fire regimes; reforestation; preservation of old and large trees; increased utilization of small-diameter trees; and the creation of forest-related local employment. The act limits projects to four years and sets forth cost limits and provisions respecting collaborative project review and selection, joint monitoring and evaluation, and reporting. The act authorizes appropriations of up to $5 million annually and directs the Secretary to convene a technical advisory panel to evaluate proposals that may receive funding through the CFRP.

Source: Catalog of Federal Funding Sources for Watershed Protection
Agency: N/A
Website: http://cfpub.epa.gov/fedfund/
Examples of the types of grants found at this site are:

- Native Plant Conservation Initiative: http://www.nfwf.org/AM/Template.cfm?Section=Browse_All_Programs&TEMPLATE=/CM/ContentDisplay.cfm&CONTENTID=3966
- Targeted Watershed Grants Program, http://www.epa.gov/owow/watershed/initiative/
- Predisaster Mitigation Program, http://www.fema.gov/government/grant/pdm/index.shtm
- Environmental Education Grants, http://www.epa.gov/enviroed/grants_contacts.html

Source: Firewise Communities
Agency: Multiple
Website: http://www.firewise.org
Description: The Wildland/Urban Interface Working Team (WUIWT) of the National Wildfire Coordinating Group is a consortium of wildland fire organizations and federal agencies responsible for wildland fire management in the United States. The WUIWT includes the U.S. Forest Service, Bureau of Indian Affairs, BLM, U.S. Fish and Wildlife Service, National Park Service, FEMA, U.S. Fire Administration, International Association of Fire Chiefs, National Association of State Fire Marshals, National Association of State Foresters, National Emergency Management Association, and National Fire Protection Association. Many different Firewise Communities activities are available help homes and whole neighborhoods become safer from wildfire without significant expense. Community cleanup days, awareness events, and other cooperative activities can often be successfully accomplished through partnerships among neighbors, local businesses, and local fire departments at little or no cost. The Firewise Communities recognition program page (http://www.firewise.org/usa) provides a number of excellent examples of these kinds of projects and programs.

The kind of help you need will depend on who you are, where you are, and what you want to do. Among the different activities individuals and neighborhoods can undertake, the following actions often benefit from some kind of seed funding or additional assistance from an outside source:

- Thinning/pruning/tree removal/clearing on private property—particularly on very large, densely wooded properties
- Retrofit of home roofing or siding to non-combustible materials
- Managing private forest
- Community slash pickup or chipping
- Creation or improvement of access/egress roads
- Improvement of water supply for firefighting
- Public education activities throughout the community or region

Some additional examples of what communities, counties, and states have done can be found in the National Database of State and Local Wildfire Hazard Mitigation Programs at http://www.wildfireprograms.usda.gov. You can search this database by keyword, state, jurisdiction, or program type to find information about wildfire mitigation education programs, grant programs, ordinances, and more. The database includes links to local websites and e-mail contacts.

Source: The National Fire Plan (NFP)
Website: http://www.forestsandrangelands.gov/
Description: Many states are using funds from the NFP to provide funds through a cost-share with residents to help them reduce the wildfire risk to their private property. These actions are usually in the form of thinning or pruning trees, shrubs, and other vegetation and/or clearing the slash and debris from this kind of work. Opportunities are available for rural, state, and volunteer fire assistance.

Source: Staffing for Adequate Fire and Emergency Response (SAFER)
Agency: DHS
Website: http://www.firegrantsupport.com/safer/
Description: The purpose of SAFER grants is to help fire departments increase the number of frontline firefighters. The goal is for fire departments to increase their staffing and deployment capabilities and ultimately attain 24-hour staffing, thus ensuring that their communities have adequate protection from fire and fire-related hazards. The SAFER grants support two specific activities: (1) hiring of firefighters and (2) recruitment and retention of volunteer firefighters. The hiring of firefighters activity provides grants to pay for part of the salaries of newly hired firefighters over the five-year program. SAFER is part of the Assistance to Firefighters Grants and is under the purview of the Office of Grants and Training of the DHS.

Source: The Fire Prevention and Safety Grants (FP&S)
Agency: DHS
Website: http://www.firegrantsupport.com/fps/
Description: The FP&S are part of the Assistance to Firefighters Grants and are under the purview of the Office of Grants and Training in the DHS. FP&S offers support to projects that enhance the safety of the public and firefighters who may be exposed to fire and related hazards. The primary goal is to target high-risk populations and mitigate high incidences of death and injury. Examples of the types of projects supported by FP&S include fire-prevention and public-safety education campaigns, juvenile fire-setter interventions, media campaigns, and arson prevention and awareness programs. In fiscal year 2005, Congress reauthorized funding for FP&S and expanded the eligible uses of funds to include firefighter safety research and development.

Source: Rural Fire Assistance (RFA)
Agency: U.S. Department of the Interior – U.S. Fish and Wildlife Service
Website: http://www.nifc.gov/rfa.
Description: The RFA program provides funds for RFDs that Protect rural, wildland-urban interface communities; play a substantial cooperative role in the protection of federal lands; are cooperators with the U.S. Department of the Interior (USDI)–managed lands through cooperative agreements with the USDI, or their respective state, tribe or equivalent; are less than 10,000 in population. The required cost share amount for the recipient RFD will not exceed 10 percent of the amount awarded. The RFD must demonstrate the capability to meet cost share requirements Cooperator contribution may be contributed as in-kind services. Cooperator contribution may exceed, but not amount to less than 10 percent. Examples of in-kind services may include but are not limited to: facility use incurred by and RFD for hosting training courses, travel and per diem costs incurred by an RFD when personnel attend training courses, and administration costs related to purchasing RFA equipment and supplies. Finding or in-kind resources may not be derived from other federal finding programs.

II. State Funding Information

Source: State and Private Forestry Programs
Agency: National Association of State Foresters
Website: http://www.stateforesters.org/S&PF/coop_fire.html
Description: The National Association of State Foresters recommends that funds become available through a competitive grant process on Wildland Urban Interface hazard mitigation projects. State fire managers see opportunities to use both the State Fire Assistance Program and the Volunteer Fire Assistance Program to improve the safety and effectiveness of firefighters in the interface, as well as in other wildland fire situations. To ensure firefighter safety, minimize property and resource loss, and reduce suppression costs, land management agencies, property owners, local leaders, and fire protection agencies must work cooperatively to mitigate interface fire risks, as well as to ensure that wildland firefighters receive the training, information, and equipment necessary to safely carry out their responsibilities.

Source: New Mexico Association of Counties: Wildfire Risk Reduction Program
Agency: New Mexico Association of Counties
Website: http://www.nmcounties.org/wildfire.html
Description: This program targets at-risk communities by offering seed money to help defray the costs of community wildfire protection projects. During the past two years, the Wildfire Risk Reduction Grant Program has primarily funded projects for the development of Community Wildfire Protection Plans (CWPPs), a prerequisite to all other activities. In 2007, priority was given to projects that requested funding for hazardous fuel reduction, wildfire prevention, and community outreach activities that were identified in completed CWPPs.

III. Private Funding Information

Source: The Urban Land Institute (ULI)
Website: http://www.uli.org
Description: ULI is a 501(c)(3) nonprofit research and education organization supported by its members. The institute has more than 22,000 members worldwide, representing the entire spectrum of land use and real estate development disciplines, working in private enterprise and public service. The mission of the ULI is to provide responsible leadership in the use of land to enhance the total environment. ULI and the ULI Foundation have instituted Community Action Grants (http://www.uli.org/Content/NavigationMenu/MyCommunity/CommunityActionGrants/Community_Action_Gr.htm) that could be used for Firewise Communities activities. Applicants must be ULI members or part of a ULI District Council. Contact actiongrants@uli.org or review the web page to find your District Council and the application information.

Source: Environmental Systems Research Institute (ESRI)
Website: http://www.esri.com/grants
Description: ESRI is a privately held firm and the world's largest research and development organization dedicated to geographic information systems. ESRI provides free software, hardware, and training bundles under ESRI-sponsored Grants that include such activities as conservation, education, and sustainable development, and posts related non-ESRI grant opportunities under such categories as agriculture, education, environment, fire, public safety, and more. You can register on the website to receive updates on grant opportunities.

Source: StEPP Foundation
Website: http://www.steppfoundation.org/default.htm
Description: StEPP is a 501(c)(3) organization dedicated to helping organizations realize their vision of a clean and safe environment by matching projects with funders nationwide. The StEPP Foundation provides project oversight to enhance the success of projects, increasing the number of energy efficiency, clean energy, and pollution prevention projects implemented at the local, state, and national levels for the benefit of the public. The website includes an online project submittal system and a Request for Proposals page.

Source: The Public Entity Risk Institute (PERI)
Website: http://www.riskinstitute.org
Description: PERI is a not for profit, tax-exempt organization. Its mission is to serve public, private, and nonprofit organizations as a dynamic, forward-thinking resource for the practical enhancement of risk management. With its growing array of programs and projects, along with its grant funding, PERI's focus includes supporting the development and delivery of education and training on all aspects of risk management for public, nonprofit, and small business entities, and serving as a resource center and clearinghouse for all areas of risk management.

IV. Other Funding Information

The following resources may also provide helpful information for funding opportunities:

- National Agricultural Library Rural Information Center: http://www.nal.usda.gov/ric/ricpubs/fire_department_resources.htm
- Forest Service Fire Management website: http://www.fs.fed.us/fire/
- Insurance Services Office Mitigation Online (town fire ratings): http://www.isomitigation.com/
- National Fire Protection Association: http://www.nfpa.org
- National Interagency Fire Center, Wildland Fire Prevention/Education: http://www.nifc.gov/preved/rams.htm
- Department of Homeland Security U.S. Fire Administration: http://www.usfa.dhs.gov/fireservice/grants/rfff/

APPENDIX I.
HOMEOWNERS GUIDE

This page intentionally left blank

This guide has been developed to address site-specific information on wildfire for Claunch-Pinto Soil and Water Conservation District. In public meetings and written comments, residents expressed a need for better information on reducing wildfire risk and what to do in the event of a wildfire. This document was developed to meet these expressed community needs, as well as to fulfill requirements for the Community Wildfire Protection Plan. This guide (1) suggests specific measures that can be taken by homeowners to reduce structure ignitability and (2) enhances overall preparedness in the planning area by consolidating preparedness information from several local agencies and departments.

BEFORE THE FIRE—PROTECTION AND PREVENTION

REDUCING STRUCTURE IGNITABILITY

Structural Materials

Roofing—The more fire-resistant the roofing material, the better. The roof is the portion of the house that is most vulnerable to ignition by falling embers, known as firebrands. Metal roofs afford the best protection against ignition from falling embers. Slate or tile roofs are also non-combustible, and Class-A asphalt shingles are recommended as well. The most dangerous type of roofing material is wood shingles. Removing debris from roof gutters and downspouts at least twice a year will help to prevent fire, along with keeping them functioning properly.

Siding—Non-combustible materials are ideal for the home exterior. Preferred materials include stucco, cement, block, brick, and masonry.

Windows—Double-pane windows are most resistant to heat and flames. Smaller windows tend to hold up better within their frames than larger windows. Tempered glass is best, particularly for skylights, because it will not melt as plastic will.

Fencing and trellises—Any structure attached to the house should be considered part of the house. A wood fence or trellis can carry fire to your home siding or roof. Consider using non-flammable materials or use a protective barrier such as metal or masonry between the fence and the house.

If you are designing a new home or remodeling your existing one, do it with fire safety as a primary concern. Use non-flammable or fire resistant materials and have the exterior wood treated with UL-approved fire-retardant chemicals. More information on fire-resistant construction can be found at http://www.firewise.org.

SCREEN OFF THE AREA BENEATH DECKS AND PORCHES

The area below an aboveground deck or porch can become a trap for burning embers or debris, increasing the chances of the fire transferring to your home. Screen off the area using screening with openings no larger than one-half inch. Keep the area behind the screen free of all leaves and debris.

FIREWOOD, KINDLING, AND OTHER FLAMMABLES

Although convenient, stacked firewood on or below a wooden deck adds fuel that can feed a fire close to your home. Be sure to move all wood away from the home during fire season. Stack all firewood uphill, at least 30 feet and preferably 100 feet from your home.

When storing flammable materials such as paint, solvents, or gasoline, always store them in approved safety containers away from any sources of ignition such as hot water tanks or furnaces. The fumes from highly volatile liquids can travel a great distance after they turn into a gas. If possible, store the containers in a safe, separate location away from the main house.

PNM does not have sufficient crews for frequent inspection of all its high-voltage power lines. If you have high-voltage lines running near your property, take a moment to walk underneath them and ensure that no tree branches are close to the towers or lines. If there is any situation that could be a fire hazard, contact a customer service representative from PNM.

CHIMNEYS AND FIREPLACE FLUES

Inspect your chimney and damper at least twice a year and have the chimney cleaned every year before first use. Have the spark arrestor inspected and confirm that it meets the latest safety code. Your local fire department will have the latest edition of National Fire Prevention Code 211 covering spark arrestors. Make sure to clear away dead limbs from within 15 feet of chimneys and stovepipes

FIREPLACE AND WOODSTOVE ASHES

Never take ashes from the fireplace and put them into the garbage or dump them on the ground. Even in winter, one hot ember can quickly start a grass fire. Instead, place ashes in a metal container, and as an extra precaution, soak them with water. Cover the container with its metal cover and place it in a safe location for a couple of days. Then either dispose of the cold ash with other garbage or bury the ash residue in the earth and cover it with at least 6 inches of mineral soil.

PROPANE TANKS

Your propane tank has many hundreds of gallons of highly flammable liquid that could become an explosive incendiary source in the event of a fire. The propane tank should be located at least 30 feet from any structure. Keep all flammables at least 10 feet from your tank. Learn how to turn the tank off and on. In the event of a fire, you should turn the gas off at the tank before evacuating, if safety and time allow.

SMOKE ALARMS

A functioning smoke alarm can help warn you of a fire in or around your home. Install smoke alarms on every level of your residence. Test and clean smoke alarms once a month and replace batteries at least once a year. Replace smoke alarms once every 10 years.

FIRE-SAFE BEHAVIOR

- If you smoke, always use an ashtray in your car and at home.
- Store and use flammable liquids properly.
- Keep doors and windows clear as escape routes in each room.

DEFENSIBLE SPACE

The removal of dense, flammable foliage from the area immediately surrounding the house reduces the risk of structure ignition and allows firefighters access to protect the home. A 100-foot safety zone, free of all trees and shrubs, is recommended by the fire department; the minimum distance is 30 feet. Steep slopes require increased defensible space because fire can travel quickly uphill.

Within the minimum 30-foot safety zone, plants should be limited to fire-resistant trees and shrubs. Focus on fuel breaks such as concrete patios, walkways, rock gardens, and irrigated garden or grass areas within this zone. Use mulch sparingly within the safety zone, and focus use in areas that will be watered regularly. In areas such as turnarounds and driveways, non-flammable materials such as gravel are much better than wood chips or pine needles.

Pine needles provide important erosion protection for soil but also may carry a surface fire. It is simply not feasible to remove all the pine needles around your property. However, it is a good idea to remove any accumulations of pine needles or cones within the safety zone and extending out as far as possible. This is particularly important if pine needles tend to build up alongside your house or outbuildings. Removing needles and leaves and exposing bare mineral soil are recommended in a 2-foot-wide perimeter along the foundation of the house. Also, be sure to regularly remove all dead vegetative matter including grasses, flowers, and leaf litter surrounding your home and any debris from gutters, especially during summer months. Mow the lawn regularly and promptly dispose of the cuttings properly. If possible, maintain a green lawn for 30 feet around your home.

All trees within the safety zone should have lower limbs removed to a height of 6–10 feet. Remove any branches within 15 feet of your chimney or overhanging any part of your roof. Ladder fuels are short shrubs or trees growing under the eaves of the house or under larger trees. Ladder fuels carry fire from the ground level onto the house or into the tree canopy. Be sure to remove all ladder fuels within the safety zone first. The removal of ladder fuels within about 100 feet of the house will help to limit the risk of crown fire around your home. More information about defensible space is provided at http://www.firewise.org.

FIRE RETARDANTS

For homeowners who would like home protection beyond defensible space and fire-resistant structural materials, fire retardant gels and foams are available. These materials are sold with various types of equipment for applying the material to the home. They are similar to the substances applied by firefighters in advance of wildfire to prevent ignition of homes. Different products have different timelines for application and effectiveness. The amount of product needed is based on the size of the home, and prices may vary based on the application tools. Prices range from a few hundred to a few thousand dollars. An online search for "fire blocking gel" or "home firefighting" will provide a list of product vendors.

ADDRESS POSTING

Locating individual homes is one of the most difficult tasks facing emergency responders. Every home should have the address clearly posted with numbers at least three inches high. The colors of the address posting should be contrasting or reflective. The address should be posted so that it is visible to cars approaching from either direction.

ACCESS

Unfortunately, limited access may prevent firefighters from reaching many homes within the Claunch-Pinto SWCD boundary. Many of the access problems occur at the property line and can be improved by homeowners. First, make sure that emergency responders can get in your gate. This may be important not only during a fire but also to allow access during any other type of emergency response. If you will be gone for long periods during fire season, make sure a neighbor has access, and ask them to leave your gate open in the event of a wildfire in the area.

Ideally, gates should swing inward. A chain or padlock can be easily cut with large bolt cutters, but large automatic gates can prevent entry. Special emergency access red boxes with keys are sold by many gate companies but are actually not recommended by emergency services. The keys are difficult to keep track of and may not be available to the specific personnel that arrive at your home. An alternative offered by some manufacturers is a device that opens the gate in response to sirens. This option is preferred by firefighters but may be difficult or expensive to obtain.

Beyond your gate, make sure your driveway is uncluttered and at least 12 feet wide. The slope should be less than 10%. Trim any overhanging branches to allow at least 13.5 feet of overhead clearance. Also make sure that any overhead lines are at least 14 feet above the ground. If any lines are hanging too low, contact the appropriate phone, cable, or power company to find out how to address the situation.

If possible, consider a turnaround within your property at least 45 feet wide. This is especially important if your driveway is more than 300 feet in length. Even small fire engines have a hard time turning around and cannot safely enter areas where the only means of escape is by backing out. Any bridges must be designed with the capacity to hold the weight of a fire engine.

NEIGHBORHOOD COMMUNICATION

It is important to talk to your neighbors about the possibility of wildfire in your community. Assume that you will not be able to return home when a fire breaks out and may have to rely on your neighbors for information and assistance. Unfortunately, it sometimes takes tragedy to get people talking to each other. Don't wait for disaster to strike. Strong communication can improve the response and safety of every member of the community.

PHONE TREES

Many neighborhoods use phone trees to keep each other informed of emergencies within and around the community. The primary criticism is that the failure to reach one person high on the tree can cause a breakdown of the system. However, if you have willing and able neighbors, particularly those that are at home during the day, the creation of a well-planned phone tree can

often alert residents to the occurrence of a wildfire more quickly than media channels. Talk to your neighborhood association about the possibility of designing an effective phone tree.

NEIGHBORS IN NEED OF ASSISTANCE

Ask mobility-impaired neighbors if they have notified emergency responders of their specific needs. It is also a good idea for willing neighbors to commit to evacuating a mobility-impaired resident in the event of an emergency. Make sure that a line of communication is in place to verify the evacuation.

ABSENTEE OWNERS

Absentee owners are often not in communication with their neighbors. If a home near you is unoccupied for large portions of the year, try to get contact information for the owners from other neighbors or your neighborhood association. Your neighbors would probably appreciate notification in the event of an emergency. Also, you may want to contact them to suggest that they move their woodpile or make sure that the propane line to the house is turned off.

HOUSEHOLD EMERGENCY PLAN

A household emergency plan does not take much time to develop and will be invaluable in helping your family deal with an emergency safely and calmly. One of the fundamental issues in the event of any type of emergency is communication. Be sure to keep the phone numbers of neighbors with you rather than at home.

It is a good idea to have an out of state contact, such as a family member. When disaster strikes locally, it is often easier to make outgoing calls to a different area code than local calls. Make sure everyone in the family has the contact phone number and understands why they need to check in with that person in the event of an emergency. Also, designate a meeting place for your family. Having an established meeting site helps to ensure that family members know where to go, even if they can't communicate by phone.

CHILDREN

Local schools have policies for evacuation of students during school hours. Contact the school to get information on how the process would take place and where the children would likely go.

The time between when the children arrive home from school and when you return home from work is the most important timeframe that you must address. Fire officials must clear residential areas of occupants to protect lives and to allow access for fire engines and water drops from airplanes or helicopters. If your area is evacuated, blockades may prevent you from returning home to collect your children. It is crucial to have a plan with a neighbor for them to pick up your children if evacuation is necessary.

PETS AND LIVESTOCK

Some basic questions about pets and livestock involve whether you have the ability to evacuate the animals yourself and where you would take them. Planning for the worst-case scenario may save your animals. An estimated 90% of pets left behind in an emergency do not survive. Don't expect emergency service personnel to prioritize your pets in an emergency. Put plans in place to protect your furry family members.

PETS

Assemble a pet disaster supply kit and keep it handy. The kit should contain a three-day supply of food and water, bowls, a litter box for cats, and a manual can opener if necessary. It is also important to have extra medication and medical records for each pet. The kit should contain a leash for each dog and a carrier for each cat. Carriers of some kind should be ready for birds and exotic pets. In case your pet must be left at a kennel or with a friend, also include an information packet that describes medical conditions, feeding instructions, and behavioral problems. A photo of each pet will help to put the right instructions with the right pet.

In the event of a wildfire you may be prevented from returning home for your animals. Talk to your neighbors and develop a buddy system in case you or your neighbors are not home when fire threatens. Make sure your neighbor has a key and understands what to do with your pets should they need to be evacuated.

If you and your pets were evacuated, where would you go? Contact friends and family in advance to ask whether they would be willing to care for your pets. Contact hotels and motels in the area to find out which ones accept pets. Boarding kennels may also be an option. Make sure your pets' vaccinations are up-to-date if you plan to board them.

Once you have evacuated your pets, continue to provide for their safety by keeping them cool and hydrated. Try to get your pets to an indoor location rather than leaving them in the car. Do not leave your pets in your vehicle without providing shade and water. It is not necessary to give your pets water while you are driving, but be sure to offer water as soon as you reach your destination.

LIVESTOCK

Getting livestock out of harm's way during a wildfire is not easy. You may not be able or allowed to return home to rescue your stock during a wildfire evacuation. Talk to your neighbors about how you intend to deal with an evacuation. If livestock are encountered by emergency responders, they will be released and allowed to escape the fire on their own. Make sure your livestock have some sort of identification. Ideally, your contact information should be included on a halter tag or ear tag so that you could be reached if your animal is encountered.

If you plan to evacuate your livestock, have a plan in place for a destination. Talk to other livestock owners in the area to find out whether they would be willing to board your stock in the event of an emergency. Often in large-scale emergencies, special accommodations

can be made at fair and rodeo grounds, but personal arrangements may allow you to respond more quickly and efficiently.

If you do not own a trailer for your horses or other livestock, talk to a neighbor who does. Find out whether they would be willing to assist in the evacuation of your animals. If you do own a trailer, make sure it is in working condition with good, inflated tires and functioning signal lights. Keep in mind that even horses that are accustomed to a trailer may be difficult to load during an emergency. Practicing may be a good idea to make sure your animals are as comfortable as possible when being loaded into the trailer.

HOUSE AND PROPERTY

Insurance companies suggest that you make a video that scans each room of your house to help document and recall all items within your home. This video can make replacement of your property much easier in the unfortunate event of a large insurance claim. See more information on insurance claims in the "After the Fire" section below.

PERSONAL ITEMS

During fire season, items you would want to take with you during an evacuation should be kept in one readily accessible location. As an extra precaution, it may be a good idea to store irreplaceable mementos or heirlooms away from your home during fire season.

It is important to make copies of all important paperwork, such as birth certificates, titles, and so forth, and store them somewhere away from your home, such as in a safe deposit box. Important documents can also be protected in a designated fire-safe storage box within your home.

IN THE EVENT OF A FIRE

NOTIFICATION

In the event of a wildfire, announcements from the local Emergency Management office will be broadcast over local radio and television stations. Media notification may be in the form of news reports or the Emergency Alert System. On the radio, the AM station 770 KOB generally provides frequent updates. On television, the emergency management message will scroll across the top of the screen on local channels. The notice is not broadcast on non-local satellite and cable channels.

One good way to stay informed about wildfire is to use a National Oceanic and Atmospheric Administration (NOAA) weather alert radio. The radios can be purchased at most stores that carry small appliances, such as Target, Sears, or Radio Shack. The radio comes with instructions for the required programming to tune the radio to your local frequency. The programming also determines the types of events for which you want to be alerted. The weather alert radio can be used for any type of large incident (weather, wildfire, hazardous materials, etc.), depending on how it is programmed. Local fire personnel can assist with programming if needed.

WHEN FIRE THREATENS

Before an evacuation order is given for your community, there are several steps you can take to make your escape easier and to provide for protection of your home. When evaluating what to do as fire threatens, the most important guideline is: DO NOT JEOPARDIZE YOUR LIFE.

Back your car into the garage or park it in an open space facing the direction of escape. Shut the car doors and roll up the windows. Place all valuables that you want to take with you in the vehicle. Leave the keys in the ignition or in another easily accessible location. Open your gate.

Close all windows, doors, and vents, including your garage door. Disconnect automatic garage openers and leave exterior doors unlocked. Close all interior doors as well.

Move furniture away from windows and sliding glass doors. If you have lightweight curtains, remove them. Heavy curtains, drapes, and blinds should be closed. Leave a light on in each room.

Turn off the propane tank or shut off gas at the meter. Turn off pilot lights on appliances and furnaces.

Move firewood and flammable patio furniture away from the house or into the garage.

Connect garden hoses to all available outdoor faucets and make sure they are in a conspicuous place. Turn the water on to "charge," or fill your hoses and then shut off the water. Place a ladder up against the side of the home, opposite the direction of the approaching fire, to allow firefighters easy access to your roof.

EVACUATION

When evacuation is ordered, you need to go ***immediately***. Evacuation not only protects lives, it also helps to protect property. Many roads within the Claunch-Pinto SWCD boundary are too narrow for two-way traffic, especially with fire engines. Fire trucks often can't get into an area until the residents are out. Also, arguably the most important tool in the wildland urban interface toolbox is aerial attack. Airplanes and helicopters can be used to drop water or retardant to help limit the spread of the fire, but these resources cannot be used until the area has been cleared of civilians.

Expect emergency managers to designate a check-out location for evacuees. This process helps to ensure that everyone is accounted for and informs emergency personnel as to who may be remaining in the community. Every resident should check out at the designated location before proceeding to any established family meeting spot.

A light-colored sheet closed in the front door serves as a signal to emergency responders that your family has safely left. This signal saves firefighters precious time, as it takes 12–15 minutes per house to knock on each door and inform residents of the evacuation.

AFTER THE FIRE

RETURNING HOME

First and foremost, follow the advice and recommendations of emergency management agencies, fire departments, utility companies, and local aid organizations regarding activities following the wildfire. Do not attempt to return to your home until fire personnel have deemed it safe to do so.

Even if the fire did not damage your house, do not expect to return to business as usual immediately. Expect that utility infrastructure may have been damaged and repairs may be necessary. When you return to your home, check for hazards, such as gas or water leaks and electrical shorts. Turn off damaged utilities if you did not do so previously. Have the fire department or utility companies turn the utilities back on once the area is secured.

INSURANCE CLAIMS

Your insurance agent is your best source of information as to the actions you must take in order to submit a claim. Here are some things to keep in mind. Your insurance claim process will be much easier if you photographed your home and valuable possessions before the fire and kept the photographs in a safe place away from your home. Most if not all of the expenses incurred during the time you are forced to live outside your home could be reimbursable. These could include, for instance, mileage driven, lodging, and meals. Keep all records and receipts. Don't start any repairs or rebuilding without the approval of your claims adjuster. Beware of predatory contractors looking to take advantage of anxious homeowners wanting to rebuild as quickly as possible. Consider all contracts very carefully, take your time to decide, and contact your insurance agent with any questions.

POST-FIRE REHABILITATION

Homes that may have been saved in the fire may still be at risk from flooding and debris flows. Burned Area Emergency Rehabilitation (BAER) teams are inter-disciplinary teams of professionals who work to mitigate the effects of post-fire flooding and erosion. These teams often work with limited budgets and manpower. Homeowners can assist the process by implementing treatments on their own properties as well as volunteering on burned public lands to help reduce the threat to valuable resources. Volunteers were instrumental in implementing many of the BAER treatments following the Cerro Grande fire. Volunteers can assist BAER team members by planting seeds or trees, hand mulching, or helping to construct straw-bale check dams in small drainages.

Volunteers can help protect roads and culverts by conducting storm patrols during storm events. These efforts dramatically reduce the costs of such work as installing trash racks, removing culverts, and rerouting roads.

Community volunteers can also help scientists to better understand the dynamics of the burned area by monitoring rain gauges and monitoring the efficacy of the installed BAER treatments.