



September 2020

FIRE ADAPTED COMMUNITIES



People and communities are prepared to receive, respond to and recover from wildfire.

SAFE, EFFECTIVE WILDFIRE RESPONSE



All jurisdictions coordinate to implement safe, effective, risk-based management decisions.

RESILIENT LANDSCAPES



Landscapes are resilient to fire, insect, and disease disturbances, regardless of jurisdictional boundaries.

SANTA FE COUNTY CWPP

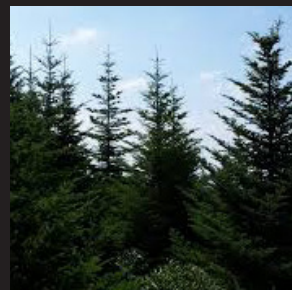
POST-FIRE RECOVERY



Preparing communities for inevitable fire effects, through pre-fire planning for post-fire response.

SWCA
ENVIRONMENTAL CONSULTANTS

Santa Fe County Community Wildfire Protection Plan





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EXECUTIVE SUMMARY

This Santa Fe County Community Wildfire Protection Plan (SCCWPP) addresses hazards and risks of wildland fire throughout Santa Fe County (hereafter referred to as the County) and makes recommendations for fuel reduction projects, public outreach and education, structural ignitability reduction, and fire response capabilities. The County comprises a diverse landscape and land ownership but a population with a common concern: the need to prepare for wildfire to reduce the risk of loss of life and property.

While community members are familiar with large fires, as several have occurred in the southwest region in recent years, the County itself has experienced several years with minimal large catastrophic fires. Fire managers believe the danger is increasing, however, and a large fire is likely imminent. This SCCWPP has been developed to assist the County in ensuring that a catastrophic wildfire will be avoided in the future by assessing areas at risk and recommending measures to decrease that risk.

The purpose of the SCCWPP is to assist in protecting human life and reducing property loss due to wildfire throughout the County. 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. This plan was compiled in 2019 and 2020 as an update to the original 2008 CWPP. All versions of the SCCWPP have been developed in response to the federal Healthy Forests Restoration Act (HFRA) of 2003.

The SCCWPP meets the requirements of the HFRA by addressing the following:

1. Having been developed collaboratively by multiple agencies at the state and local levels 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. Soliciting input from the public on the Draft SCCWPP.

A group of multijurisdictional agencies (tribal, federal, state, and local), organizations, and residents joined together as a Core Team to develop this CWPP Update. Many of these Core Team members were part of the original Core Team for the 2008 CWPP. Core Team members have also had many years of experience working in fire management in the County.

The planning process has served to identify many physical hazards throughout the County that could increase the threat of wildfire to communities. During development of the 2008 CWPP, the community members were highly engaged in providing input. Several public meetings were convened to gather comments. By incorporating public and Core Team input into the recommendations, treatments are tailored specifically for the County. The SCCWPP emphasizes the importance of collaboration among multijurisdictional agencies in order to develop fuels mitigation treatment programs to address wildfire hazards. The County has a committed team of career and volunteer firefighters, who work arduously to protect the life and property of citizens, but without homeowners taking on some of the responsibility of reducing fire hazards in and around their own homes, these resources are severely stretched. A combination of homeowner and community awareness, public education, and agency collaboration and treatments are necessary to fully reduce wildfire risk.

A significant amount of fire mitigation work has been completed by the County and other stakeholders since the 2008 SCCWPP was completed. These actions include many cross-boundary hazardous fuels projects that cover various jurisdictions; the completion of defensible space treatments in the wildland urban interface (WUI) to reduce the potential for structural ignitability; hundreds of home hazard assessments, to identify actions homeowners can take to harden their homes and make them more

defensible; expansion of firefighting capability through the procurement of funds to purchase vital firefighting equipment to support the many fire departments throughout the County; and the development of hazard mitigation plans to support emergency management including the safe and effective evacuation of people and animals in the event of a wildfire or other emergencies.

Some of the highest risk areas identified in this SCCWPP are communities located within and adjacent to National Forest land and the WUI. Federal and state agencies have tirelessly treated these areas, including within the Santa Fe Watershed, utilizing an active prescribed fire program and mechanical treatments. Treatments to fuels in these high hazard areas contribute to decreasing the likelihood of wildfire's negative impacts on communities in the County WUI. Continued preventive activities are needed however to further reduce the negative impacts that wildland fire can have on communities and community members living in the WUI.

Communities located in bosque, grassland and shrubland areas of the County also need to prepare for fast paced wildfire spread in these fine fuels. Recommendations for improving wildfire mitigation in these communities may include focusing on actions to reduce the presence of weeds in WUI communities, encouraging residents to mow borders around their property; encouraging residents to harden their homes to potential flame impingement from fast moving grass fires; and, equipping fire departments to respond quickly to these fast-paced wildfire events.

The SCCWPP provides background information, a risk assessment, and recommendations. Unlike the original CWPP and updates, much of this background information is housed in several appendices to the main document to focus the main document on analysis and action items. Chapter 1 provides a general overview of CWPPs and describes actions that have been taken to mitigate wildfire risk since 2008. Chapter 2 presents an overview of the fire environment and specific information about fuel types. Chapter 3 describes the results of the risk assessment and summary of community risk ratings. Chapter 4 provides recommendations with respect to the three primary goals of the National Cohesive Wildfire Strategy: 1) restore and maintain landscapes, 2) create fire-adapted communities, and 3) improve wildfire response. Recommendations outlined under each goal include action plans and monitoring strategies for implementing fuels reduction projects, reducing structural ignitability, improving fire response capabilities, and initiating public outreach and education. Chapter 5 describes monitoring strategies and details regarding implementation of actions. The plan does not require implementation of any of the recommendations, but the message throughout this document is that the greatest fire mitigation could be achieved through the joint actions of individual homeowners and local, state, and federal governments. It is important to stress that this document is an initial step in raising public awareness and treating areas of concern and should serve as a tool in doing so.

The SCCWPP should be treated as a live document to be updated annually or immediately following a significant fire event. The plan should continue to be revised to reflect changes, modifications, or new information. These elements are essential to the success of mitigating wildfire risk throughout Santa Fe County and will be important in maintaining the ideas and priorities of the plan and the communities in the future.

CWPP STORY MAP

This CWPP was developed during the 2020 COVID-19 pandemic. As a result, it was not possible to convene the public to gather input in the planning process. In order to address this, the County developed a story map (online web content) to disseminate information to the public and provide an opportunity for the public to provide input into the plan content. In addition to facilitating information sharing, the story map also provides the County with a platform that can be readily revised to keep the CWPP document current. The CWPP is shared on the Wildland page of the County Fire Department: <https://www.santafecountynm.gov/fire/wildland>.

PREVIOUS CWPP ACCOMPLISHMENTS

The following table outlines the progress that has been made throughout the County since the 2008 CWPP. This table should be revised annually as projects are implemented.

Project	Date	Entity	Serves to
Structural Ignitability Projects			
The County enacted a new WUI code, based on the international WUI code. The code includes requirements for vegetation management around a structure, based on the Ready-Set-Go! Defensible space guidelines. The County revised their WUI delineation for implementation of the WUI code.	2018	Santa Fe County	Provide legal guidelines for new construction and remodels, pertaining to structural requirements and defensible space.
The City of Santa Fe is working toward adoption of a similar WUI code.	2020	City of Santa Fe	Provide legal guidelines for new construction and remodels, pertaining to structural requirements and defensible space.
Several WUI communities have established phone trees for notifications. This is especially encouraged for communities with a large number of vacation properties.	2013	Santa Fe County Fire Dept	Facilitate communication between residents in the event of an emergency.
A pilot project utilizing EQIP funds was launched in La Barbaria in 2013 for a cost-share program in conjunction with Santa Fe-Pojoaque Soil and Water Conservation District (SWCD). Similar efforts have been implemented throughout the Edgewood SWCD and southern portion of the County.	2013	Multiple partners	Provide funding to implement hazardous fuels treatments.
Assessments were carried out to assess access and improve accessibility into the property, as part of the home hazard assessments.	2013	Santa Fe County Fire Dept	Provide direction for homeowners on how to improve emergency access.
The County ran a program to provide rural address markers to all residents.	2013	Santa Fe County Fire Dept	Facilitate fast emergency response.
The County ran a program to educate residents about the importance of home hardening, as part of the home hazard assessments. Ready, Set, Go! literature is provided to all residents who enquire about an assessment.	2013	Santa Fe County Fire Dept	Provide direction for homeowners on home hardening techniques to reduce the wildfire threat from ember cast.

Project	Date	Entity	Serves to
National Association of Counties granted the County Fire Department an Achievement Award for their Wildfire Hazard Assessment and Prevention Program.	2015	New Mexico Association of Counties (NMAC)	Recognize the actions the County has implemented to improve education to residents of the County and mitigate wildfire hazards.
Fire Response Projects			
The Wildland Division was formed, funded from a Collaborative Forest Restoration Program (CFRP) grant and a NMAC grant. A WUI specialist and several other staff members have been hired. The Division has a 5-10 person fire suppression/fuels crew and a seasonal Youth Conservation Corp (YCC) crew.	2008	Santa Fe County Fire Dept	Increase wildfire response capacity
The City of Santa Fe Fire Department has also established a Wildland Division and a permanent and seasonal fire crew.	2008	City of Santa Fe Fire Dept	Increase wildfire response capacity
The County initiated online training for National Wildfire Coordinating Group (NWCG) courses. This online platform is a work in progress and a priority for the County in 2020.	2011	Santa Fe County Fire Dept.	Provide opportunities for volunteer fire fighters to keep current on all NWCG classes and refreshers.
A volunteer firefighter reimbursement program was started in 2009 and improved upon in 2020 by increasing payments for calls and trainings.	2009	Santa Fe County Fire Dept	Support and incentivize volunteerism
The City of Santa Fe has implemented a program partnering with Santa Fe Beautiful, to provide curbside pick-up of slash and green waste.	2019	City of Santa Fe	Support and encourage residents to implement defensible space practices.
The County provides fire refresher training (RT-130) for approximately 260 people each year. Trainings are provided for all entities.	Annually	Santa Fe County Fire Dept	Maintain qualifications for key fire responders.
The County utilize a SimTable for community education and officer training.	2013	Santa Fe County Fire Dept	Enhance fire training through mock incidents.
The County has established Mutual Aid Agreements (MAA) and Joint Powers Agreements (JPA) with state and federal partners to maintain and enhance fire response capacity. The JPA allows for provision of firefighting resources to non-fed agencies.	2013	Santa Fe County Fire Dept	Enhance cross-jurisdictional response.
The County hosts an annual agency cooperator meeting every year	Annually	Santa Fe County Fire Dept	Improve coordination ahead of fire season.
There has been significant equipment replacement countywide, including new Type 6 trucks for several volunteer departments.	Annually	Santa Fe County Fire Dept	Maintain equipment quality and ensure resource needs are being met.

Project	Date	Entity	Serves to
The County has installed a new CAD system within the Regional Emergency Center, which will be tied to vehicle laptop global positioning systems (GPS).	2019	Santa Fe County Fire Dept	Support and enhance emergency response.
The County geographic information system (GIS) mapped all fire hydrants within the County boundary.	2012	Santa Fe County GIS	Support fire response and maintenance of suppression infrastructure.
The Santa Fe County Hazard Mitigation Plan (HMP) was updated in 2018.	2018	Santa Fe County Emergency Management	Provide planning for all hazards within the County.
The Wildland Incident Organizer is a documentation aid for wildland events with sections on: • Incident Complexity Analysis • Unit Log • Initial Attack Size-Up • Spot Weather Observations and Forecast • Standards for Flagging • Fire Weather Observation Log • LCES Reminder • Resource Documentation • Radio Frequency List • Risk Management Guide • After Action Review Guide • Incident Objectives • Structural Watch-outs	2011	Santa Fe County Fire Dept	Provide a rapid reference guide for use during a wildland incident.
Agencies throughout the County have been utilizing decision support tools for wildfire response, including the Wildland Fire Decision Support System (WFDSS)	2010	All agencies	Support decision making and planning and resource allocation during a wildfire event.
Public Education and Outreach Projects			
Ready, Set, Go! Program is being implemented in the County.	2018	Santa Fe County Fire Dept	Provide a consistent messaging for fire prevention activities.

Project	Date	Entity	Serves to
The County has been implementing home hazard assessments since 2009. Assessments consist of windshield assessments, with home assessed briefly and packet material left at door or gate and more detailed requested assessments, where walkaround assessments are completed with homeowner, allowing for questions and answers. Packet materials consist of Firewise information, guides to mitigating property, fire resistant plant guides and basic evacuation preparation guide. The fire department's focus is on providing Ready, Set, Go! literature, since that is the program that has been adopted countywide.	2009	Santa Fe County Fire Dept	Provide more specific data on home hazards and results in more tailored direction for a homeowner to follow to mitigate hazards around their property.
The County has been implementing larger workshop home assessments, for a group of neighbors on request. A SimTable is utilized for these assessments. The most successful meetings are those with HOAs or communities, or when fire prevention messaging is "piggybacked" on existing events. Larger regional meetings have been attempted but are not as successful. Since 2009, over 75 community educational meetings have been convened in the County.	2009	Santa Fe County Fire Dept	Provide more specific data on home hazards and results in more tailored direction for a homeowner to follow to mitigate hazards around their property.
State forestry produces radio ads, Fire Adapted Communities has begun TV ads, and Santa Fe County Fire Prevention is active on local radio stations. In 2013, a Living with Fire Conference was held at Santa Fe Community College with speakers and attendees from New Mexico, Colorado, and Arizona. Two websites (sfcfire-wildland.com and fireadaptednewmexico.org) distribute timely information, as well as Facebook and Twitter postings.	2013	Santa Fe County Fire Dept	Keep wildfire in the minds of the local residents throughout the year and share new information for mitigating risk.
The Greater Santa Fe Fireshed Coalition was formed in 2016 and is a coalition of public-private partners who convened to address wildfire risk and forest health in the Santa Fe Watershed. http://www.santafefireshed.org/	2016	Santa Fe County Fire Dept	Take a proactive approach to improving the long-term resilience of the forests, watershed, wildlife and communities in the southern Sangre de Cristo Mountains.
The Greater Santa Fe Fireshed Coalition, the Forest Stewards Guild, the City of Santa Fe Fire Department, and the Santa Fe National Forest collaborated to create signage about local fire ecology at Big Tesuque trailhead.	2019	Greater Santa Fe Fireshed Coalition and others	Provide background to visitors about the ecology of the landscape and the importance of fire's role in the ecosystem.

Project	Date	Entity	Serves to
The Greater Santa Fe Fireshed Coalition hosts "Wildfire Wednesdays" (a webinar) during the COVID-19 pandemic to inform participants about fire mitigation actions and activities as well as local fire ecology.	2020	Greater Santa Fe Fireshed Coalition	Continue public outreach around wildfire topics during the COVID-19 pandemic.
The County have hosted Town Hall style meetings (as called on by the County Commissioners) providing outreach to residents on fire prevention and fire risk.	2008	Santa Fe County Fire Dept	Provide outreach to community members.
During annual fire refreshers, the County fire department provides orientation on the Ready, Set, Go! materials; County firefighters can then outreach to the public whenever possible.	2008	Santa Fe County Fire Dept	Provide a consistent message between fire departments and the public.
The County has utilized the Fireworks Curriculum (developed by the Missoula Fire Lab) in local schools to educate youth in fire prevention and introduction of fire into fire-adapted veg communities. The department is looking at ways to restructure and potentially expand this program.	2008	Santa Fe County Fire Dept	Educate youth on fire science and fire prevention.
The County has and continues to hold emergency preparedness meetings. The County will respond to requests for information and provide Emergency Management personnel to discuss emergency reverse 911 and other emergency management protocols.	2008	Santa Fe County Emergency Management	Prepare residents for evacuation and emergency messaging.
The County has been working to build strong communication networks between departments, and the public. New technologies have been employed, including Smart 911, Santa Fe alert and social media platforms.	2013	All entities	Improve messaging before, during and after a wildfire event.
Fuel Treatments			
The County works with a YCC crew for hazardous fuel treatment projects.	2009	Santa Fe County Fire Dept	Implement and maintain hazardous fuel reduction.

Project	Date	Entity	Serves to
Several landscape-level treatment projects have been implemented utilizing multijurisdictional and cross boundary partnerships (see Figure 4.1). 900 acres have been treated on state lands. Approximately 170,512 acres of U.S. Forest Service (USFS) lands have been treated in the eastern portion of the Santa Fe National Forest. This includes 88,313 acres of completed treatments; 5,087 of ongoing treatments; and 77,112 acres of historical treatments. There are additional planned treatments covering 130,918 acres of USFS lands (NMFWR 2020).	2009	Multiple agencies	Address landscape level forest health and hazardous fuel loading.
Chipper days are scheduled as needed to support community clean-ups; however, the County is moving toward curbside pick-up of waste, using a grapple truck and 40-yard dumpsters.	2013	Santa Fe County Fire Dept	Encourage and support defensible space practices on private land.
The County has been able to mobilize fire fighters using the Resource Mobilization Plan, to give fire fighters necessary fire experience.	2019	Santa Fe County Fire Dept	Provide on-fire training for County fire staff.
The Bureau of Indian Affairs (BIA) developed fuel management plans with each of the Pueblo within the County.	2009	BIA	Address wildfire hazards on Pueblo lands.
The Santa Fe-Pojoaque Soil and Water Conservation District offered a private, tribal, and non-federal public lands grant funding opportunity for landowners.	2019	Santa Fe-Pojoaque Soil and Water Conservation District	Create defensible space around structures within Hyde Park and Tesuque Corridors, as well as other areas around the Fireshed.
The National Fire Protection Association and State Farm offered small grants to fund wildfire risk reduction and preparedness activities on Wildfire Community Preparedness day.	2020	National Fire Protection Association and State Farm	Bring the community together to take action to reduce wildfire risk.
The U.S. Department of Agriculture granted funding to the Greater Santa Fe Fireshed for activities that will mitigate the risk of wildfire, improve forest health, and protect water quality.		U.S. Department of Agriculture	Complete science-based restoration projects collaboratively.
The County works with City Wildland Division crew, YCC crews, New Mexico State Forestry Division's (NMSF's) Inmate Working Crew, Returning Heroes Veterans Crew, Chimayo Conservation Corp, and private contractors. At a minimum, 20 new jobs have been created since 2008 to implement the CWPP (Evans et al. 2015).	2008	All	Increase the capacity to implement fuel mitigation.



CHAPTER 1 – INTRODUCTION

The New Mexico Draft Forest Action Plan (EMNRD 2020) states that New Mexico, like other western states, faces urgent issues concerning forests and watersheds, including catastrophic wildfires, epidemic insect outbreaks, and changing climate conditions (New Mexico Department of Energy, Minerals, and Natural Resources [EMNRD] 2020). As wildfire severity increases, communities need a plan to help prepare for, reduce the risk of, and adapt to wildland fire events. Community Wildfire Protection Plans (CWPPs) 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 2008, Santa Fe County (the County) completed its first CWPP. This CWPP received a partial update in 2015. The development of the County CWPP has included meaningful collaboration among many local stakeholders including local, state, and federal officials, as well as other interested parties such as non-governmental stakeholders and private citizens. Much of the information brought forward from 2008 and 2015 is still current and reflects the concerns and issues that have been expressed by the public over recent years.

This document, hereinafter known as the “2020 Update of the Santa Fe County CWPP” (SCCWPP) reviews, verifies, and/or identifies potential new priority areas where mitigation measures are needed to protect from wildfire the irreplaceable life, property, and critical infrastructure in the County. This 2020 CWPP reviews and presents potential treatments for mitigation of wildfire-related risks in the priority areas but does not attempt to mandate the type and priority for treatment projects that will be carried out by the land management agencies and private landowners. With the responsibility for implementing wildfire mitigation treatments being totally at the discretion of the landowner, the 2020 SCCWPP will only identify potential treatments and a suggested priority for these projects.

PURPOSE

It is the intent of this 2020 SCCWPP to provide a countywide scale of wildfire risk and protection needs and then bring together all of the responsible wildfire management and suppression entities in the County to address the identified needs and to support these entities in planning and implementing the necessary mitigation measures.

This CWPP update process involves looking at past fires and treatment accomplishments using the knowledge and expertise of the professional fire managers who work for the various agencies and governing entities in the County. This update process identifies the current local wildfire risks and needs that occur in the County, supporting this with relevant science and literature from the southwest region.

NAVIGATION

The plan provides background information, a risk assessment, and recommendations to reduce or mitigate wildfire risk to communities. The CWPP is designed to be used by the residents of the County, as well as stakeholders tasked with forest, fire, and emergency management. Some information is therefore highly technical in order to provide sufficient detail to aid in project implementation. During this CWPP update, the plan has been supplemented with online content compiled into a project story map. The story map serves as a synopsis to the larger plan and is designed to make the information in this plan more accessible to the reader as it allows the public and stakeholders to interface with the various map products that have been developed through this planning process. The story map and CWPP will be readily updated as conditions change throughout the County. The story map can be accessed via the County Fire Department, Wildland webpage.¹

This CWPP is organized into several chapters with more detailed information compiled into appendixes. Chapter 1 provides an overview of CWPPs and describes the need for a plan; Chapter 2 gives an overview of the fire environment and introduces the reader to fire history information and well as fire response; Chapter 3 describes the methodology for the risk assessment and the results in detail; Chapter 4 outlines the mitigation strategies that could be implemented to reduce wildfire risk under the umbrella of the National Cohesive Strategy, including action plans that outline priorities and recommendations for reducing fuels, initiating public education and outreach, reducing structural ignitability, and improving fire response capabilities; and Chapter 5 provides suggested approaches to monitoring actions. The SCCWPP does not require implementation of any of the recommendations; however, these recommendations may be used as guidelines for the implementation process if funding opportunities become available. The recommendations for fuels reduction projects are general in nature; site-specific planning that addresses location, access, land ownership, topography, soils, and fuels would need to be employed upon implementation. Also, it is important to note that the recommendations are specific to wildland urban interface (WUI) areas and are expected to reduce the loss of life and property.

In developing the SCCWPP, a large amount of background information on the County is compiled and analyzed, including location and land use data, climate and weather data, baseline vegetation data, historic conditions, population, and demographics, CWPP planning process, fire regime and baseline conditions, fire policy, and other supporting background information. This information is presented in Appendix A, Community and CWPP Background.

Additional appendices to this CWPP include maps in Appendix B; the Core Team contact list in Appendix C; community descriptions and hazard ratings in Appendix D; the National Fire Protection Association (NFPA) Wildfire Fire Risk and Hazard Severity Form 1144 in Appendix E; funding opportunities in Appendix F; a homeowner's guide in Appendix G; and Community Outreach in Appendix H.

ALIGNMENT WITH THE NATIONAL COHESIVE STRATEGY

As part of the 2020 update to the CWPP, the 2008 plan has been aligned with the National Cohesive Wildland Fire Management Strategy (Cohesive Strategy) and its Phase III Western Regional Action Plan by adhering to the nation-wide goal *"To safely and effectively extinguish fire, when needed; use fire where allowable; manage our natural resources; and as a Nation, live with wildland fire."* (National Strategy 2014:3).

The primary, national goals identified as necessary to achieving the vision are:

Restore and maintain landscapes: Landscapes across all jurisdictions are resilient to fire-related disturbances in accordance with management objectives.

¹ CWPP Story Map- <https://www.santafecountynm.gov/fire/wildland>

Fire-adapted communities: Human populations and infrastructure can withstand a wildfire without loss of life and property.

Wildfire response: All jurisdictions participate in making and implementing safe, effective, efficient risk-based wildfire management decisions.

For more information on the Cohesive Strategy, please visit: <https://www.forestsandrangelands.gov/strategy/documents/strategy/CSPPhaseIIINationalStrategyApr2014.pdf>

Alignment with these Cohesive Strategy goals is described in more detail in Chapter 4, Mitigation Strategies.

In addition to aligning with the Cohesive Strategy, the CWPP Update also incorporates information on post-fire recovery, the significant hazards of a post-fire environment, and the risk that post-fire effects pose to communities (Figure 1.1).



Figure 1.1. CWPP Update incorporating the three primary goals of the Cohesive Strategy and post-fire recovery and serving as holistic plan for fire prevention and resilience.

ALIGNMENT WITH STATE PLANS AND AGREEMENTS

The New Mexico Forest Action Plan (FAP) (EMNRD 2020) is still in draft form at the time of writing, however, this CWPP aligns with many of the goals and strategies laid out in that plan, as described in Chapter 4. Future updates to the CWPP should continue to align with the FAP.

The recent passing of House Bill 266- the Forest and Watershed Restoration Act (FAWRA)- emphasized the need for restoration throughout the state, and allocates funds through EMNRD for the purpose of restoring forests and watersheds (See Appendix F for more information).²

In 2019, EMNRD and the USFS signed a shared stewardship agreement to commit to collaborative forest management and set landscape scale priorities for targeted treatments that manage risks and increase benefits in areas where they will have the greatest impact across broad landscapes. The shared stewardship agreement includes a commitment to implement the Cohesive Strategy. As part of the agreement, EMNRD and the USFS will use their respective authorities to conduct government-to-government consultation directly with the tribes and pueblos throughout the state to encourage shared stewardship strategies.

CORE TEAM

In 2008, representatives from various government agencies—along with members of fire departments and local communities—formed a Core Team and participated in decision-making activities that led to the development of the original Santa Fe County CWPP. Some of the members of the original Core Team were joined by new stakeholders and convened to provide input on this 2020 CWPP update. Stakeholder involvement is critical in producing a meaningful document that included all collaborators' diverse perspectives. The Core Team drives the planning process in its decision making, data sharing, experience, and communication with community members who are not on the Core Team. The project was kicked-off on October 31, 2019; the Core Team met for the first time on January 9, 2020, and convened again on March 4, 2020. Due to the Covid-19 pandemic throughout the spring of 2020, all other Core Team communications were limited to email and conference calls.

The Core Team List is provided in Appendix C.

PROJECT AREA

The project area includes all of Santa Fe County as delineated by its geographic and political boundaries. The project boundary encompasses several municipalities. The largest municipal area is the county seat of Santa Fe (Figure 1.2).

LAND OWNERSHIP

Santa Fe County has varied land ownership, including large areas of U.S. Forest Service (USFS) Santa Fe National Forest, USFS Wilderness Areas, Bureau of Land Management (BLM), National Park Service (NPS), tribal, state, and private land (Figure 1.3). Tribal lands include San Ildefonso Pueblo, Pojoaque Pueblo, Nambe Pueblo, and Tesuque Pueblo.

² <http://www.emnrd.state.nm.us/SFD/FAWRA.html>

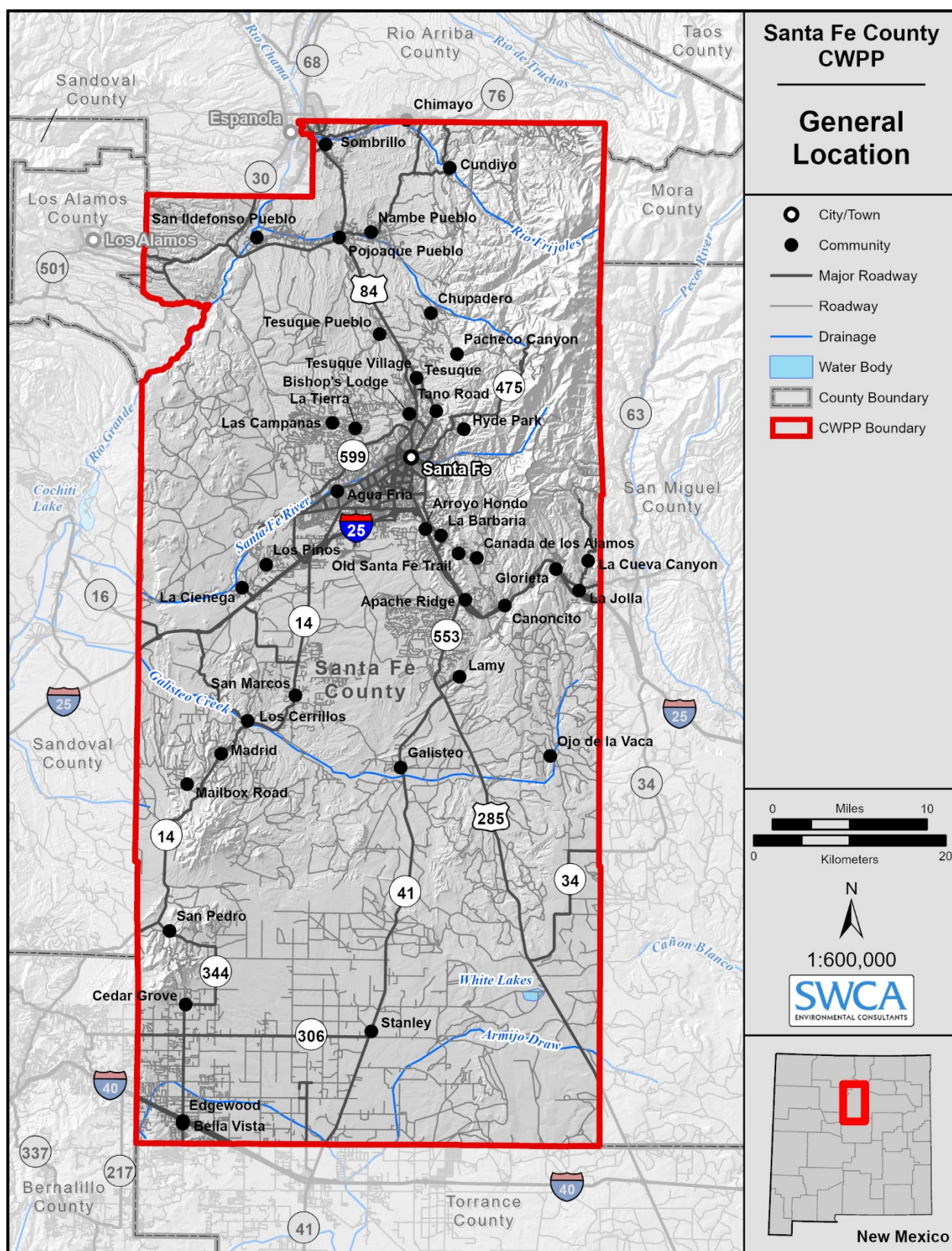


Figure 1.2. Santa Fe County CWPP general location.

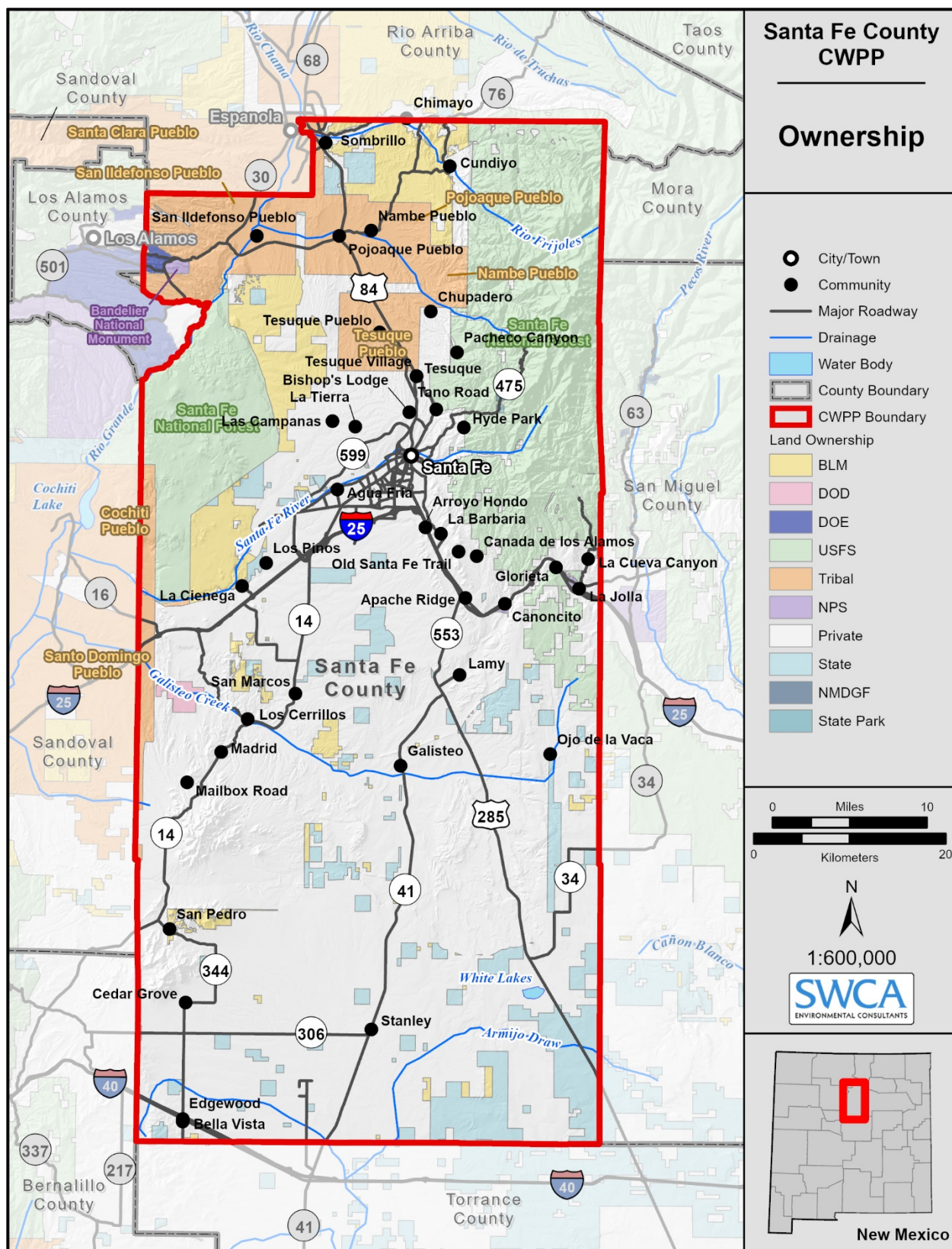


Figure 1.3. Santa Fe County land ownership.

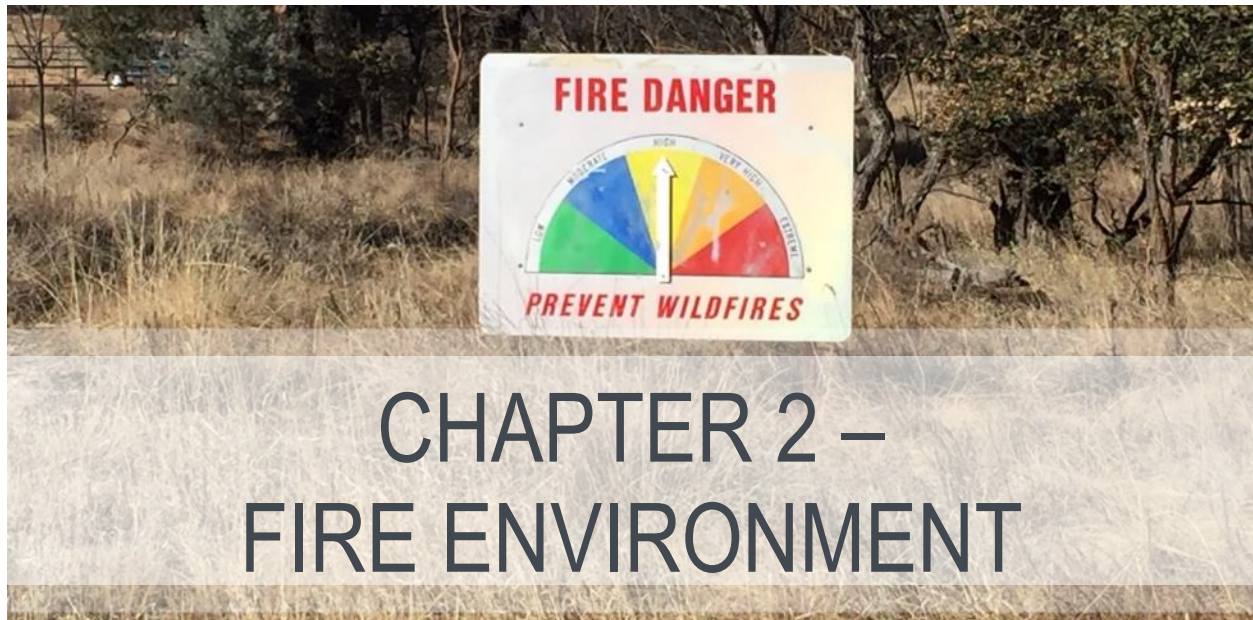
PUBLIC INVOLVEMENT

A key element in the CWPP process is the meaningful discussions it generates among community members regarding their priorities for local fire protection and forest management (Society for American Foresters [SAF] 2004). Due to the COVID-19 pandemic, traditional CWPP public meetings and gatherings were not possible. In order to accommodate engagement with the public, while adhering to restrictions on public gatherings, the County developed a CWPP story map (online content) to provide opportunities for information sharing and gathering.³ In addition, the draft was made available for public review from August 7 through September 6, and the story map and draft were announced through several different media outlets including newspapers, radio, social media, and online blogs (Appendix H).

Between July 25, 2020, and August 25, 2020, several social media and news sites published information about the CWPP story map and draft Plan. Additionally, the Santa Fe Reporter published an article during the week of September 21, 2020. Next Door, Facebook, and Twitter accounts were all used by New Mexico Fire Information, New Mexico State Forestry, the Southwest Fire Consortium, and more to distribute information to the public about the Plan update and the public comment period. In addition, the Richard Eeds show featured an interview with two Core Team members on August 20, 2020. More information on the details of these online resources (including URLs) can be found in Appendix H. Appendix H also includes a brief summary of the story map including representative photographs of the information available to the public.

During subsequent updates to this plan, the County will employ more traditional methods of engagement to ensure the community are able to continue to provide substantive input into the document. Recommendations for future community engagement and outreach are provided in Table 4.4.

³ CWPP Story Map- <https://www.santafecountynm.gov/fire/wildland>



WILDLAND URBAN INTERFACE

A WUI is composed of both interface and intermix communities and is defined as areas where human habitation and development meet or intermix with wildland fuels (U.S. Department of the Interior [USDI] and U.S. Department of Agriculture [USDA] 2001:752–753). Interface areas include housing developments that meet or are in the vicinity of continuous vegetation. Intermix areas are those areas where structures are scattered throughout a wildland area where the cover of continuous vegetation and fuels is often greater than cover by human habitation.

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 potential loss of life and property. Human encroachment upon wildland ecosystems within recent decades is increasing the extent of the WUI throughout the country as a whole, which is having a significant influence on wildland fire management practices. Combined with the collective effects of aggressive suppression policies, resource management practices, land use patterns, climate change, and insect and disease infestations, the expansion of the WUI into areas with high fire risk has 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). Mitigation techniques for fuels and fire management can be strategically planned and implemented in WUI areas; for example, with the development of defensible space around homes and structures (Figures 2.1 and 2.2).



Figure 2.1. Example of the WUI in Santa Fe County.



Figure 2.2. Example of the WUI in Santa Fe County.

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

On December 12th, 2018 the County Board of Commissioners adopted the International WUI Code.⁴ The Ordinance (2018-8) is cited as the Santa Fe County Fire Code and referred to as the Fire Code.

The Fire Code is effective within the unincorporated boundaries of the County, including private land or land owned by the United States. The Fire Code adopts the International Fire Code, 2015 edition, as well as Appendix Chapters B and D (IFC), as published by the International Code Council.⁵ The Fire Prevention Division of the Santa Fe County Fire Department is responsible for the implementation, administration and enforcement of the provisions of the Fire Code. The Fire Code applies to new construction only and includes provisions including but not limited to fire protection water supply, access road width and locations of above-ground propane tanks.

During the promulgation process for the Fire Code, the County revised the original CWPP WUI delineation. The classification the County used in delineating the WUI areas was based on an analysis of fuels, similar to a hazard assessment. The Core Team determined that this new WUI delineation should be integrated into this CWPP Update (Figure 2.3).

⁴ Ordinance No. 2018-8: https://www.santafecountynm.gov/documents/ordinances/Ordinance_2018-8.pdf

⁵ 2015 International Wildland Urban Interface Code: <https://codes.iccsafe.org/content/IWUIC2015/toc>

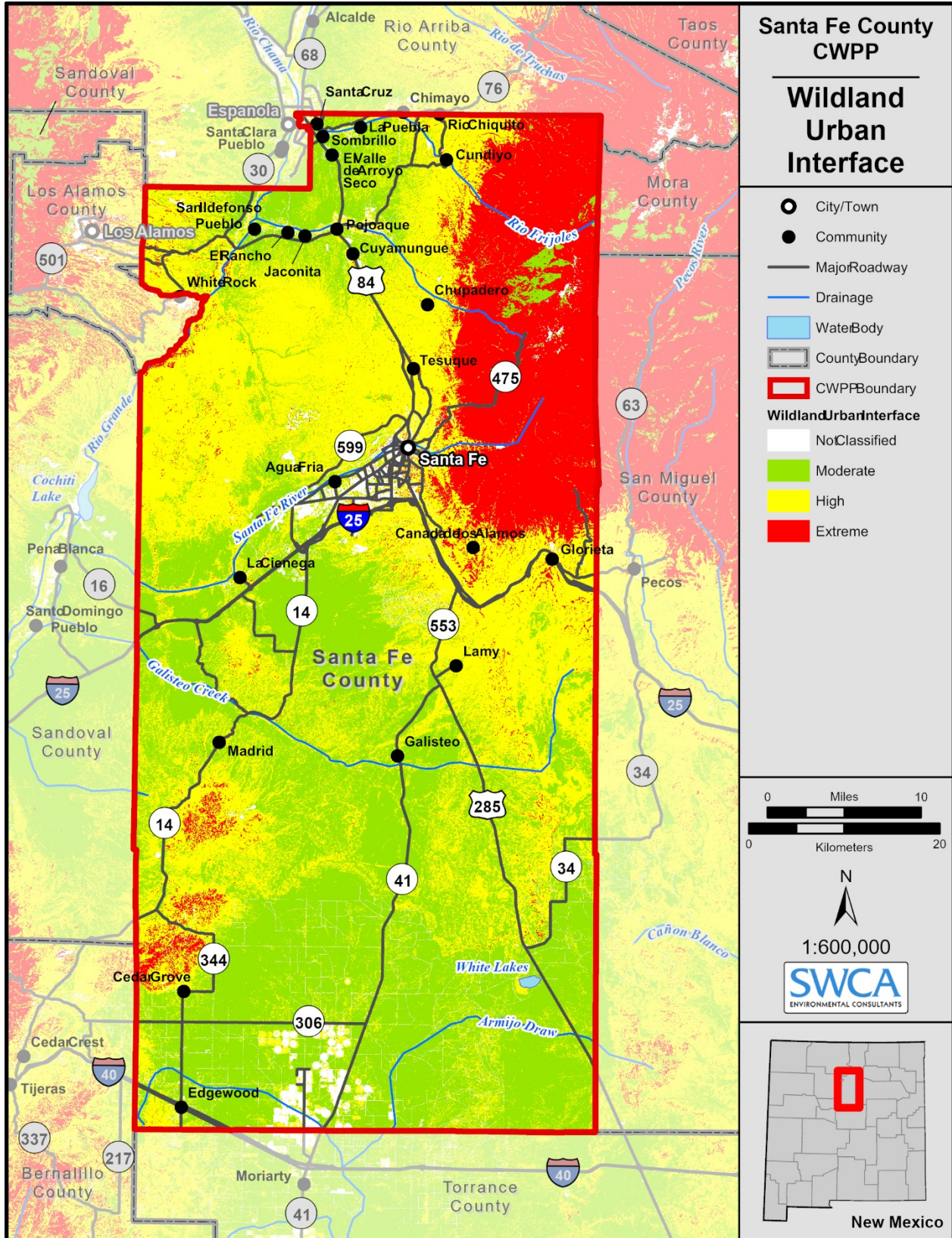


Figure 2.3. WUI delineation for Santa Fe County.

FIRE HISTORY

Recent Fire Occurrence

Historic wildfire activity and information regarding fire regime are described in detail in Appendix A.

Fire history data encompassing the period from 1960 to 1996 suggests a pattern of increased numbers of fires starting in 1996 (Figure 2.4), with a decline in fire frequency over the last decade. This data set may reflect an increase in fire reporting from the mid-1990s, or a change in suppression tactics away from immediate suppression of fires; because these data anomalies are unknown, the period from 1996 to 2018 is the focus of the discussion below.

During the more active fire period from 1996-2018, human ignitions are historically the most common cause of fires within the County (Figure 2.5); however, lightning is widespread throughout monsoon season and could contribute to fire starts from June through August (Figure 2.6). Most fires are detected early and suppressed before they gain acreage (Figure 2.7); however, given the right conditions, some fires may grow large and become difficult to suppress. During the development of the CWPP update, the County experienced the Medio Fire, a 4,010-acre fire on the Espanola Ranger District. The fire was a result of a lightning ignition on August 17, 2020 and demonstrates the potential for large fire growth. Adjacent counties with similar fuels and topographic conditions have also experienced large fires.

Most fires in the County have occurred along roadways and close to more populated areas. The Santa Fe National Forest and the Greater Santa Fe Fireshed have in contrast received very low numbers of fires over the last century (Forest Stewards Guild n.d). Figure 2.8 shows the fire history across the County since 1914.

A concern of residents in the WUI is the number of human ignitions, particularly with the development and improvement of roads, residences, and recreational opportunities in wildland areas. Human-caused fires account for approximately 84% of the wildfires recorded for the County since 1996. Although the majority of fires take place during the summer months, human-caused ignitions increase the potential for wildfires throughout the year.

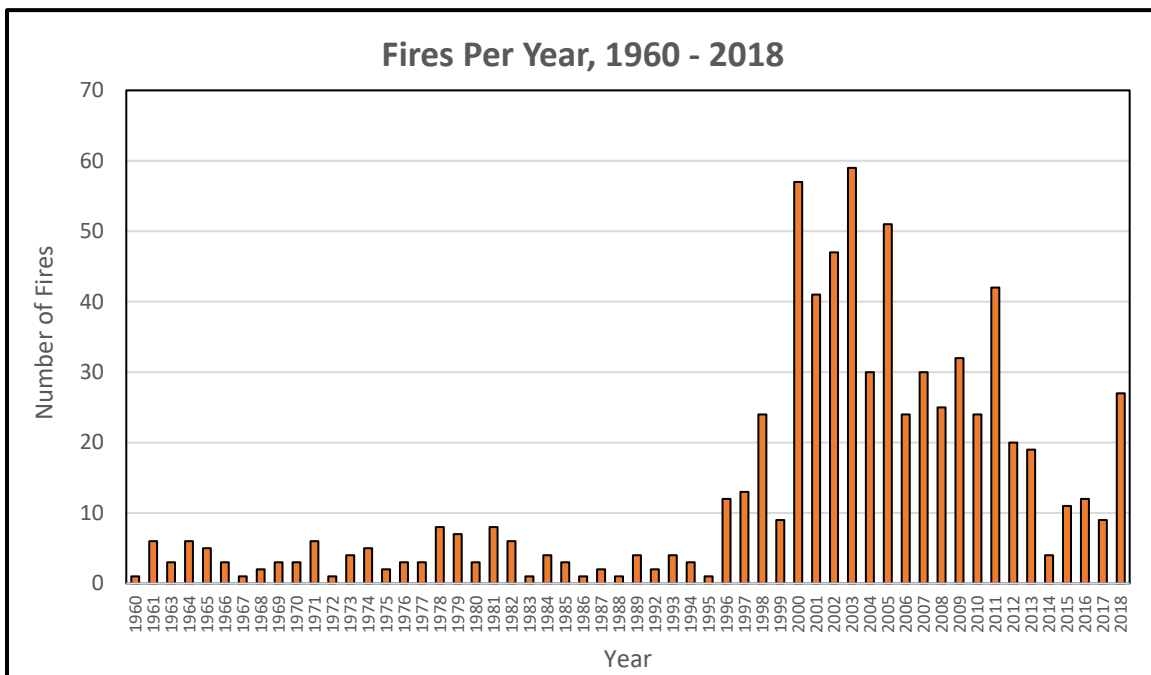


Figure 2.4. Annual wildfire frequency in Santa Fe County from 1960 to 2018, based on available data.

Source: USFS/NMSF.

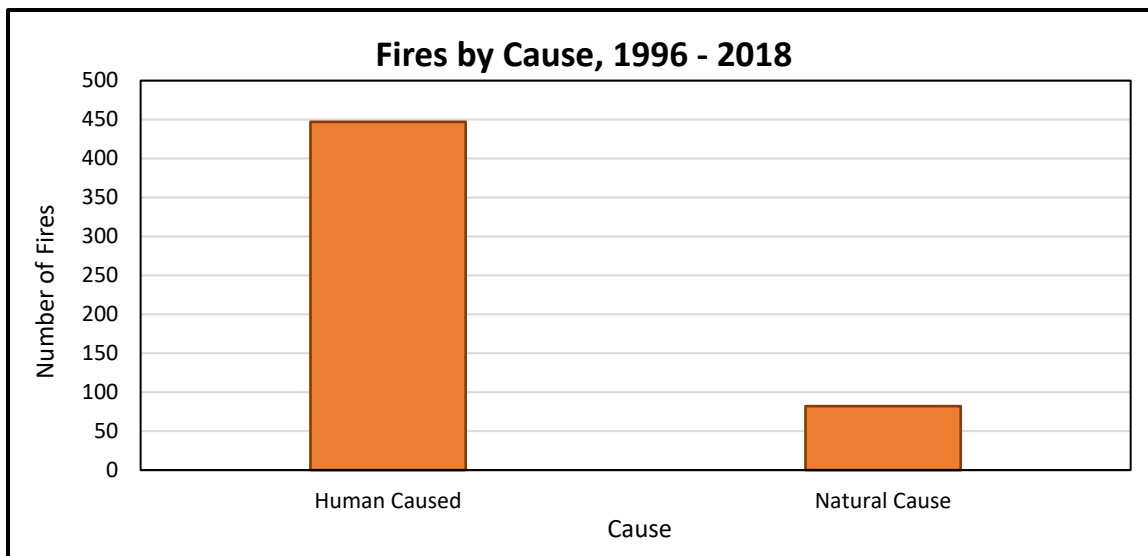


Figure 2.5. Fire causes for Santa Fe County from 1996 to 2018.

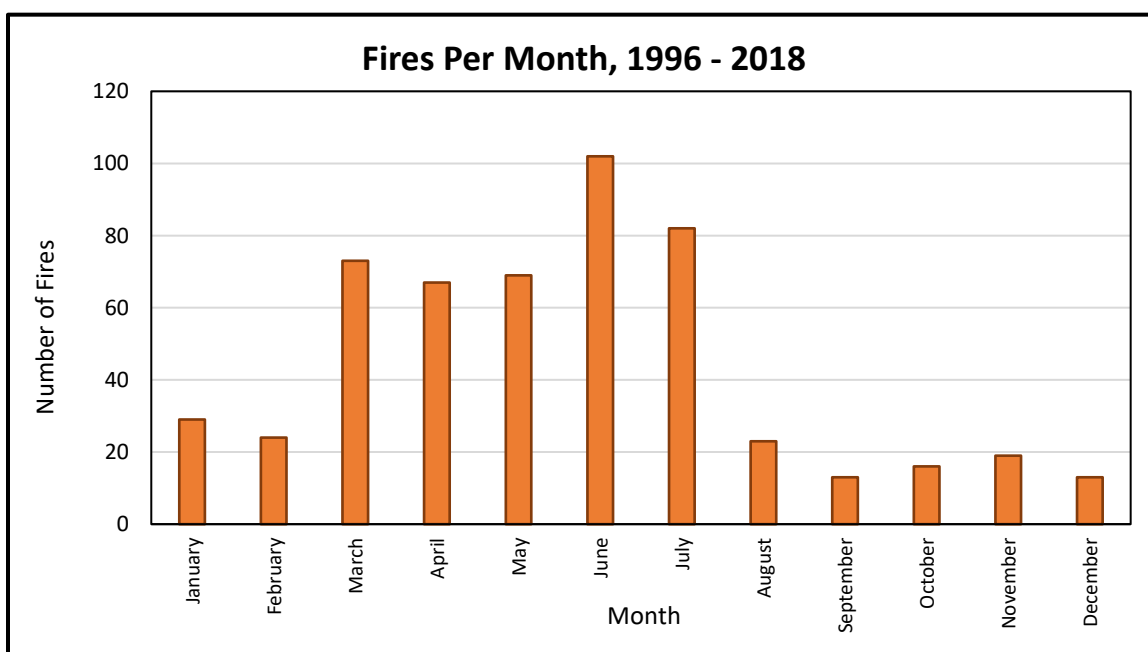


Figure 2.6. Monthly fire frequency in Santa Fe County based on data from 1996 to 2018.

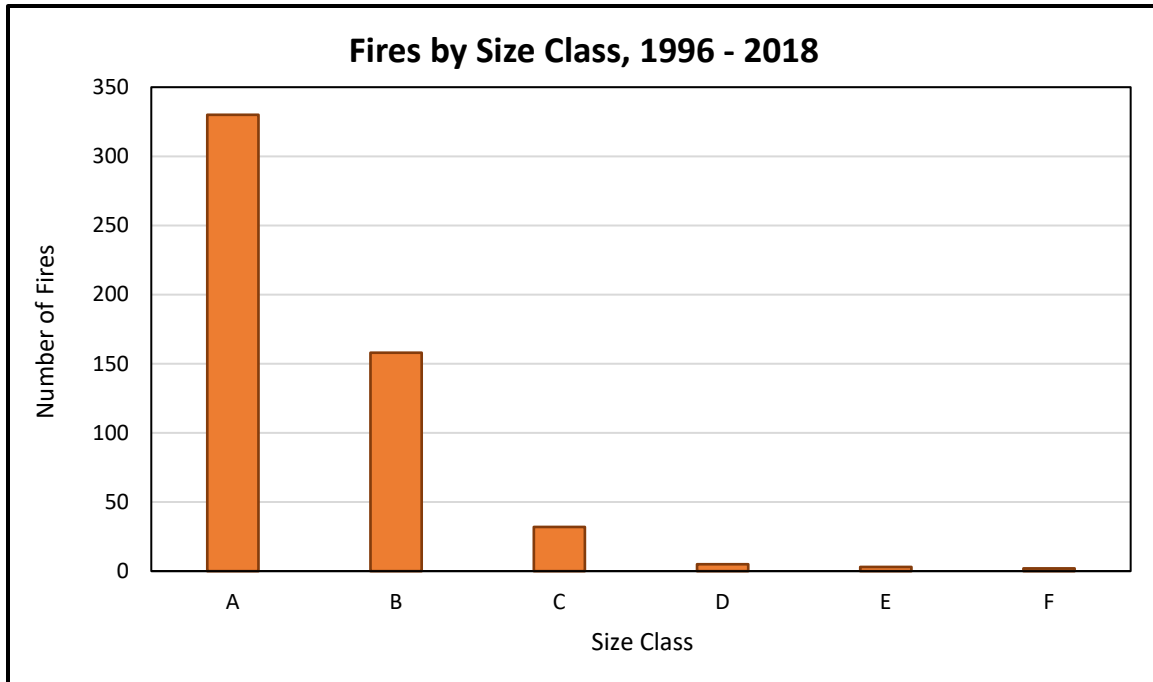


Figure 2.7. Fire size statistics for Santa Fe County based on fire history data from 1996 to 2018.

Size Class: A = 0.25 acre or less; B = greater than 0.25 to 10 acres; C = 10 to 100 acres; D = 100 to 300 acres; E = 300 to 1,000 acres; F = 1,000+ acres.

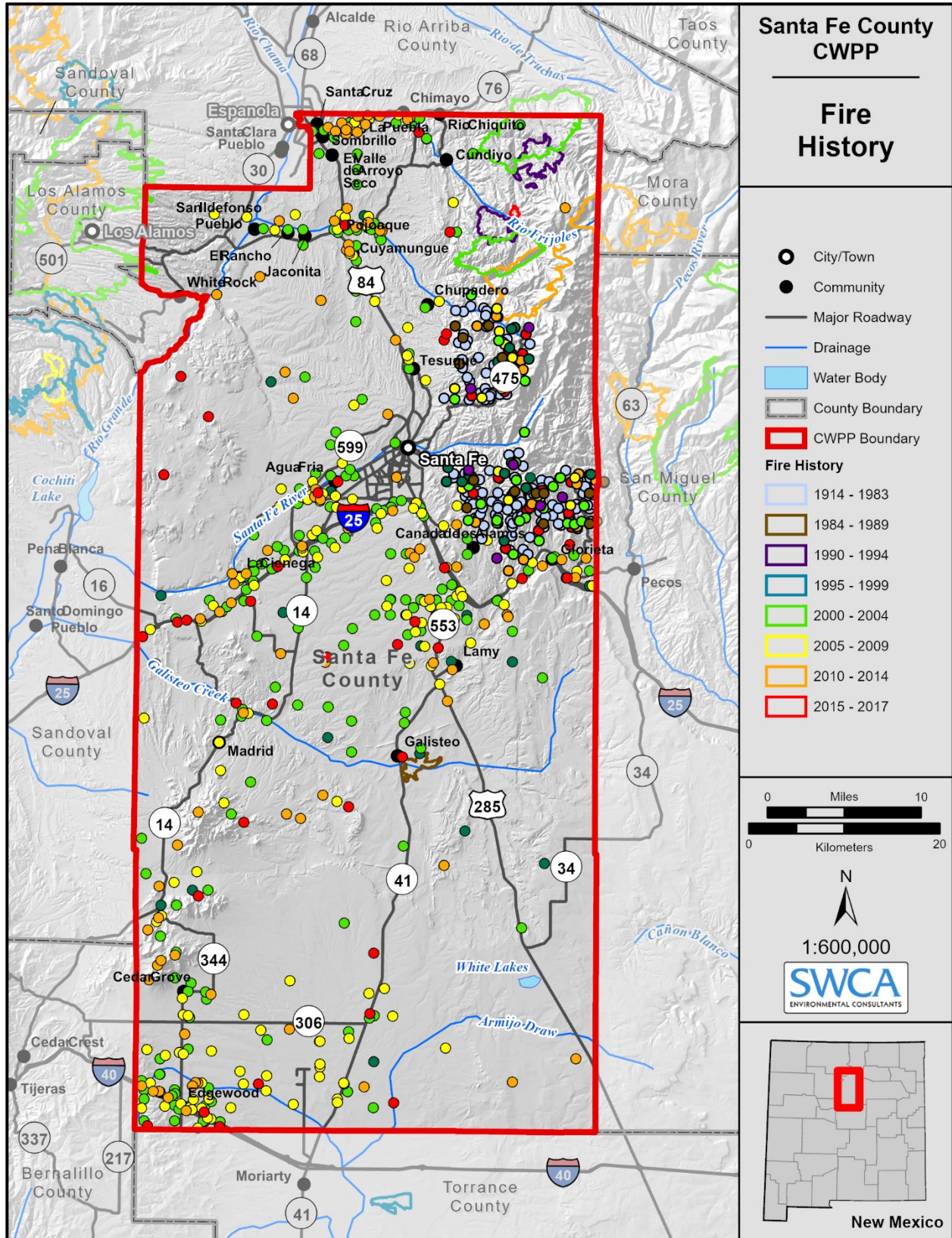


Figure 2.8. Fire history for Santa Fe County from 1914 to 2017.

Future Challenges

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 (Loehman et al. 2018; Westerling et al. 2006; Westerling 2016). 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. An update to Westerling et al.'s 2006 work found that the frequency of large wildfires has continued to increase with each decade since 1970 (Westerling 2016). Within just the last 10 years, a record number of acreages have burned, and numbers are continually getting larger (NIFC 2019). In 2019, 50,477 fires were reported nationwide, burning 4.7 million acres (NIFC 2020). With increased fires comes increased suppression costs; 2018 beat all previous records, with federal firefighting costs hitting \$3,143,256,000. In New Mexico, 79,887 acres were burned by wildfire in 2019.

Periodic drought and intense rainfall patterns projected for the Southwest are expected to result in significantly diminished stream flow and drier surface conditions (Seager et al. 2008), shifting the regional climate further toward aridity. These changes in relative humidity are blamed for many of the wildfire conditions observed today, as increased drying over much of the Southwest has led to an increase in days with high fire danger (Abatzoglu and Williams, 2016; Prein et al. 2016). In the forests of the Southwest, total area burned, and percent burned at high severity have continued to increase over the past three decades (Mueller et al. 2020). Since ca. 2000, there has been a notable increase in annual area burned at high severity and a greater percent of fires are burning at high severity (Mueller et al. 2020).

Drought conditions coupled with warmer temperatures, also called global-change-type droughts, increase water stress on vegetation (Breshears et al. 2005) and decrease forest resilience to wildfire and other disturbance events. 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). 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 further 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). In a study examining multiple climatic scenarios on Southwestern ecosystem structure, Loehman et al. (2018) found that their hot-arid climate scenario catalyzed fundamental, long-term forest ecosystem shifts including reduced biomass and altered forest structure. Extreme hot-arid climatic conditions can push forest ecosystems over a tipping point, or threshold at which even small changes could reorganize ecosystem processes (Loehman et al. 2018). Dry forests already at the edge of their climatic tolerance are most likely to convert to non-forest systems (Stevens-Rumann et al. 2018, Millar and Stephenson 2015). In Loehman et al.'s (2018) study, shrubland ecosystems were identified as a stable alternative to forest systems. These findings are in agreement with observed shifts from ponderosa pine forests to pinyon-juniper woodlands as a result of global-change style drought conditions. These predicted and observed shifts will radically affect land management goals and strategies on Southwestern landscapes. Current strategies can't prevent this ecosystem reorganization (Loehman et al. 2018). Rather, novel approaches must be utilized to manage for desired ecosystem conditions.

Although fire suppression is still aggressively practiced, fire management techniques are continually adapting and improving, especially in light of changing climate. Management of fire for resource objectives is an option for land managers in the County. Due to scattered human developments (homes, ranches, and farms) and values (residential and commercial structures, historic and natural values) throughout the WUI, suppression in WUI areas will always have to be a priority. However, combining prescribed fire and managing wildland fire for resource objectives 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 associated with heightened risk due to a warming climate. The use of prescribed fire on private land is a decision to be made by the landowner, and it is acknowledged that given the prevailing drought such a management technique may not always be feasible in the County.

FIRE RESPONSE CAPABILITIES

Planning and Decision Support

As wildfires have continued to grow in size and severity over the last decade, this has led to fire managers needing to institute more robust pre-fire planning as well as adapt and improve decision-making tools in order to reduce risk to fire responders and the public and assess impacts on ecological processes.

A primary decision tool utilized by fire managers across all agencies is the Wildland Fire Decision Support System (WFDSS), a system that assists fire managers and analysts in making strategic and tactical decisions for fire incidents (WFDSS 2015).⁶ WFDSS combines desktop applications for fire modeling into one web-based system. It provides a risk-informed decision process and documentation system for all wildland fires and it also introduces economic principles into the fire decision process in order to improve efficiencies which also ensuring safe and effective wildfire response.

One intent of WFDSS is to ensure that when fire response decisions are made, they fall in line with agency land and resource management plans. Agencies have recently been moving away from the traditional written fire management plans and instead are developing spatial fire management plans that can be housed within WFDSS (WFDSS 2015). The Santa Fe National Forest for example will have all management requirements and strategic objectives for fire management, contained within WFDSS, so that in the event of a fire, incident managers are considering this information when making decisions and developing strategic direction for the wildfire incident (WFDSS 2015).

Another tool employed by fire managers in pre-fire planning is the potential operational delineation (POD). PODs combine fire modeling with expertise from local fire practitioners and managers to identify potential locations where fire suppression could be effective (Caggiano et al. 2020; Harden 2020). This concept was tested in northern New Mexico during the 2019 fire season on seven New Mexico fires, including land in the Santa Fe National Forest. This pilot project demonstrated the effectiveness of PODs for decision support. It is anticipated that these processes will continue to be used in future fire planning across jurisdictions.

Fire Resources

The availability of resources is dictated by the state and federal wildland fire season. From approximately April 15 through July 15, resources are plentiful around the region. This time period is considered the Southwest fire season, so multiple crews, engines, helicopters, and air tankers are available. However, from July 15 to October 31, firefighting focus often changes to other regions such as to the Northwest and California. During this period, the time frame to obtain resources is extended, sometimes taking up to 48 hours. During the winter months, obtaining resources is difficult as many firefighters are employed seasonally from April through October. Given the changing fire regimes, wildfires now occur throughout the entire year, extending beyond the state and federal designated wildland fire season. Resources are limited for fires that occur outside of this time frame.

⁶ WFDSS: https://wfdss.usgs.gov/wfdss/WFDSS_Home.shtml

Santa Fe County Fire Department

Volunteer and career firefighters at the County and community level have similar capabilities throughout the entire year, while state and federal responders are affected by fire season. In spite of the continuous level of capabilities, ebbs and flows occur within the volunteer service. Recruiting and retaining volunteers is challenging due to people's lifestyles and the training requirements one must follow to be a volunteer firefighter. Although several volunteer firefighters are present in the County, not all are available to respond to every fire. The County Wildland Division has taken steps to have a fire crew all year round for county response.

Santa Fe National Forest

The Santa Fe National Forest provides fire response on USFS land in the County. Fire management and suppression protocols are directed by the Forest Plan.

On USFS land, the USFS has the responsibility for initial attack (initial response). The USFS maintains Mutual Aid Agreements (MAA) with the New Mexico State Forestry Division (NMSF), the County, and the NPS. Under the MAA, agency personnel may respond to incidents outside their agency boundaries.

The management of wildfire ignitions for multiple resource objectives (managing naturally burning fires in forests as a tool for helping to restore forest health and mitigating the escalating costs of fire suppression) is practiced on federal land but depends upon a thorough assessment of risk to values at risk in the WUI. 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. All large wildfire response would be based upon assessment using WFDSS.

In wilderness areas, the Santa Fe National Forest supervisor must approve the use of helicopters, portable pumps, and chainsaws, as well as the construction of helispots. The Southwestern Regional Forester must approve the use of motorized vehicles and bulldozer line construction. Fire strategies call for:

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

The USFS has the following resources available for fire suppression throughout the County:

- Santa Fe Supervisors Office
 - 3 – Type 3 Incident Command
 - 2 – Operations Section Chiefs
 - 3 – Task Force Leaders
 - Santa Fe Hotshots
- Espanola Ranger District
 - 2 – Type 3 ICs/Division Supervisors
 - 1 – Type 4 Engine
 - 1 – Type 6 Engine
- Pecos/Las Vegas Ranger District
 - 2 – Type 3 ICs/Division Supervisors
 - 1 – Type 3 Engine
 - 1 – Type 6 Engine

New Mexico State Forestry Resources

The Bernalillo District of NMSF has primary responsibility for non-federal, non-municipal, non-tribal, and non-pueblo lands within the SCCWPP area. In the event of a wildfire on state land, local fire departments or other resources may be used for initial attack under the New Mexico Joint Powers Agreements.⁷

Bureau of Land Management

The BLM operates a State Fire and Aviation Management office in Santa Fe and four District Fire Programs located in Albuquerque, Farmington, Roswell (Pecos District) and Las Cruces Districts. The County falls within the management area of the Farmington District, Taos Field Office. The local field office has initial attack responsibility and provides mutual aid assistance for wildland fire activities on BLM-administered public land. Through the Joint Powers Agreements, the BLM also maintains initial fire attack response responsibilities for designated state and private lands. Fire suppression resources are stationed in Taos covering the County and other areas of BLM responsibility. Additional resources can be drawn from other parts of the district or other districts as needed.

Each field office or district office in New Mexico has a Resource Management Plan, which provides management direction for all BLM resources. FMPs are supplements to the Resource Management Plans and are more detailed, site-specific plans. FMPs 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 or district office has an approved FMP. These plans are periodically reviewed and updated as needed.

The single overriding priority in BLM fire management is to protect human life, of 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.

Bureau of Indian Affairs

The Southwest BIA operates in the State of New Mexico and southern Colorado. BIA Fire and Aviation Management operate in Ohkay Owingeh but oversee four tribes located within Santa Fe County. The four tribes are Pueblo of Tesuque, Pueblo of Pojoaque, Pueblo of Nambe, and the Pueblo of Idelfonso. Northern Pueblos Agency has initial attack responsibility and provides mutual aid assistance for wildland fire activities on the Santa Fe Zone. Through the Joint Powers Agreements, the Northern Pueblos Agency also maintains initial attack fire response responsibilities for designated state and private lands. Fire suppression resources are stationed in Ohkay Owingeh covering three Counties and other areas of BIA responsibility. Additional resources can be drawn from other Fire Cooperative Tribes as needed.

Each BIA Agency in New Mexico and Colorado has a Forest Management Plan, which provides management direction for all BIA natural resources. Fire Management Plans (FMP) are supplements to the Forest Management Plans and are more detailed and site-specific plans for each tribe. FMPs 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 agency has an approved FMP. These plans are annually reviewed and updated as needed.

The single overriding priority in BIA fire management is to protect human life, of both the public and firefighters. In addition, agency policies aim to protect tribal trust communities, their infrastructure, and the natural resources on which they depend upon. Other property and improvements will be protected. Where possible on BIA trust lands, 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

⁷ Joint Powers Agreement: https://gacc.nifc.gov/swcc/dc/nmadc/management_admin/incident_business/documents/New%20Mexico%20JPA.pdf

improvement or maintenance of ecosystem health and wildlife habitat and the protection of high-value cultural, historical, and religious resources.

Northern Pueblos Agency has the following resources available for fire suppression throughout the County:

- 2 – Type 3 Incident Commanders/Division Group Supervisors
- 2 – Type 4 Incident Commanders
- 1 – Task Force Leaders
- 6 – Type 5 Incident Commanders
- 6 – Engine Bosses
- 3 – Type 6 Engines (E-2561, E-2562, E-2563)

Pueblo Tesuque (Fire Cooperative)

- 2 – Type 5 Incident Commanders
- 1 – Engine Boss
- 1 – Type 6 Engine (E-1860)

Santa Clara Pueblo (Fire Cooperative/Fire Compact)

- 2 – Type 5 Incident Commanders
- 1 – Engine Boss
- 1 – Type 6 Engine

MUTUAL AID

The wildland fire community is well known for its development of mutual aid agreements at the federal, state, and local levels. Such automatic aid agreements allow for closest forces to respond to an incident as quickly as possible regardless of jurisdiction. Such agreements may also describe how reimbursement will be conducted; state resources responding to wildfires on federal land may have their associated costs reimbursed by the responsible federal agency, and the reverse is true for federal resources suppressing a wildfire on state land.

EVACUATION RESOURCES

As part of emergency management protocols, Santa Fe County has adopted the Ready, Set, Go! protocols for community evacuation.⁸

Road Systems

Much of Santa Fe County is accessible via surfaced roads and highways; however, some communities are accessed only via unsurfaced roads (Figure 2.9), which are often narrow and windy with many dead-end roads (Figure 2.10). These routes may prove hazardous during emergency evacuation, especially where they are adjacent to forested land with vegetation close to or overhanging the road. Fuel treatment may be needed along some roads where vegetation is overhanging and could prevent safe evacuation of residents or safe access by emergency responders. Some rural roads and driveways may also have narrow bridges with weight limits (see Figure 2.10) that may impact access with large emergency apparatus.

⁸ Ready-Set-Go and Santa Fe County Evacuation: https://www.santafecountynm.gov/fire/emergency_management_division/evacuation_planning_guide



Figure 2.9. Example of unsurfaced road.



Figure 2.10. Example of unsurfaced roads.

Horses, Livestock, and Animals

Many rural homes also have horses and other large animals and livestock, and pets are common in homes throughout the County. In the event of a wildfire, it is important that residents and fire responders have a plan for evacuation of pets and livestock. Evacuation planning often neglects to describe how animals will be evacuated and where they will be taken. The loading of horses, for example, during a fire and smoke situation, and transport of stock vehicles down narrow roads under stressful situations, can be very difficult. Public education could emphasize the need to practice loading horses quickly, for example.

There is also a need to pre-identify where animals can be taken, such as county fairgrounds, for large animal shelter. Similarly, locations where small animals such as dogs and cats picked up in the fire area should also be pre-identified, as well as the lead agencies, such as humane societies, coordinating this work.

A plan for livestock evacuation and shelter has been identified as a need in the County.

WATER AVAILABILITY AND SUPPLY

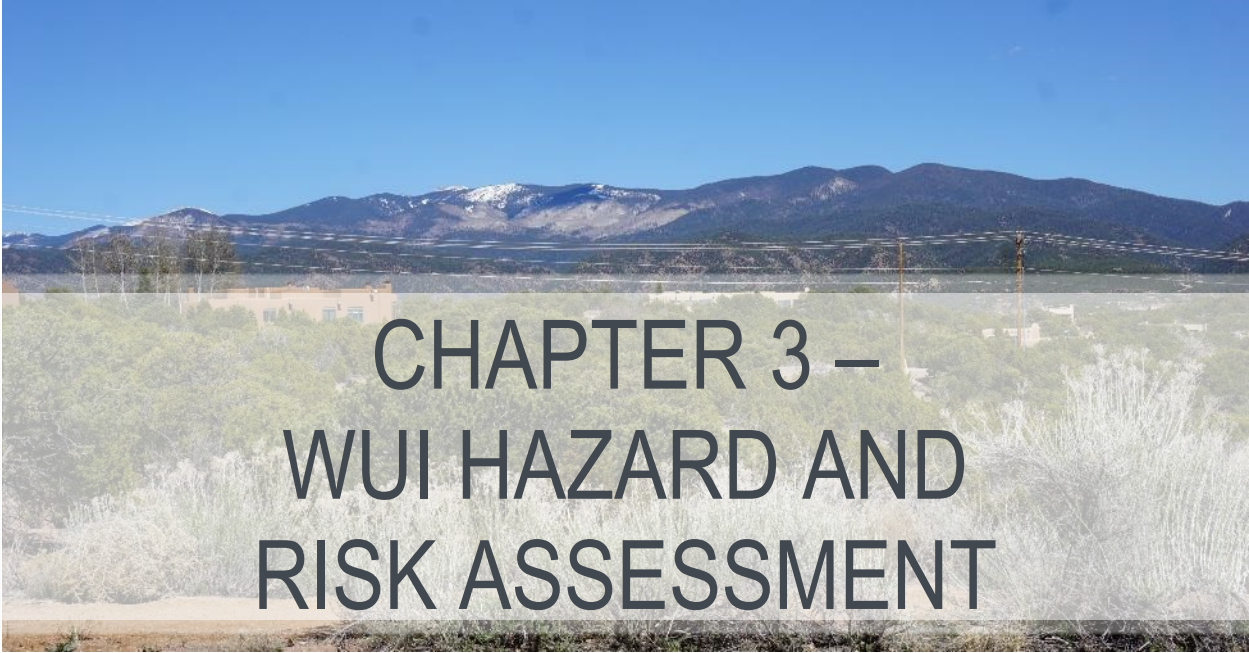
Water supply is variable around the County and may be provided by hydrants, wells, cisterns, and ponds. Many rural and unincorporated communities lack water for fire suppression. There have been upgrades at fire stations implemented in some communities, including installation of aboveground and belowground water tanks. Additional water storage is still needed in many areas.

Ponds and rivers could also provide alternative sources for suppression, and many stations have the capability and equipment to draft, but suitable drafting sources are not always known.

Limited water supply can impact International Standards Organization (ISO) ratings for fire departments, so improvements to water infrastructure have been identified as a priority for this CWPP update. The hydrant location dataset for the County is incomplete, and therefore, mapping is identified as a needed project in this CWPP update.

PUBLIC EDUCATION AND OUTREACH PROGRAMS

Public education and outreach programs are a common factor in virtually every agency and organization involved with the wildfire issue. Detailed information on these programs is provided in Appendix A.



CHAPTER 3 – WUI HAZARD AND RISK ASSESSMENT

PURPOSE

The purpose of developing the risk assessment model described here is to create a unique tool for evaluating the risk of wildland fires to communities within the WUI areas of Santa Fe County. Although many definitions exist for hazard and risk, for the purpose of this document these definitions follow those used by the firefighting community:

Hazard is a fuel complex defined by kind, arrangement, volume, condition, and location that forms a special threat of ignition and resistance to control.

Risk is defined as the chance of a fire starting as determined by the presence and activity of causative agents (National Wildfire Coordinating Group [NWCG] 1998).

The hazard and risk assessment is twofold and combines a geographic information system (GIS) model of hazard based on fire behavior and fuels modeling technology (Composite Risk/Hazard Assessment) and a Core Team generated assessment of on-the-ground community hazards and values at risk.

From these assessments, land use managers, fire officials, planners, and others can begin to prepare strategies and methods for reducing the threat of wildfire, as well as work 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.

The Santa Fe County Hazard Mitigation Plan (HMP) (Santa Fe County 2018) lists wildfire hazard as a highly likely hazard, with extensive spatial extent, with a critical magnitude/severity and high overall significance.

FIRE BEHAVIOR MODEL

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 embers are plentiful and/or long range (>0.5 mile), resistance to control can be very high. Crown fire and spotting activity has been a concern for fire managers particularly under extreme weather conditions. In areas where homes are situated close to timber fuels and/or denser shrubs and trees, potential spotting from woody fuels to adjacent fuels should always be acknowledged.

Treating fuels in the WUI can lessen the risk of intense or extreme fire behavior (Martinson and Omi 2013; Safford et al. 2009). Studies and observations of fires burning in areas where fuel treatments have occurred have shown that the fire either remains on or drops to the surface, thus avoiding destructive crown fire, as long as activity fuels are treated or removed (Graham et al 2004; Pollet and Omi 2002; Prichard et al. 2010; Safford et al. 2012; Waltz et al. 2014). Fuel mitigation efforts therefore should be focused specifically where these critical conditions could develop in or near communities at risk (CARs).

For this plan, an assessment of fire behavior has been carried out using well-established fire behavior models: FARSITE, FlamMap, BehavePlus, and FireFamily Plus housed within the Interagency Fuel Treatment Decision Support System (IFTDSS), as well as ArcGIS Desktop Spatial Analyst tools. Data used in the Composite Risk/Hazard Assessment is largely obtained from LANDFIRE.

Information regarding the modeling approach and components is included in Appendix A.

COMPOSITE RISK/HAZARD ASSESSMENT

The Composite Risk/Hazard Assessment modeling approach utilizes a Weighted Sum Model, which “stacks” geographically aligned datasets and evaluates an output value derived from each cell value of the overlaid dataset in combination with the weighted assessment. In a Weighted Sum Model, the weighted values of each pixel from each parameter dataset are added together so that the resulting dataset contains pixels with summed values of all the parameters. This method ensures that the model resolution is maintained in the results and thus provides finer detail and range of values for denoting fire risk. Figure 3.1 illustrates the individual datasets and the relative weights assigned within the modeling framework.

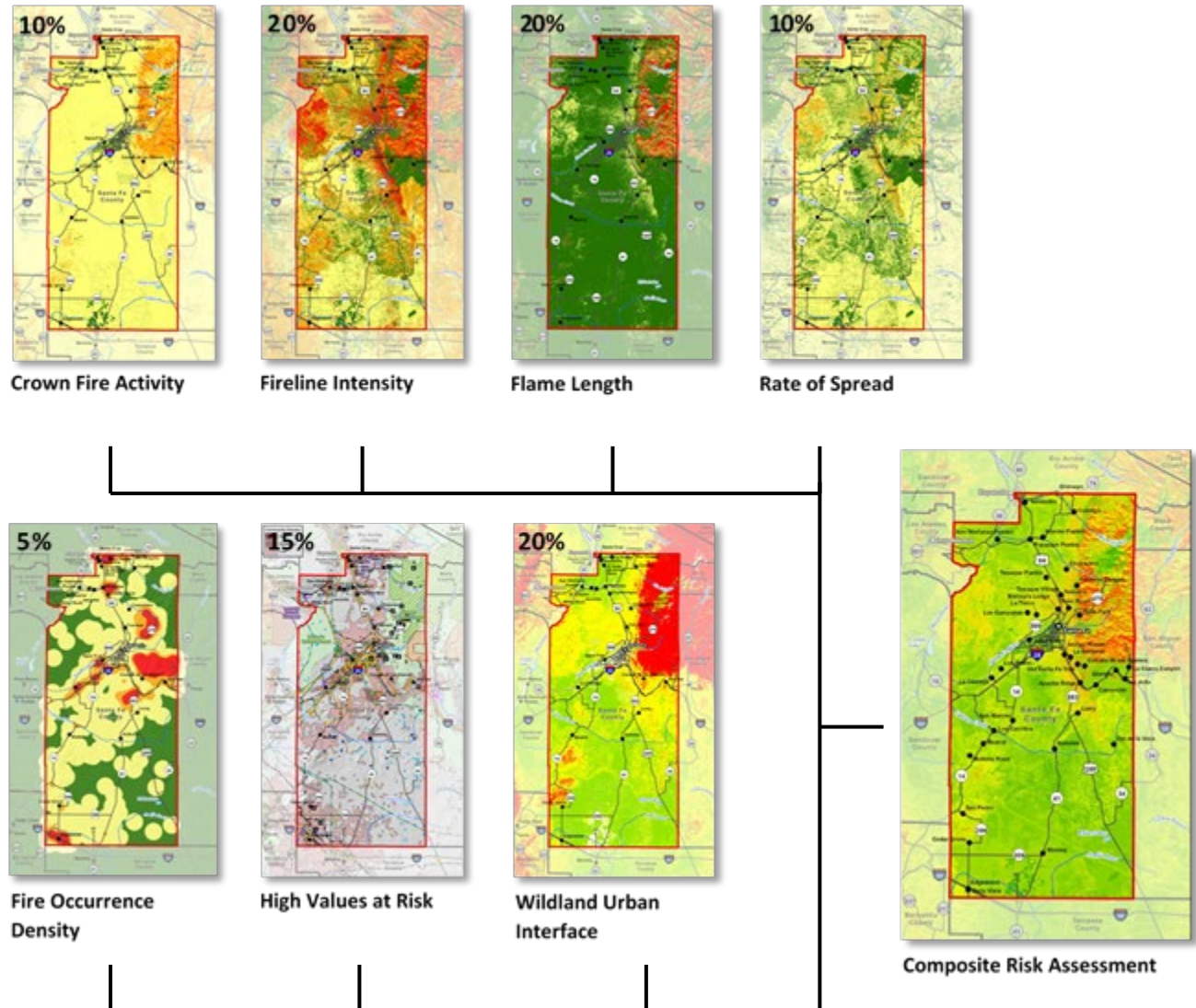


Figure 3.1. Composite risk/hazard overlay process.

Figure 3.2 is the risk assessment for the planning area; it combines all the fire behavior parameters described above. The risk assessment classifies the planning area into low, moderate, and high-risk categories.

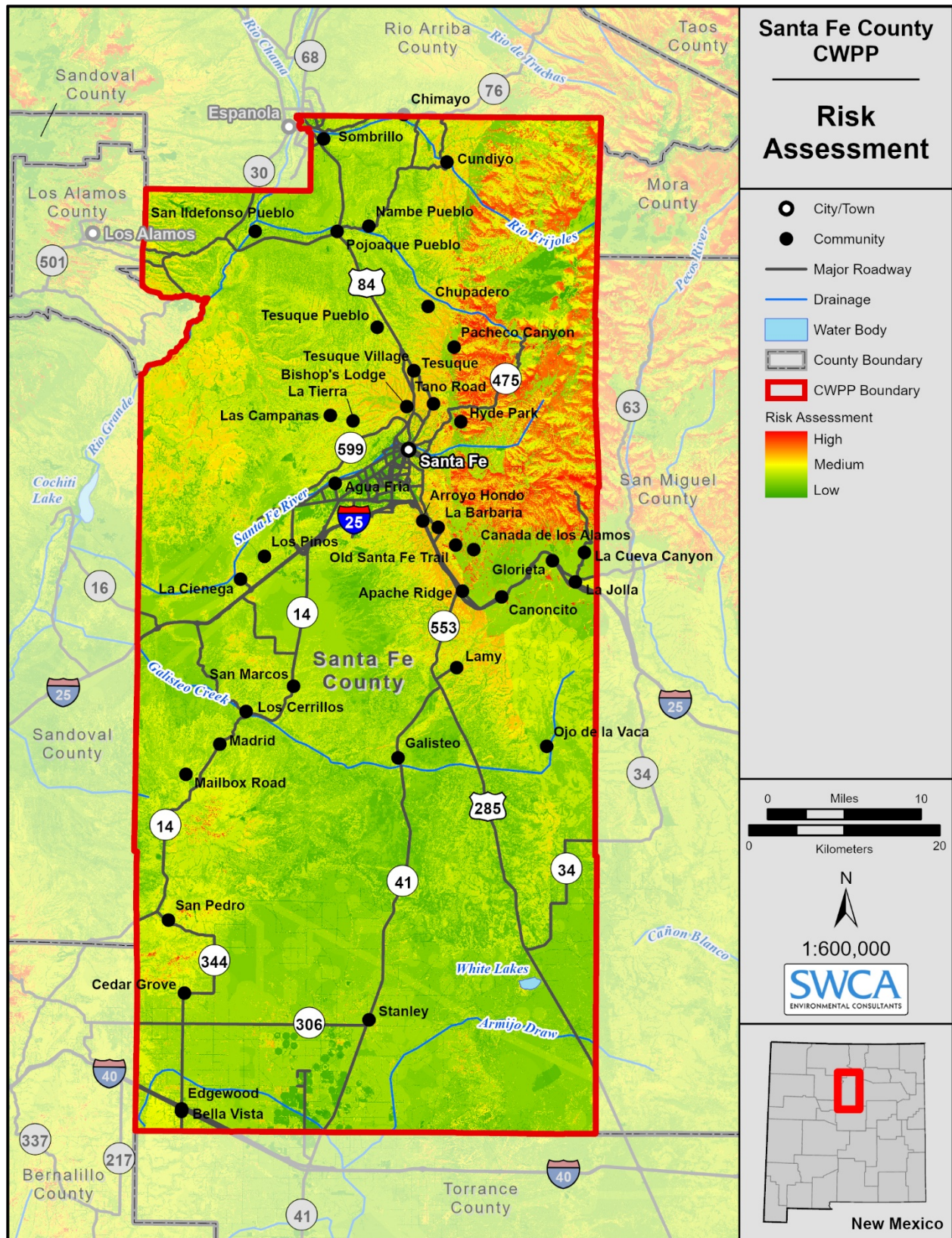


Figure 3.2. Composite risk/hazard assessment.

COMMUNITY HAZARD ASSESSMENTS

The 2008 CWPP developed descriptions of risk and hazard for each community. As part of the update, the Core Team revisited these descriptions and identified several areas within Santa Fe County that may have experienced a change in risk rating. In order to properly assess the hazards in and around these communities, several field days were implemented to carry out community assessments.

The assessment was conducted in Spring 2020 using the NFPA Wildland Fire Risk and Hazard Severity Form 1144 (Appendix E). This form is based on the NFPA Standard for Reducing Structure Ignition Hazards from Wildland Fire 2013 Edition. The NFPA 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 and is used by planners and developers in areas that are threatened by wildfire and is commonly applied in the development of Firewise Communities (for more information, see www.firewise.org).

Each area was rated based on conditions within the community and immediately surrounding structures, including access, adjacent vegetation (fuels), defensible space, adjacent topography, roof and building characteristics, available fire protection, and placement of utilities. Where a range of conditions was less easily parsed out, a range of values was assigned on a single assessment form. Each score was given a corresponding adjective rating of low, moderate or high. An example of the assessment form used in this plan is in Appendix E. The purpose of the community WUI assessment 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 or triage plans. The community assessment helps to drive the recommendations for mitigation of structural ignitability, community preparedness, and public education. The assessment also helps to prioritize areas for fuels treatment based on the hazard rating. The NFPA ratings serve as the CAR ratings required by the New Mexico Fire Planning Task Force.

The CAR hazard ratings from the community assessment and the GIS hazard/risk assessment are provided in Table 3.1. This table also includes a summary of the positive and negative attributes of a community as they relate to wildfire risk. Full CAR descriptions are provided in Appendix D.

Table 3.1. Communities at Risk List with Assessment Summary

Fire District	Community	CAR Rating (based on NFPA 1144)	Positive	Negative
Pojoaque	Sombrillo and Cuartelez	70 Medium	• ~1 mile to nearest fire station • Flat terrain • Bosque fuels • Hydrants in community	• Narrow driveways, many unmarked • Relatively high density of homes • Many values at risk
Chimayo	Chimayo (NOTE- roads north of 76 are Rio Arriba County jurisdiction)	69 Medium	• ~1 mile to nearest fire station • Bosque fuels • Sparse fuels adjacent to community	• Some rolling topography • Narrow driveways, many unmarked • Many values at risk • Limited hydrants
	Cundiyo	62 Medium	• Hydrants in community • Small population • Structure separation • Agricultural lands providing buffer to wildlands	• Some rolling topography • Narrow roads through community • Narrow driveways, many unmarked
Tesuque	Tesuque Village	69 Medium	• Flat terrain • Good access • Bosque fuels	• Dense vegetation around roads and driveways • Limited hydrants in town • Many values at risk • Relatively high population
	Chupadero	70 Medium	• Good access along main road • Small population • Structure separation • Close to fire station	• Some continuous fuels • Limited hydrants along main road • Narrow driveways with limited turnaround
	Pacheco Canyon	95 High	• Sparse population • Access good from main road • Low density of values at risk	• Rugged terrain • Continuous fuels • Some narrow driveways, some with locked access
	Tano Road	96 High	• Access good from main road • Structure separation • Relatively close to fire station	• Steep grades and topographic features • Some narrow and steep driveways, some with locked access • Limited water availability • Some continuous fuels

Fire District	Community	CAR Rating (based on NFPA 1144)	Positive	Negative
Santa Fe City	Hyde Park	103 High	- Hydrants in community - Close to fire station - Good road conditions	- Steep grades - Gated driveways may restrict access - High population density
	Bishops Lodge	96 High	- Some hydrants - Close to fire station - Good road conditions	- Heavy fuels - Steep grades - Heavy density of values at risk
Agua Fria	La Tierra	68 Medium	- Close to fire station - Some hydrants - Lower population density - Structure separation - Light fuels	- Water availability limited in some areas - Rolling topography
	Las Campanas	38 Low	- Hydrants in community - Wide paved driveways - Good access - Close to fire station	- Complicated road network - Relatively high population density - Heavy density of values at risk
La Cienega	La Cienega	70 Medium	- Hydrants in community - Close to fire station - Good access from main roads - Sparse vegetation in vicinity of community	- Some driveways are narrow and unmarked - Some dense vegetation around homes - Bridges may impede travel
	Los Pinos	70 Medium	- Hydrants in community - Close to fire station - Good access from main roads - Sparse vegetation in vicinity of community	- Some driveways are narrow and unmarked - Some dense vegetation around homes - Bridges may impede travel

Fire District	Community	CAR Rating (based on NFPA 1144)	Positive	Negative
Glorieta Pass	Glorieta (including Glorieta Estates and Glorieta Mesa)	95 High	- Some hydrants in community - Close to fire station - Good access from main roads	- Steep grades in vicinity - Continuous fuel loads adjacent to WUI - Heavy density of values at risk - Narrow driveways - Limited signage - Unsurfaced roads around Glorieta Mesa and Glorieta Estates
	La Cueva Canyon	112 High	- Good access from main roads - Low population density - Evidence of defensible space actions - Cohesive community with history of collaboratively implementing fire-adapted community concepts	- Steep grades and topographic concerns - Narrow, unsurfaced and windy roads - Unmarked driveways 5 miles from fire station - Limited water availability
	La Jolla	92 High	- Close to fire station - Good access from main roads - Low population density	- Limited water availability - Poor defensible space - Continuous fuel loads adjacent to WUI
Hondo	Ojo de la Vaca	99 High	- Good access from main road - Sparse vegetation adjacent to community - Low population density	- Heavy fuels around homes - Topographic concerns - Limited water availability - Over 4 miles to fire station
	Apache Ridge	114 High	- Close to fire station - Good access from main road - Structure separation - Low population density	- Steep grades - Narrow side roads with poor surface conditions - Limited water availability - Dense vegetation around homes
	La Barbaria	110 High	- Close to fire station - Structure separation - Lower population density	- Steep grades - Narrow driveways with limited turnaround - Limited water availability - Complicated road networks
	Canada de los Alamos	96 High	- Low population density - Structure separation	- Limited water availability - Over 4 miles to fire station - Steep grades - Narrow driveways, many unmarked

Fire District	Community	CAR Rating (based on NFPA 1144)	Positive	Negative
	Canoncito	90 High	• Good access from main roads • Low population density • Sparse vegetation in community	• Narrow driveways • Steep grades • Topographic concerns • Limited water availability • Denser vegetation adjacent to WUI
	Old Santa Fe Trail	93 High	• Close to fire station • Some hydrants • Good access from main roads	• Steep grades • Complicated road networks • Heavy fuels near homes • Heavy density of values at risk
	Arroyo Hondo	63 Medium	• Sparse vegetation • Good access from main roads • Flat terrain	• Heavy population density • Heavy density of values at risk • Limited hydrants
El Dorado	Lamy	75 High	• Some hydrants in community • Good access from main roads • Sparse vegetation	• Heavy density of values at risk • Over 5 miles to nearest fire station • Driveways are narrow and some are unmarked.
Turquoise Trail	San Marcos and Turquoise Trail	72 High	• Sparse vegetation • Good access from main roads • Low population density	• 5 miles from fire station • Poorly marked driveways • Historic and cultural values at risk • Limited water availability
Galisteo	Galisteo	74 High	• Close to fire station • Good access from main roads • Sparse vegetation	• Narrow and unmarked driveways • Compact and dense community structure, poor separation of structures. • High density of values at risk
	Los Cerrillos	74 High	• Close to fire station • Good access from main roads • Sparse vegetation	• Narrow and unmarked driveways • Compact and dense community structure, poor separation of structures. • High density of values at risk

Fire District	Community	CAR Rating (based on NFPA 1144)	Positive	Negative
Madrid	Madrid	78 High	• Close to fire station • Good access from main roads • Sparse fuels	• Narrow driveways • Poor road conditions • Limited water availability • Heavy density of values at risk • Compact and dense community, poor structure separation
	Mail Box Road	94 High	• Low population density • Sparse fuels • Good access from main roads	• Steep grades • Narrow driveways, many unmarked • Limited turnarounds • Poor road conditions • Limited water availability • 5 miles to fire station
Edgewood	San Pedro	100 High	• Close to fire station • Good access from main roads • Low population density	• Some poor road conditions • Narrow driveways, some unmarked • Limited water availability • Some heavy fuels adjacent to WUI
	Cedar Grove	100 High	• Close to fire station • Low population density • Structure separation	• Limited water availability • Some steep grades • Some steep and narrow driveways • Some heavy fuels adjacent to WUI
	Bella Vista	78 High	• Hydrants in community • Close to fire station • Good access from main roads	• Some heavy fuels adjacent to WUI • Some narrow driveways • Relatively high population density
	Thunder Mountain	83 High	• Some hydrants in community • Close to fire station • Close to fire station • Good access from main roads	• Dense vegetation close to homes • Steep grades • Homes mid-slope
Nambe Pueblo		51 Moderate	• Good access • Sparse vegetation surrounding community	• 4.5 miles from a fire station • Limited water availability • High density of cultural values at risk
Tesuque Pueblo		44 Moderate	• Close to fire station • Sparse vegetation surrounding community	• Limited water availability • High density of cultural values at risk • Some steep slopes

Fire District	Community	CAR Rating (based on NFPA 1144)	Positive	Negative
San Ildefonso Pueblo		53 Moderate	• Sparse vegetation surrounding community	• 7.4 miles from a fire station • Very limited water availability • Some access concerns
Pojoaque Pueblo		44 Moderate	• Good highway access • Sparse vegetation surrounding community • Close to fire station • Hydrants in community	• High density of cultural values at risk • Some moderate slopes • Limited separation of structures in some areas

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, has helped in the development of a list of community values at risk (CVARs) from wildland fire. These data are also supplemented with Highly Valued Resources and Assets (HVRA) data, which is a data set that is being gathered nationwide and available through IFTDSS. In addition to critical infrastructure, CVARs can include natural, social, and cultural resources. The public is encouraged to provide additional CVARs during the public outreach period, via the story map survey link. Based on feedback provided, this section and the associated mapping will be revised.

In addition to critical infrastructure, CVARs can also include natural, social, and cultural resources (see Maps 8 and 9 in Appendix B). It is important to note that although an identification of CVARs can inform treatment recommendations, a number of factors must be considered in order to fully prioritize areas for treatment; these factors include appropriateness of treatment, land ownership constraints, locations of ongoing projects, available resources, and other physical, social, or ecological barriers to treatment.

The scope of this CWPP 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 call upon resources locally, regionally, and nationally.

NATURAL CVARS

The CWPP planning area has a variety of natural resources of particular concern to land managers, such as rare habitats and listed plant and wildlife species. Public outreach throughout the County over the last decade or so, has emphasized the importance of natural/ecological values to the general public. Examples of natural values identified by the public and the Core Team include the following:

- Public land
- Hunting areas
- Trail systems
- Agricultural land
- Viewsheds
- Wildlife habitat and game species
- Watersheds and water quality (Figure 3.3)



Figure 3.3. Example of a natural CVAR, a stream.

SOCIOECONOMIC CVARS

Social values include population, recreation, infrastructure, agriculture, and the built environment. Much of the built environment in the planning area falls within the WUI zones. Examples include the following:

- Tourism
- Schools
- Fire departments (Figure 3.4)
- Highways
- Churches
- Care homes, senior housing, day care, and other group homes
- Water storage
- Recreation sites



Figure 3.4. Turquoise Trail volunteer fire department.

CULTURAL CVARS

Many historical landmarks are scattered throughout Santa Fe County. Particular CVARs that have been identified by the Core Team and the public in the CWPP planning area are the following:

- Pueblos
- Archeological resources
- Churches (Figure 3.5)
- Barns
- Historic houses
- Agricultural infrastructure



Figure 3.5. Example of a cultural CVAR, a church.

EXPOSURE ANALYSIS

In order to assess the vulnerability of CVARs to wildfire, an exposure analysis was completed, which is an assessment of wildfire hazard—likelihood and intensity—where HVRA are located (IFTDSS 2020; Scott et al. 2013).⁹ The analysis was applied to the following national HVRA data sets: communities, infrastructure, wildlife, surface water, and recreation (IFTDSS 2020). Figure 3.6 is a composite map representing the combined exposure hazards to these values. The results of the exposure analysis can be applied to determine treatment location priorities relative to values and their exposure to fire (IFTDSS 2020).

⁹ IFTDSS- Exposure Analysis: https://iftdss.firenet.gov/firenetHelp/help/pageHelp/content/30-tasks/qwra_ea/exposureanalysis/overview.htm

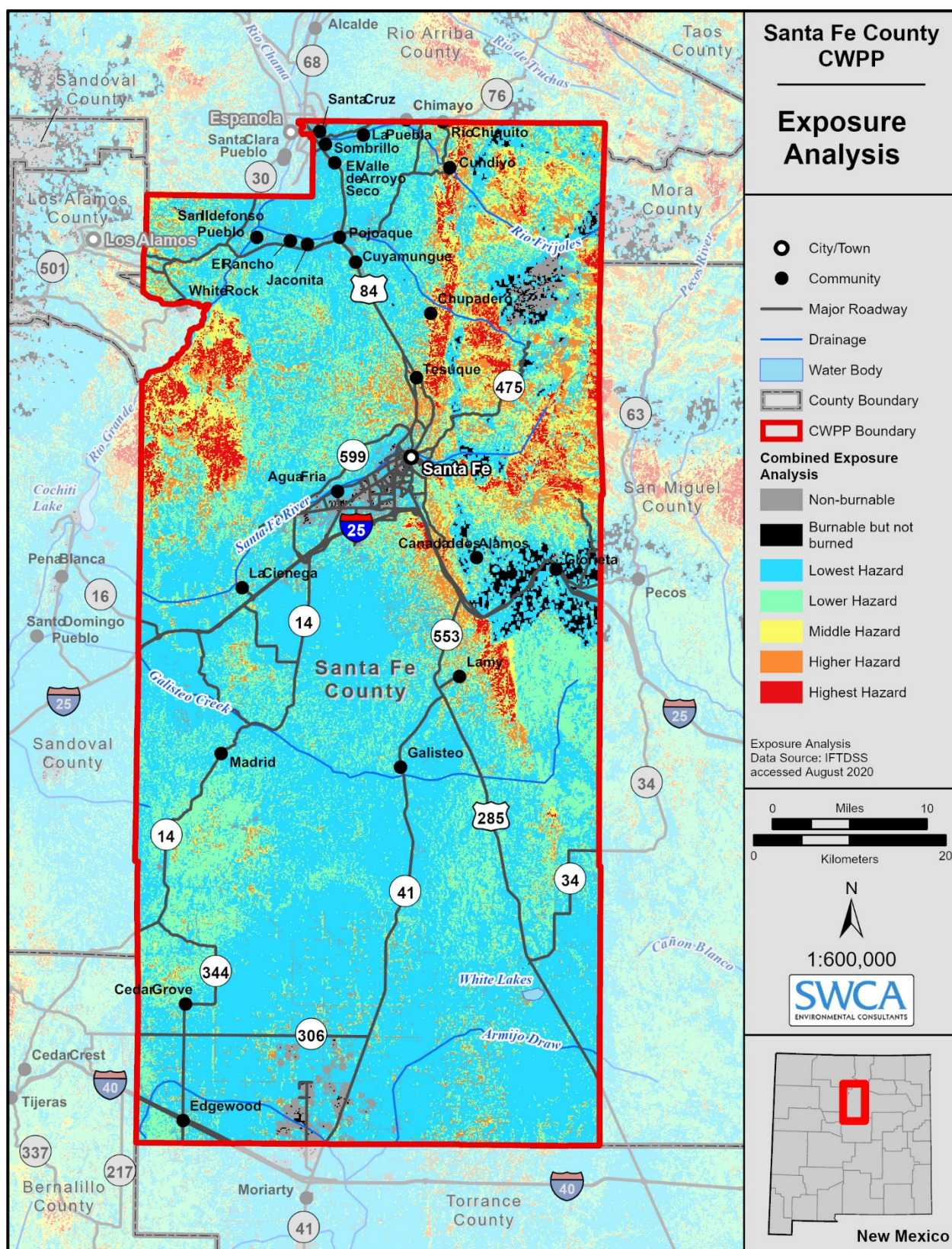
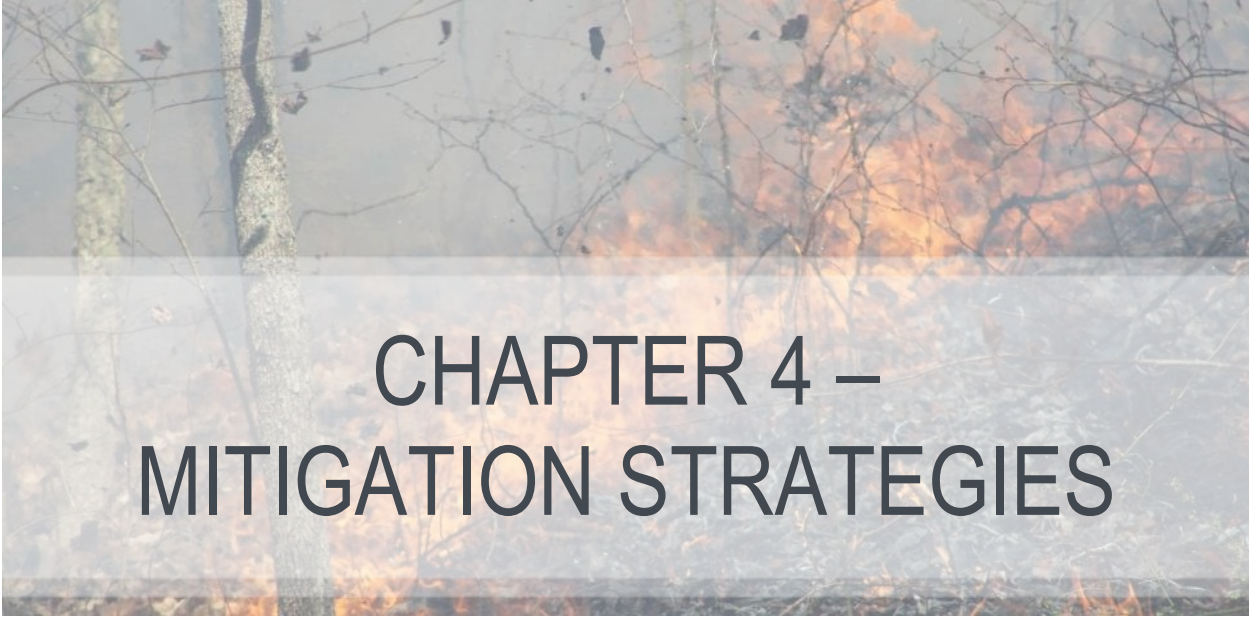


Figure 3.6. Exposure analysis map showing hazards to highly valued resources and assets (communities, infrastructure, wildlife, recreation, and surface water).



CHAPTER 4 – MITIGATION STRATEGIES

As part of the 2020 CWPP update, this plan has been aligned with the National Cohesive Wildland Fire Management Strategy (Cohesive Strategy) and its Phase III Western Regional Action Plan by adhering to the nation-wide goal *“To safely and effectively extinguish fire, when needed; use fire where allowable; manage our natural resources; and as a Nation, live with wildland fire.”* (National Strategy 2014:3).

In order to do this, the CWPP recommendations have been structured around the three main goals of the Cohesive Strategy: restoring and maintaining landscapes, fire-adapted communities, and wildfire response.

This chapter provides guidance for implementing recommendations under each Cohesive Strategy goal. Many of these community-specific recommendations can be implemented at the homeowner or community level. Projects requiring large-scale support can be prioritized based on the Community Hazard/Risk Assessments and Composite Risk Assessment.

Recommendation matrixes are used throughout this chapter to serve as an action plan for implementation. Recommendations have been aligned with the strategies in the Draft NM State Forest Action Plan (EMNRD 2020) wherever possible.

COHESIVE STRATEGY GOAL 1: RESTORE AND MAINTAIN LANDSCAPES

Goal 1 of the Cohesive Strategy and the Western Regional Action Plan is Restore and Maintain Landscapes: Landscapes across all jurisdictions are resilient to fire and other disturbances in accordance with management objectives.

“Sustaining landscape resiliency and the role of wildland fire as a critical ecological process requires a mix of actions that are consistent with management objectives. The West will use all available methods and tools for active management of the landscape to consider and conserve a diversity of ecological, social, and economic values. The West will coordinate with all partners and seek continued stakeholder engagement in developing market-based, flexible and proactive solutions that can take advantage of economies of scale. All aspects of wildland fire will be used to restore and maintain resilient landscapes. Emphasis will be placed on protecting the middle lands near communities.” (Western Regional Action Plan 2013:14).

In this CWPP, recommendations to restore and maintain landscapes focus on vegetation management and hazardous fuel reduction.

RECOMMENDATIONS FOR HAZARDOUS FUEL REDUCTION

Fuels management of public and private land in the WUI is key to the survival of homes during a wildfire event, as well as the means to meet the criteria of Goal 1. Research in New Mexico has shown how fuel treatments in the WUI can change fire behavior to support suppression activities and protect homes (Evans et al. 2015). The importance of fuels management is reflected in policy at the federal level, with the HFRA requiring that federal land management agencies spend at least 50% of their fuels reduction funds on projects in the WUI. One of the major goals of the County HMP is to expand hazardous fuel mitigation activities (Santa Fe County 2018).

Fuels should be modified with a strategic approach across Santa Fe County to reduce the threat that high-intensity wildfires pose to lives, property, and other values. Pursuant to these objectives, recommendations have been developed in the context of existing and planned fuels management projects. This section provides information on fuel treatment methodologies that can be applied to protect structures (defensible space), then near community boundaries (fuel breaks, cleanup of adjacent open spaces), and finally in the wildlands beyond community boundaries (larger-scale forest health and restoration treatments).

While not necessarily at odds with one another, the emphasis of each of these treatment types is different. Proximate to structures, the recommendations focus on reducing fire intensity consistent with Firewise and International Fire Code standards. Further into open space areas, treatments will tend to emphasize forest health and increasing resiliency to catastrophic wildfire and other disturbances. Cooperators in fuels management should include federal, state, and local agencies as well as interested members of the public. Federal land management plans focus on these more landscape level treatments, so the CWPP incorporates most federal land management by reference to those land management planning documents. The CWPP focuses primarily on projects within or adjacent to WUI areas.

Table 4.1 summarizes the types of treatments recommended throughout the planning area. The majority of the treatments are focused on higher risk areas, as defined by the Composite Risk/Hazard Assessment and Core Team input. Many of these treatment recommendations are general across the communities because similar conditions and concerns were raised by fire responders for all communities that border wildland areas. Table 4.1 also addresses the requirement for an action plan and assessment strategy by providing monitoring guidelines and a timeline for implementation. This timeline is obviously dependent on available funding and resources, as well as National Environmental Policy Act (NEPA) protocols for any treatments pursued on public land.

The treatment list is by no means exhaustive and should be considered purely a sample of required projects for the future management of the planning area. Many projects may be eligible for grant funds available from federal and/or state sources. A key source of funding for implementing hazardous fuel reduction are funds available through Western Regional Action Plan, which is the reason this CWPP tiers to those goals. For an additional list of funding sources, please refer to Appendix F.

Each land management agency has a different set of policies governing the planning and implementation of fuels reduction projects. A thorough assessment of current fuel loading is an important prerequisite for any fuels prescription, and all treatment recommendations should be based on the best possible science. 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. 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.

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. Moreover, each treatment recommendation should address protection of CVARs, particularly the protection of threatened and endangered species.

Table 4.1. Fuel Treatment Recommendations

Project Description	Location	Land Ownership	Method and Goal	Timeline	Resources/Funding	Priority
Expand multi-agency collaboration to link fuel mitigation activities and adopt a more holistic view of forest management (Aligns with Draft NM Forest Action Plan Strategy 1 and Sub-Strategies 1.1 and 1.2) ¹⁰	All communities where appropriate. High-risk communities to be prioritized.	All ownership and partners, including Greater Santa Fe Fireshed Coalition, Forest Stewards Guild, The Nature Conservancy, Rio Grande Water Fund, City of Santa Fe, New Mexico Forestry Division, USFS, BLM.	- Protect forests, watersheds, and water quality by moderating catastrophic fire behavior. - Communicate early and often with local residents, and engage communities in the planning process. - Identified as a goal in the 2018 HMP. Possibility of leveraging hazard funding for implementation (see page 5.36 in the 2018 HMP). - Utilize Greater Santa Fe Fireshed Coalition to provide detailed action plans and strategy for landscape treatment on all jurisdictions. - Continue current initiatives to increase collaboration across boundaries. - Integrate with fuels strategies on public lands. - Align with agency land and resource management plans. - Work from existing and planned treatment data (Figure 4.1) and the risk assessment, to develop conceptual treatment plans that are highest priority for treatment. - Appoint a chair and a representative responsible for seeking grant opportunities.	Meetings in conjunction with Greater Santa Fe Fireshed Coalition.	- National Fire Plan Rural Fire Assistance - FEMA Hazard Mitigation Grant funding - FEMA Pre-disaster Mitigation funding - USFS Hazard Fuels grants - Utilize the latest relevant scientific literature to support approach, including information generated by the various southwest forest restoration institutes. - USFS Title II - FAWRA funding- see Appendix F.	High

¹⁰ New Mexico Forest Action Plan: http://www.emnrd.state.nm.us/SFD/documents/NMFAP_DraftforReview4.22.2020.pdf

Project Description	Location	Land Ownership	Method and Goal	Timeline	Resources/Funding	Priority
			- Encourage cooperation by private landowners to expand treatments onto private land. - Build upon existing monitoring efforts on USFS land and expand monitoring to all jurisdictions (including private land) in order to contribute to adaptive management. Consider the impacts that treatments may have on altering the fuel complex (e.g., introducing more flashy fine fuels). - Consider the use of citizen science programs to engage Santa Fe County citizens, schools, and/or interested citizens in monitoring forest treatments.			
Expand hazardous fuel mitigation activities utilizing various options and methods as appropriate	All communities where appropriate. High-risk communities to be prioritized.	All ownership	- Identified as a goal in the 2018 HMP. Possibility of leveraging hazard funding for implementation (see page 5.35 in the 2018 HMP). - Utilize the fire behavior modeling to identify areas that would burn with uncharacteristically high flame lengths and rapid rates of spread, in order to mitigate fire behavior and provide for areas where fire responders could more safely suppress future wildfire.	2022	- National Fire Plan Rural Fire Assistance - FEMA Hazard Mitigation Grant funding - FEMA Pre-disaster Mitigation funding - USFS Hazard Fuels grants - Work with existing collaborative groups to engage the public, i.e., the Greater Santa Fe Fireshed Coalition.	High

Project Description	Location	Land Ownership	Method and Goal	Timeline	Resources/Funding	Priority
			- Utilize optimization models (e.g., IFTDSS) to determine fuel treatment scenarios that would provide optimal fire behavior moderation while protecting watersheds and community values. - Identify regular maintenance schedules for upcoming treatments and identify areas that were previously treated and would now require maintenance activities. - Develop robust monitoring strategies and communicate findings to the public, practitioners, and research community.		Utilize the latest relevant scientific literature to support approach, including information generated by the various southwest forest restoration institutes.	
Roadside thinning along access roads and evacuation routes with scheduled maintenance to improve sustainability	All communities where appropriate. High-risk communities to be prioritized.	Private, New Mexico Department of Transportation and USFS land	- Reduce fuel loading along roadways in order to mitigate potential ignitions from the highway and provide safe clearance to facilitate evacuation and emergency access. - Mechanical treatment: tree removal, mowing. - Herbicide treatment to remove weeds, as needed or appropriate. - Design maintenance schedule depending upon vegetation type. Goal is to maintain clearance during fire season.	Implement and maintain annually or as outlined in maintenance schedule.	- National Fire Plan Rural Fire Assistance - FEMA Hazard Mitigation Grant funding - FEMA Pre-disaster Mitigation funding - USFS Hazard Fuels grants	High

Project Description	Location	Land Ownership	Method and Goal	Timeline	Resources/Funding	Priority
Maintain utility line right-of-way (ROW) (Aligns with Draft NM State Forest Action Plan Strategy 4: Utility Rights of Way)	PNM (Public Service Company of NM) ROW	PNM	- Utility line ROWs need more regular maintenance to ensure clearance with heavy fuels, especially across forested property. - PNM to increase maintenance cycles. - Develop a utility specific fire plan to identify inspection, vegetation and maintenance standards and protocols to reduce potential utility ignitions and harden the electric grid.	Implement and maintain annually or as outlined in maintenance schedule.	- PNM - Utility clearance standards and protocols.	High
Develop pre-fire plans for post-fire response (Aligns with Draft NM State Forest Action Plan Sub-Strategy 2.1.3)	Countywide, focusing on areas at highest risk first.	County, municipal, tribal governments; utility providers; water providers	- Review the Post-Fire Response and Rehabilitation section (Chapter 4) for post-fire planning and actions. - Develop and/or familiarize yourself with Burned Area Emergency Rehabilitation (BAER) protocols. - Establish guidelines for county, municipal, utility providers, water providers that details the steps required in the event of a fire, to better prepare for post-fire response. - Establish relationships with agencies responsible for post-fire response, before the fire.	2021	- FEMA - County Hazard Mitigation - Emergency Managers https://afterwildfirenm.org/	High
Equipment purchase for riparian fuel break maintenance	BIA NPA	Tribal	- Purchase a skid steer with masticating head for removal and maintenance of fuel brakes within the riparian areas of all 4 tribes within Santa Fe County. - Majority of fire activity occur within the riparian fuels.	2021	National Fire Plan Rural Fire Assistance	High

Project Description	Location	Land Ownership	Method and Goal	Timeline	Resources/Funding	Priority
Focus on mitigation measures within areas of high exposure potential (Figure 3.6) (Aligns with Draft NM State Forest Action Plan Sub-Strategy 2.1.2)	Priority areas of interest (Figure 4.1)	All ownership	- Assess hazard mitigation opportunities to protect values at risk within areas of highest exposure potential. - Consider a full tool kit of mitigation measures.	2021	- National Fire Plan Rural Fire Assistance - FEMA Hazard Mitigation Grant funding - FEMA Pre-disaster Mitigation funding - USFS Hazard Fuels grants - Work with existing collaborative groups to engage the public, i.e., the Greater Santa Fe Fireshed Coalition. - Utilize the latest relevant scientific literature to support approach, including information generated by the various southwest forest restoration institutes	High

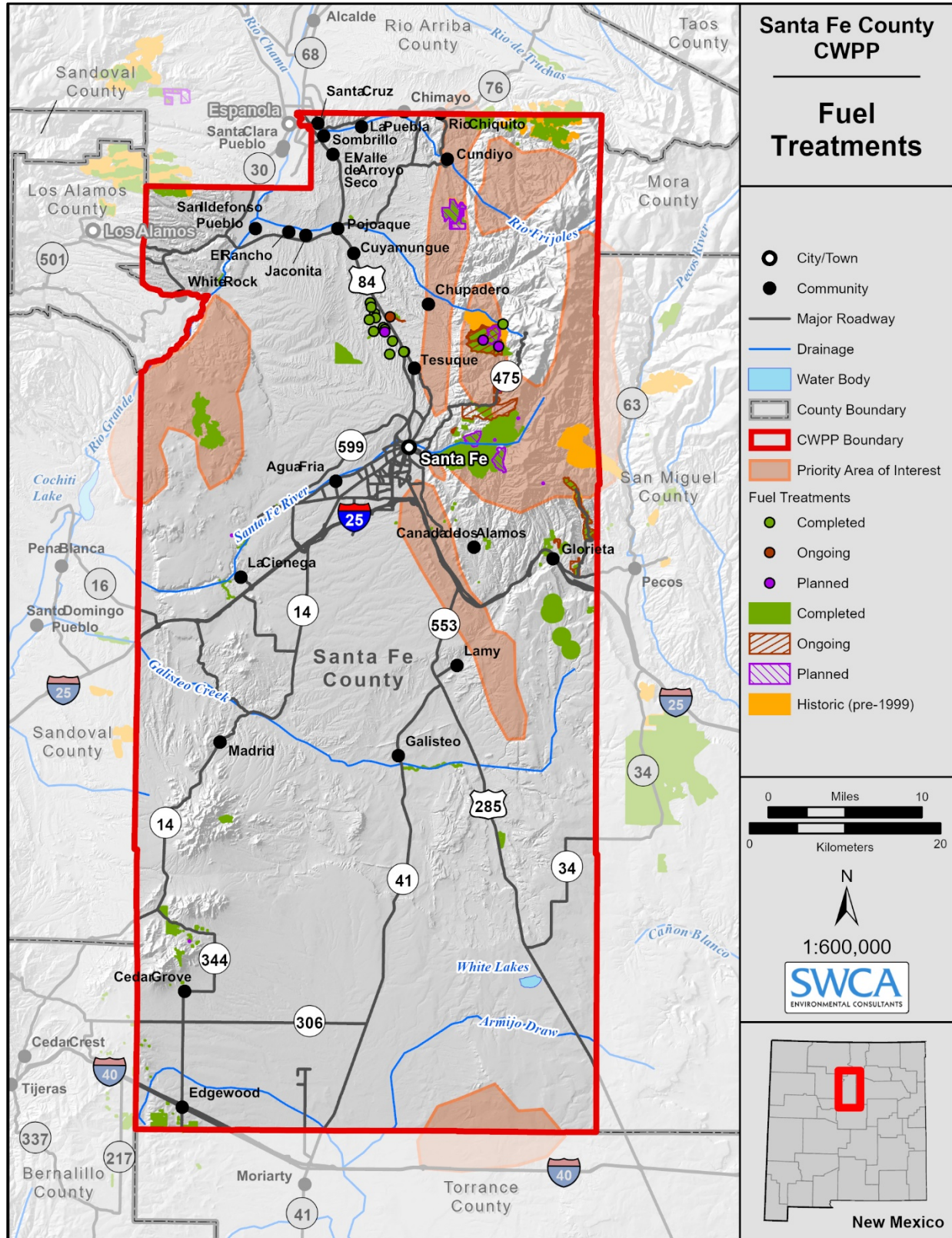


Figure 4.1. Existing and planned fuel treatments across all jurisdictions.

Priority Areas of Interest delineate areas with dense concentrations of values at risk with high potential exposure to wildfire.

Fuels Treatment Scales

Defensible Space

Defensible space is perhaps the fastest, most cost-effective, and most efficacious means of reducing the risk of loss of life and property. Although fire agencies can be valuable in providing guidance and assistance, creating defensible space is the responsibility of the individual homeowner (Figure 4.2).

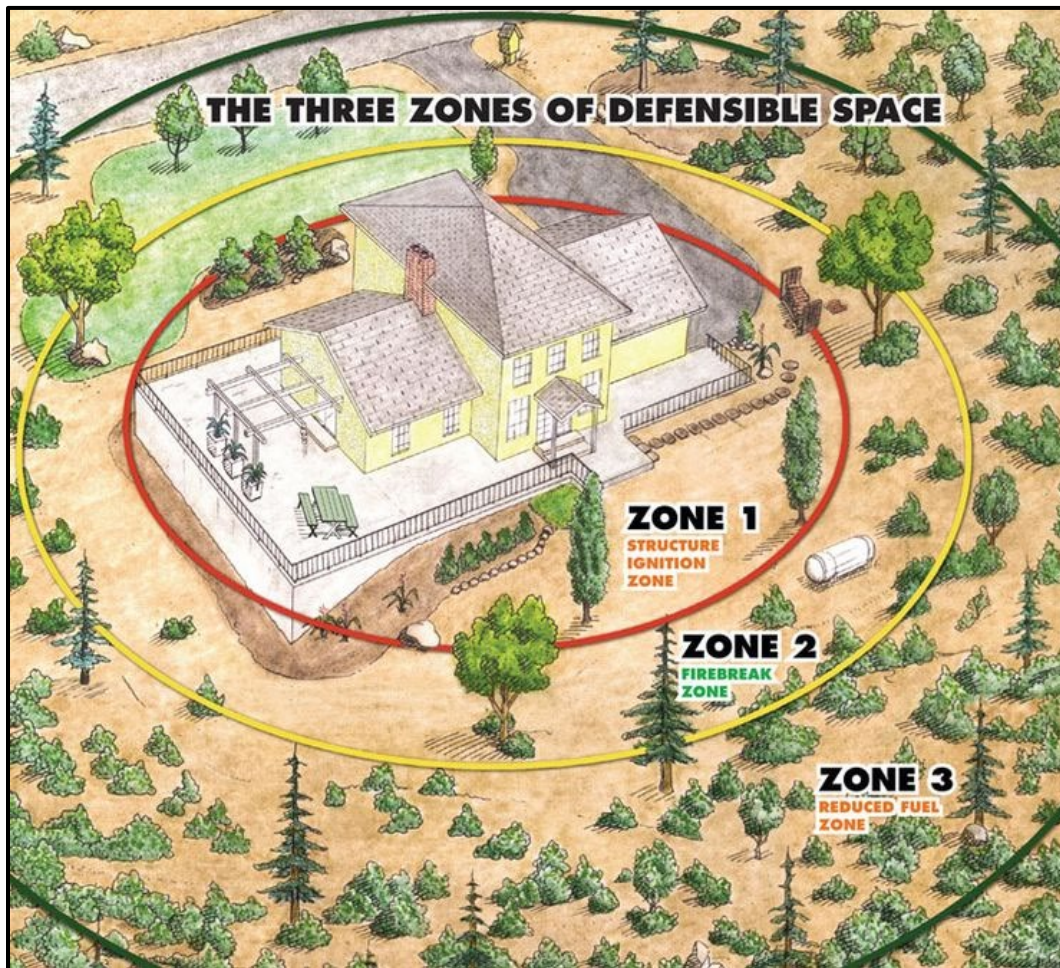


Figure 4.2. Defensible space providing clearance between a structure and adjacent woodland or forest fuels.

Source: Firewise.org.

Effective defensible space consists of creating an essentially fire-free zone adjacent to the home, a treated secondary zone that is thinned and cleaned of surface fuels, and (if the parcel is large enough) a transitional third zone that is basically a managed forest area. These components work together in a proven and predictable manner. Zone 1 keeps fire from burning directly to the home; Zone 2 reduces the adjacent fire intensity and the likelihood of torching, crown fire, and ember production; and Zone 3 does the same at a broader scale, keeping the fire intensity lower by maintaining a more natural, historic condition (Figures 4.2 and 4.3).

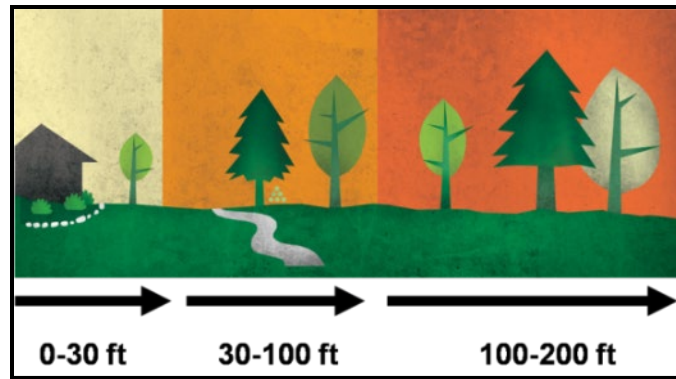


Figure 4.3. Defensible space zones.

Source: www.firewise.org.

It should be emphasized that defensible space is just that—an area that allows firefighters to work effectively and with some degree of safety to defend structures. While defensible space may increase a home’s chance of surviving a fire on its own, a structure’s survival is not guaranteed, with or without firefighter protection. Nevertheless, when these principles are consistently applied across a neighborhood, everybody benefits.

Specific recommendations should be based on the hazards adjacent to a structure such as slope steepness and fuel type. The County has a program established for carrying out home hazard assessments and therefore homeowners are encouraged to contact the County fire department to schedule an assessment on their home to provide specific actions they can take for wildfire mitigation. Firewise guidelines and the Homeowners Guide (Appendix G) are excellent resources, but creating defensible space does not have to be an overwhelming process. Assisting neighbors may be essential in many cases. Homeowners should consider assisting the elderly, sharing ladders for gutter cleaning, and assisting neighbors with large thinning needs. Homeowner actions have been found to also motivate neighbors to act, increasing the scope of the wildfire mitigation across a community (Evans et al. 2015). Adopting a phased approach can make the process more manageable and encourage maintenance (Table 4.2).

Table 4.2. Example of a Phased Approach to Mitigating Home Ignitability

Year	Project	Actions
1	Basic yard cleanup (annual)	Dispose of clutter in the yard and under porches. Remove dead branches from yard. Mow and rake. Clean off roofs and gutters. Remove combustible vegetation near structures. Coordinate disposal as a neighborhood or community. Post 4-inch reflective address numbers visible from road.
2	Understory thinning near structures	Repeat basic yard cleanup. Limb trees up to 6–10 feet. Trim branches back 15 feet from chimneys. Trim or cut down brush. Remove young trees that can carry fire into forest canopy. Coordinate disposal as a neighborhood or community.

Year	Project	Actions
3	Understory thinning on private property along roads and drainages	Limb trees up to 6–10 feet. Trim or cut down brush. Remove young trees that can carry fire into forest canopy. Coordinate disposal as a neighborhood or community.
4	Overstory treatments on private property	Evaluate the need to thin mature or diseased trees. Prioritize and coordinate tree removal within neighborhoods to increase cost effectiveness.
5	Restart defensible space treatment cycle	Continue the annual basic yard cleanup. Evaluate need to revisit past efforts or catch those that were bypassed.

Fuel Breaks and Open Space Cleanup

The next location priority for fuels treatments should be where the community meets the wildland. This may be the outer margins of a town or an area adjacent to occluded open spaces such as a park. Fuel breaks (also known as shaded fuel breaks) are strips of land where fuel (for example living trees and brush, and dead branches, leaves or downed logs) has been modified or reduced to limit the fires ability to spread rapidly. Fuel breaks should not be confused with firebreaks, which are areas where vegetation and organic matter is removed down to mineral soil. Shaded fuel breaks may be created to provide options for suppression resources or to provide opportunities to introduce prescribed fire. In many cases, shaded fuel breaks may be created by thinning along roads. This provides access for mitigation resources and firefighters, as well as enhancing the safety of evacuation routes.

Larger-scale Treatments

Farther away from WUI communities, the emphasis of treatments often becomes broader. While reducing the buildup of hazardous fuels remains important, other objectives are often included, such as forest health and resiliency to catastrophic wildfire and climate change considerations. Wildfires frequently burn across jurisdictional boundaries, sometimes on landscape scales. As such, these larger treatments need to be coordinated on a strategic level. This requires coordination between projects and jurisdictions, as is currently occurring.

Land managers have carried out numerous forest restoration projects across Santa Fe County and the Sangre de Cristo Mountains and have ongoing projects planned on public land that are designed to reduce hazardous fuels to protect communities and resources, while restoring fire-adapted communities. Figure 4.1 shows existing fuel treatments that have been completed or planned across the County. This information is derived from the NM Vegetation Treatment Mapping project developed by the New Mexico Forest and Watershed Restoration Institute.¹¹ The reader is referred to agency websites and the Federal Register for the latest information on planned or ongoing actions on federal land within the County.¹² Figure 4.1. also includes areas delineated as priority areas of interest. These are areas of high concentrations of HVRA that coincide with high potential exposure to wildfire, based on exposure analysis (Figure 3.6). These are areas where land managers should consider employing mitigation measures to protect these CVARs.

Public support for landscape projects can often be mixed because some individuals or communities do not perceive the treatments to be effective (Evans et al. 2015). Building public trust is therefore important, and this includes ensuring that federal agencies engage the community early and often in the planning process and that science is used to support fuel treatment planning and management decisions.

¹¹ NMFWR Vegetation Treatment Mapper- <https://nmfwri.org/gis-projects/nm-vegetation-treatment-mapping>

¹² Federal Register: <https://www.federalregister.gov/>

Fuel Treatment Methods

Since specifics of the treatments are not provided in detail in Table 4.1, different fuels reduction methods are outlined in the following narrative.

Several treatment methods are commonly used, including manual treatments, mechanized treatments, and prescribed fire (Table 4.3). 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 4.3. Summary of Fuels Treatment Methods

Treatment	Comments
Machine mowing	Appropriate for large, flat, grassy areas on relatively flat terrain.
Prescribed fire	Can be very cost effective. Ecologically beneficial. Can be used as training opportunities for firefighters. 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.
Brush mastication	Brush species 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.
Manual treatment with chipping or pile burning	Requires chipping, hauling, pile burning of slash in cases where lop and scatter is inappropriate. Pile burning must comply with smoke management policy.
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

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.

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. In this situation, where the amount of fuel to carry a fire is minimal, it is best to leave the site in its current condition to avoid the introduction of exotic species.

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 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, several 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 can grind 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.

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 (Figure 4.4). Where possible, prescribed fire could occur on public lands since fire is ecologically beneficial to this fire-adapted vegetation community and wildlife habitat. Land managers are already cooperating to implement prescribed burning in Santa Fe County.

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. The areas to be burned would occur within fuel breaks or appropriate fire lines (USFS 2015). 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. Smoke monitors could be placed in areas where smoke concerns have been raised in the past.



Figure 4.4. Photographs showing two treatment plots on the Santa Fe National Forest, pre- and post-prescribed fire.

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. The vegetation within this ecosystem 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.

Several re-entries may be needed to meet full resource management objectives, so a solid maintenance plan is needed to ensure success.

Impacts of Prescribed Fire on Communities

Managing smoke from prescribed fires is an important part of planning for prescribed burning. The New Mexico Environment Department, Air Quality Bureau has smoke management guidelines to protect the health and welfare of New Mexicans from the impacts of smoke (New Mexico Environment Department 2005). Smoke from burning vegetation produces air pollutants that are regulated by both the U.S. Environmental Protection Agency (EPA) and the state of New Mexico.¹³ Fire managers must obtain a permit from the Air Quality Bureau to start a prescribed burn and can only do so during optimal conditions for smoke management. During a burn, lighting patterns can be altered to change how smoke is generated. Generally, the impacts of smoke from prescribed burning are far less than those from wildfire events. Prescribed burns aid in reducing the potential smoke impacts of high-intensity, extensive wildfires.¹⁴

Prescribed fires can have impacts on air quality that may impact local communities. Impacts on a regional scale are typically only acute when many acres are burned on the same day, which is rare in this region. Local problems are occasionally acute due to the large quantities of smoke that can be produced in a given area during a short period of time. Residents with respiratory problems may be impacted during these burning periods since smoke consists of small particles of ash, partly consumed fuel, and liquid droplets that are considered air pollutants. Other combustion products include invisible gases such as carbon monoxide, carbon dioxide, hydrocarbons, and small quantities of nitrogen oxides. Oxides of nitrogen are usually produced at temperatures only reached in piled or windrowed slash or in very intense wildfires that are uncommon in the region. In general, prescribed fires produce inconsequential amounts of these gases.

Effects of smoke can be managed by burning on days when smoke will blow away from smoke-sensitive areas. Precautions are taken when burning near populated areas, highways, airports, and other smoke-sensitive areas. Any smoke impact downwind is considered before lighting a fire. Smoke management is a significant component of all prescribed burn plans. Other mitigating actions include alerting the public of upcoming burning activities, including the purpose, best conditions for ensuring good smoke dispersal, duration, size, and location of projects. Local radio, newspapers, social media, and TV can provide broad coverage for alerts. Land management agencies in the project area consistently work with concerned citizens regarding smoke management and attempt to provide solutions such as the placement of smoke monitors at sensitive sites.

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

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 (USDA 2010). Fuel treatment approaches should always

¹³ https://www.env.nm.gov/wp-content/uploads/sites/2/2018/03/SMP_Guidance_052505.pdf

¹⁴ <http://www.santafefireshed.org/smoke>

consider the potential for introduction or proliferation of invasive non-native species as a result of management actions.

Fuel Breaks

Fire behavior in the CWPP planning area has been modeled using FlamMap. 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. Furthermore, fuel break utility is contingent upon regular maintenance, as regrowth in a fuel break can quickly reduce its effectiveness and vegetation in this ecosystem is known to quickly re-sprout and reestablish. Maintenance of existing breaks could be more cost efficient than installation of new features.

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.

Because of the dominant wind patterns in Santa Fe County (i.e., out of the west-southwest), fuel breaks are recommended on the west sides of communities.

Strategic placement of fuel breaks is critical to prevent fire from moving from wildland fuels into adjacent neighborhoods. For effective management of most fuels, fuel breaks should be prescribed based on the conditions in each 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.

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. 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.

COHESIVE STRATEGY GOAL 2: FIRE-ADAPTED COMMUNITIES

Goal 2 of the Cohesive Strategy/Western Regional Action Plan is: Fire-Adapted Communities:

Human populations and infrastructure can withstand a wildfire without loss of life and property. The basic premise of this goal is:

“Preventing or minimizing the loss of life and property due to wildfire requires a combination of thorough pre-fire planning and action, followed by prudent and immediate response during a wildfire event. Post-fire activities can also speed community recovery efforts and help limit the long-term effects and costs of wildfire. CWPPs should identify high-risk areas and actions residents can take to reduce their risk. Fuels treatments in and near communities can provide buffer zones to protect structures, important community values and evacuation routes. Collaboration, self-sufficiency, acceptance of the risks and consequences of actions (or non-action), assisting those who need assistance (such as the elderly), and encouraging cultural and behavioral changes regarding fire and fire protection are important concepts. Attention will be paid to values to be protected in the middle ground (lands between the community and the forest) including watersheds, viewsheds, utility and transportation corridors, cultural and historic values, etc.” (Western Regional Action Plan 2013:15).

In this CWPP update, recommendations for fire-adapted communities include public education and outreach actions and actions to reduce structural ignitability.

RECOMMENDATIONS FOR PUBLIC EDUCATION AND OUTREACH

Just as environmental hazards need to be mitigated to reduce the risk of fire loss, so do the human hazards. Lack of knowledge, lack of positive actions, and negative actions all contribute to increased risk of loss in the WUI.

Most Santa Fe County residents understand the risk that wildfire poses to their communities. The community is incredibly well informed in wildfire science and already engaged in mitigation (Figure 4.5). It is important to continually engage the community as a partner in order to expand wildfire mitigation options across land ownership (McCaffrey 2004; Winter and Fried 2000; McCaffrey and Olsen 2012, McCaffrey, 2020). Table 4.4 lists recommendations for improving public education and outreach.

Three communities in the County are already Firewise certified: Monte Sereno Neighborhood, Rancho Viejo Community, and Tesuque Valley.¹⁵ Some residents would still benefit from greater exposure to the Firewise Communities concept,¹⁶ fire-adapted communities,¹⁷ and Ready, Set, Go! programs.¹⁸ Firewise programs have been found to motivate residents to carry out defensible space and other actions within their community, empower residents to take control of addressing wildfire risk, improve community cohesion through collective actions, and encourage coordination of outside agencies (Evan et al. 2019). Continuing enthusiasm over long periods is difficult however, particularly if a community “spark plug” or active coordinator leaves or steps down. Glorieta Estates used to be an active Firewise community, but activity has waned (Evans et al. 2015). Measures to improve sustainability of mitigation actions are included in Table 4.4.

The County and City of Santa Fe provide home hazard assessments to residents, and these assessments can provide tailored actions that residents can make to address wildfire hazards around their homes (Evans et al. 2015). Greater participation in these programs could improve local understanding of wildfire and, in turn, improve protection and preparedness.

Other methods to improve public education could include increasing awareness about fire department response and fire department resource needs; providing workshops at demonstration sites showing Firewise Communities landscaping techniques or fuels treatment projects; organizing community cleanups to remove green waste; publicizing availability of government funds for thinning and prescribed burning on private lands; and, most importantly, improving communication between homeowners and local land management agencies to improve and build trust, particularly since the implementation of fuel treatments and better maintenance of existing treatments needs to occur in the interface between public and private lands.

The Greater Santa Fe Fireshed Coalition carries out many public outreach activities throughout the County (Figure 4.6) and is a great resource for information and contacts regarding wildfire mitigation and wildfire prevention within the County and City of Santa Fe.¹⁹

¹⁵ State Listings of Certified Firewise Communities: <https://www.nfpa.org/Public-Education/Fire-causes-and-risks/Wildfire/Firewise-USA/Firewise-USA-Resources/Firewise-USA-sites/State-listing-of-participants>

¹⁶ Firewise Communities—A Model of Local Initiative and Cooperation: www.firewise.org

¹⁷ Fire Adapted Communities Coalition: <https://fireadapted.org/>

¹⁸ Ready, Set, Go!: https://www.wildlandfirersg.org/s/?language=en_US

¹⁹ Greater Santa Fe Fireshed Coalition- contacts: <http://www.santafefireshed.org/santafecitycounty>



Figure 4.5. Wildfire Community Preparedness Day activities attended by the City of Santa Fe Fire Department (photo credit: P. Chavarria).



Figure 4.6. The Greater Santa Fe Fireshed Coalition frequently outreaches to the Santa Fe community (photo credit: P. Chavarria).

Table 4.4 lists public education and outreach projects recommended for implementation in the County.

Table 4.4. Public Outreach and Education Recommendations

Project	Description	Presented By	Target Date	Resources Needed	Serves to...	Priority
Accurately represent fire response capability	Transparency and facts needed regarding capacity to respond to a large fire. The resources have not yet been tested. Pre-planning and mock incidents need to be used to test and report back to the public.	County Fire Department and other agencies	2022	• Agency planning • Mock incidents • Dispatch • Media blasts • Community outreach meetings	Provide an accurate assessment of fire response capacity	High
Identify vulnerable populations	The County needs to better document vulnerable populations (elderly, disabled, low income) who may need additional help to mitigate home hazards. Seek grant opportunities to support assistance for vulnerable populations.	Santa Fe County, municipalities, HOAs, community leaders	2021	• County staff • Community liaison • Community leaders to champion projects for vulnerable populations	Address a need to assist vulnerable populations.	High
Home assessments and resident surveys	Continue further home hazard assessments in conjunction with the City of Santa Fe and the Wildfire Research Center. Assessments would be windshield assessments with data and surveys sent to homeowners. The surveys could be used to inform groups (e.g., the Fireshed Coalition) about public perceptions of risk, as well as priority areas in which to focus efforts.	County, City of Santa Fe, Wildfire Research Center	Summer 2020	• 2 or 3 staff members for assessments • City is investing in this effort	Contribute to ongoing data collection on hazards in the County. Open up a line of dialogue between a fire department and the resident regarding actions that can take to reduce wildfire risk. Educates homeowners on real actions that could mitigate their wildfire hazard and risk.	High

Project	Description	Presented By	Target Date	Resources Needed	Serves to...	Priority
	Consider reassessments of homes (using the same protocols and hazard forms) previously surveyed to determine obstacles to mitigation and record successes.					
Face-to-face public engagement opportunities	The County is looking for opportunities to sample a broad selection of the public through piggybacking on events that draw all segments of the society. The County should ensure that all interactions result in follow up engagement, by gathering contact information for residents interested in action. Events in high-risk areas should be targeted first.	County Fire Department	Year round	- Funding to support purchase of materials - Venue fees	Engage a broad cross-section of the population instead of attracting only those residents who are already engaged in fire prevention and risk reduction activities. Social science has shown that face-to-face engagement is the most effective way to generate action.	High
Increase scope of outreach opportunities	The County would like to hire a communications officer. The Communications officer should pursue continuous and repeat interactions with residents to generate greater mitigation actions.	County Fire Department	Ongoing	Salary for communications officer	Improve capacity for public outreach to residents.	High
Priority ignition concerns	Use education and outreach to address priority concerns regarding ignition (e.g., exploding targets).	Public agencies, County, Sheriff's Department	2022	- Media blasts - Enforcement	Reduce unnecessary ignition through unlawful or irresponsible behaviors.	Medium

Project	Description	Presented By	Target Date	Resources Needed	Serves to...	Priority
Improve agency coordination of outreach	Agency coordinated meeting- consistent message. Could raise cross-boundary issues during this meeting. Model on Jemez Mountains annual event.	All agencies	2022	- Internal agency support for initiatives - Meeting materials - Media support	Provide a consistent message regarding wildfire activity, fire prevention goals, actions for homeowners. Reduce redundancy. Improve efficiency. Reduce potential confusion or messaging fatigue.	Medium
Expand partnerships with insurance brokers	Engaging insurance agents in dialogue. The County residents have been advised to adhere to the Ready, Set, Go! program. Provide incentives for mitigation actions	County, insurance brokerages	2022	- Potential committee - Resources from insurance companies - Outreach and education	Align insurance company requirements with County codes and ordinances Possibly increase value of homes that have wildfire mitigation completed.	Medium
Improve sustainability of mitigation actions by residents	In order to encourage engagement in mitigation actions and sustain engagement, entities should: - Provide recognition of service - Provide incentives for residents to take action - Assist and facilitate actions by providing services for treating and removing slash - Identify barriers to engagement and address (Reams 2005) - Track progress and identify areas requiring support	All agencies	2022	- Project tracking - Online tools to share recognition - Meeting materials - Media support	Increase sustainability for mitigation actions and combat fatigue amongst residents and communities.	High

RECOMMENDATIONS FOR REDUCING STRUCTURAL IGNITABILITY

Table 4.5 provides a list of community-based recommendations to reduce structural ignitability that should be implemented throughout the SCCWPP planning area. Reduction of structural ignitability depends largely on public education that provides homeowners the information they need to take responsibility for protecting their own properties. A list of action items that individual homeowners can follow can be found below.

Carrying out fuels reduction treatments on public land 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 firefighter lives are put at risk when they carry out structural defense.

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. Hardening the home to ignition from embers, including maintaining vent coverings and other openings are also strongly advised as measures to protect a home from structural ignitability.

Education about managing the landscape around a structure, such as removing weeds and debris within a 30-foot radius and keeping the roof and gutters of a home clean, are two maintenance measures proven to limit combustible materials that could provide an ember bed and ignite the structure. Educating people about the benefits of proper maintenance of their property that includes pruning and trimming trees and shrubs and, where warranted, the removal of trees and other vegetation, and using Firewise Communities landscaping methods on their property 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 must factor in slope and topography, which would require extensions to the conventional 30-foot recommendations. More detailed information on reducing structural ignitability can also be found in Appendix G (Homeowner's Guide).

Some structural ignitability hazards are related to homes being in disrepair, vacant or abandoned lots, and minimal yard maintenance. In order to influence change in homeowner behavior, county ordinances may be needed.

Table 4.5. Recommendations for Reducing Structural Ignitability

Project	Private Land/Homeowners	Programs Available	Description	Resources/Funding	Timeline	Priority
Need greater enforcement of the new International WUI code (Fire Code)	County	Fire Prevention Division	The Fire code applies only to new construction and requires that structures meet the parameters of the Code in order to secure building permits. Following permitting there is no current enforcement of those code parameters. The County would like to explore options for increasing resources to support greater Fire Code enforcement, including annual inspections to ensure that emergency access is maintained.	Fire Prevention and Safety Grants	2022	Low
Increase defensible space actions	Private land. Highest risk areas a priority.	Work with Soil and Water Conservation Districts and NMSF to find funding sources for residents	- Initiate and expand defensible space cost-sharing programs like those that have been developed in La Barbaria, Glorieta and the Edgewood Soil and Water Conservation District. - Increase enforcement of defensible space codes and ordinances. - Provide tax incentives for defensible space actions. - Work with insurance companies to determine the potential to provide incentives for defensible space associated with reduced insurance premiums. - City and County to coordinate green waste pick-up. Expand existing program.	- Water Trust Board funding - Environmental Quality Incentives Program (EQIP) funding	2021	High
Implement spring community yard cleanup days focused on neighborly service and supporting vulnerable populations	All residents would be encouraged to participate in each community. Effort to be focused on vulnerable members of the population. Additional focus on seasonal residents.	County/City chipper program	- A community-led day of yard cleanup with fire mitigation in mind would encourage large numbers within the community to carry out mitigation measures and implement defensible space. - Residents would assist elderly, disabled, or vulnerable neighbors.	- Santa Fe County - Municipalities - Churches/youth/ community service groups	Spring 2021	High

Project	Private Land/Homeowners	Programs Available	Description	Resources/Funding	Timeline	Priority
			Provide chipper and/or other green waste disposal pick-up opportunities to residents.			
Firewise/Ready Set Go! Workshops	Private land, HOAs	County home assessments	- Identified as a goal in the 2018 HMP. Possibility of leveraging hazard funding for implementation (see page 5.37 in the 2018 HMP). - Offer hands-on workshops to highlight individual home vulnerabilities and 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. - Home assessments conducted in a neighborhood often include groups of neighbors participating with the assessor to learn from each other's homes. Homeowners get a better understanding of home hardening by viewing a home other than their own and seem to feel more comfortable asking questions as a group. Home assessments in this manner are being encouraged. These types of group assessments have been conducted in the Agua Fria, Vereda Mesita, La Cueva, and Cougar Ridge neighborhoods. - Can be requested by an HOA. - Utilize a train-the-trainer model. Develop a team of trained citizens that could perform hazard assessments within their community. Seek funding to pay volunteer fire departments (VFDs) to assist with the train-the-trainer concept or consider hiring a contractor to provide training.	www.firewise.org, www.nfpa.org, www.wildlandfirersg.org https://www.fema.gov/hazard-mitigation-grant-program - Ready, Set, Go! grants - Fire Prevention and Safety grants - SAFER grants - Agency budgets	2021	High

Project	Private Land/Homeowners	Programs Available	Description	Resources/Funding	Timeline	Priority
			- Currently implemented as part of the Ambassador Program, in conjunction with the City of Santa Fe. Expand this program to reach more residents. - Ready, Set, Go! literature is provided to the homeowners during assessments. Continue this practice.			
Mitigate hazards associated with seasonal properties	Seasonal property owners, HOAs	Ready, Set, Go!	- Stay active in preparing for wildland fire when absent. - Plan to have someone maintain property when absent. - Speak with neighbors to develop an action plan in the event of a fire. - Establish phone trees.	- Water Trust Board funding - EQIP funding - Ready, Set, Go! grants	2022	High
Provide printed list of mitigation measures to homeowners with different scales of actions.	All residents would be encouraged to participate. Specific effort to be focused on seasonal residents.	Fire departments Firewise communities Academic and peer-reviewed literature	Utilize Ready, Set, Go! literature where possible. Utilize list of action items broken down by cost (see below): <u>Low or no cost</u> – ensure house numbers are easily viewed from the street. <u>Medium cost</u> – annual clearance and thinning of trees and shrubs along driveways to facilitate safe access by emergency vehicles.	- Ready, Set, Go! grants - Fire Prevention and Safety grants - SAFER grants	Fall 2021	Moderate

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. 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 non-combustible 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, non-combustible 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 (firewood, propane tanks, grills) away from the house; 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. Because prevailing winds in the area are often from the west-southwest, consider mitigating hazards on the west 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 (HIZ) (approximately 30 feet around the property), select non-combustible 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 HIZ. 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 non-combustible 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 non-combustible 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 non-combustible 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 that is less combustible.

Replace exterior windows and skylights with tempered glass or multilayered glazed panels.

Invest in updating your roof to non-combustible 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.

Relocate propane tanks underground.

COHESIVE STRATEGY GOAL 3: WILDFIRE RESPONSE

Goal 3 of the Cohesive Strategy/Western Regional Action Plan is Wildfire Response: All jurisdictions participate in making and implementing safe, effective, efficient risk-based wildfire management decisions:

“A balanced wildfire response requires integrated pre-fire planning with effective, efficient, and coordinated emergency response. Pre-fire planning helps tailor responses to wildfires across jurisdictions and landscape units that have different uses and management objectives. Improved prediction and understanding of weather, burning conditions, and various contingencies during wildfire events can improve firefighting effectiveness, thereby reducing losses and minimizing risks to firefighter and public health and safety. Wildfire response capability will consider the responsibilities identified in the Federal Response Framework. Local fire districts and municipalities with statutory responsibility for wildland fire response are not fully represented throughout the existing wildland fire governance structure, particularly at the NWCG, NMAC, and GACC levels.” (Western Regional Action Plan 2013:15).

This section provides recommended actions that jurisdictions could undertake to improve wildfire response.

RECOMMENDATIONS FOR IMPROVING FIRE RESPONSE CAPABILITIES

Educating the public so they can reduce its dependence on fire departments is essential because these resources are often stretched thin due to limited personnel.

Table 4.6 provides recommendations for improving firefighting capabilities. Many of these recommendations are general in nature.

Table 4.6. Fire Response Capability Recommendations

Project	Fire Department	Description	Timeline	Contact/Funding	Priority
Improve the public warning system to improve wildfire response and possible evacuation measures	County Fire Department	- Identified as a goal in the 2018 HMP. Possibility of leveraging hazard funding for implementation (see page 5.38 in 2018 HMP). - Investigate and procure ignition detection technology to increase response rates to wildland fire ignitions. There exist low-cost and high-impact, available technologies that address WUI Detection and Tracking gaps (e.g., Descartes Lab Platform, WIFIRE, Dunami, IRWIN, Hawkeye, ATAK, Tanka, CAWFE, LANCE) (FEMA 2019). - Seek public alert and warning technologies to deliver more targeted and effective message across the whole County, particularly to vulnerable populations. Possible solutions include CodeRed, Rumblr, SAVE, Hootsuite) (FEMA 2019). - Improve use of key public and private social media platforms to deliver emergency messaging during a WUI incident. Possible solutions include Nextdoor, Dunami, LexisNexis, Facebook and Twitter. - Pre-fire planning and mock incidents to determine capacity and identify communication problems and hurdles to public warnings. Possible solutions: agency mock incidents, fire modeling tools—IFTDSS, WFDSS, SimTable.	2021	- Technology solutions are identified in a 2019 FEMA report on WUI incidents.²⁰ - FEMA grants - Companies that develop fire detection systems include: Wildland Detection Systems http://www.wildlandsystems.com/ Fire Alert MK1 http://vigilys.com/technology/firealert/	High

²⁰ https://www.dhs.gov/sites/default/files/publications/wui_fire_report_of_findings_july_24_2019v2_508.pdf

Project	Fire Department	Description	Timeline	Contact/Funding	Priority
Integrate the HMP and CWPP to allow leveraging of hazard funds to implement projects that will mitigate wildfire risk	Santa Fe County Fire Department	• Work to bring the CWPP and HMP revisions into alignment. • Integrate the two plans or build consistent project recommendations across each planning process.	2023	• FEMA hazard mitigation plan funding. • NM Association of Counties funding.	High
Pre-fire planning (Aligns with Draft NM State Forest Action Plan Strategies 2.1.3 and 2.2.1)	All agencies	• Develop WUI pre-plans and accompanying evacuation plans for high risk communities. • Implement mock evacuations on communities identified as high risk. • Develop protocols to address weaknesses. • Helps to develop a consistent model and messaging across agencies.	2022	• FEMA, Department of Homeland Security (DHS) grants • NMFD • Resource Mobilization Plan	High
Improve communications regarding wildland fire smoke	All agencies	• Improve education and outreach regarding smoke to increase tolerance for prescribed fire smoke outside of wildfire season. • Identify vulnerable citizens and build registry. • Communicate prescribed fire plans directly to vulnerable populations.	2022	• New Mexico Environment Department, Air Quality Bureau • Greater Santa Fe Fireshed Coalition	Moderate
Identify and plan for mass shelter/care operations	County, Office of Emergency Management in conjunction with municipalities and tribes Red Cross, New Mexico Department of Homeland Security and Emergency Management	• Identified as a goal in the 2018 HMP. Possibility of leveraging hazard funding for implementation (see page 5.41 in 2018 HMP). • Identify mass-care facilities in the event of a mass-evacuation. • Develop a County community emergency response team (CERT) program and stockpile of Meals, Ready to Eat (MRE). • The casinos are a possible resource, but pre-planning is needed to ensure bandwidth.	2022	• FEMA, DHS	Moderate

Project	Fire Department	Description	Timeline	Contact/Funding	Priority
Develop a livestock evacuation plan and shelter plan	County in conjunction with municipalities and tribes,	A livestock evacuation and shelter plan is needed. Previously, the rodeo grounds have been incorrectly identified as a venue.	2022	- Santa Fe County Extension Office - New Mexico Livestock Board - Santa Fe Horse Coalition	Moderate
Increase volunteer fire department (VFD) recruitment (diversify age classes)	All fire departments	- Target fire education at schools to encourage younger generations to become interested in firefighting. - Carry out recruitment drives through open house and mailings. - Provide training incentives for VFD firefighters.	Annually	- Schools - All fire departments - Fire Prevention and Safety grants - SAFER grants	High
Increase funds for VFDs	All fire departments	- Maintain contact with NMSF and regularly seek grant money. - Implement regular evaluations of resource needs for each VFD and make available to public to raise awareness of shortages. - Maintain updated list of fire callouts and provide to NMSF/USFS/BLM. - Use local media to inform public of fire resources situation. Work with the local newspaper editor to have a year-round column that documents fire department activities. - Apply for rural fire assistance program grants. - Improve ISO ratings.	Monthly review of grant opportunities	- volfire@santafecountynm.gov - State and County - FEMA Assistance to Firefighters Grant Program, Fire Prevention and Safety grants - Rural fire assistance grants - SAFER grants - VFD assistance	High
Map and test hydrants and dry hydrant systems. Improve visibility of existing hydrants.	All fire departments	- Locate existing dry hydrants and map locations. - Test functionality. - Provide to fire departments and/or install new dry hydrants in areas with minimal water supply for suppression. - This data could be added to dispatch computer data to facilitate fire response. - Add hydrant markers to reduce obscurity by vegetation.	Spring 2021	- NRCS - Environmental Quality Incentives Program (EQIP) - USFS - NMSF	High

Project	Fire Department	Description	Timeline	Contact/Funding	Priority
Improve water supply	All departments and agencies	- Funding is needed to procure and install water storage tanks at fire departments throughout the County. - Strategic positioning of water storage tanks may alleviate shortage in some areas. - ISO rating can be improved through improved water supply infrastructure.	Fall 2021	- Fire Prevention and Safety grants - SAFER grants	High
Identify vulnerable populations	Santa Fe County, municipalities, HOAs, community leaders	- The County, in cooperation with emergency management agencies, would establish a registry of vulnerable populations (elderly, disabled, low income) who may need additional help during a wildfire event. - Develop pre-planning and outreach to these populations so that there is a plan in place in the event an individual needs to assistance for evacuation. - Incorporate data into spatial mapping	2021	- County staff - Community liaison - Community leaders to champion projects for vulnerable populations - FEMA, DHS funding	Moderate
Increase the number of “red-carded” individuals in the fire departments (Aligns with Draft NM State Forest Action Plan Sub-Strategy 2.3.4)	All fire departments	- Offer NWCG Basic Wildland Firefighting and Fire Behavior, S-130/S-190 classes to VFDs every fall with an option to attend on weekends. Incentives may be needed to encourage attendance. - NMSF could provide training. - Work with federal agencies to develop evening and weekend courses for volunteers. - Pursue online training programs and have trainees work with an in-house trained mentor to complete training. - Facilitate annual refresher participation by having in-house refreshers available or convene agencies to have a countywide refresher.	Annually, or following recruitment drives	- NMSF - County - USFS - Fire Prevention and Safety grants - SAFER grants - BLM program to help train local VFDs	High

Project	Fire Department	Description	Timeline	Contact/Funding	Priority
		• Santa Fe County and the Santa Fe National Forest should work together to develop and then sign a blanket agreement to utilize VFDs on prescribed fires to increase wildland fire experience and ultimately increase capacity for response to wildfires. • Utilize the NMSF Resource Mobilization Plan, which provides a pool of qualified wildland fire resources within the structural fire service of New Mexico so they may be mobilized to assist in the suppression of wildfires and WUI fire incidents. Through this program, VFDs can be reimbursed for wildfire assignments.			
Reduce wildfire occurrences to reduce flood and debris flow potential	All agencies, Burned Area Emergency Rehabilitation (BAER) teams	• Identified as a goal in the 2018 HMP. Possibility of leveraging hazard funding for implementation (see page 5.40 in 2018 HMP). • Develop post fire preparedness plans for high risk areas. (see Table 5.1) • Review the Post-Fire Response and Rehabilitation section below for post-fire planning and actions. • Develop response protocols in conjunction with emergency managers, FEMA, and DHS.	2021	• FEMA • County Hazard Mitigation • Emergency Managers • Edgewood Soil and Water Conservation District (Water Trust Board and Non-Federal Lands Grant funding available) • https://afterwildfirenm.org/	High
Utilize spatial fire management tools to support pre-fire planning Potential operational delineations (PODs) (Aligns with Draft NM State Forest Action Plan Sub-Strategy 2.3.1)	All departments and agency land managers	• PODs are being increasingly used for developing pre-fire plans for wildfire response. Entities throughout the County should continue to explore options to collaboratively develop PODs across jurisdictions.	2021	• BLM and USFS are already exploring the use of PODs. Information on a pilot project in New Mexico in 2019 is available here: https://forestry.usu.edu/news/utah-forest-newsletter/PODs_NM.pdf	High

Project	Fire Department	Description	Timeline	Contact/Funding	Priority
Engine Purchase	BIA	Purchase a new Type 6 engine to be located in Santa Clara Pueblo.	2021	- Fire Prevention and Safety Grants - SAFER Grants	High
Improve Storage	Water BIA	- Purchase 4, 5,000-gallon Portable Tanks; Fold-a-Tank (1 in Tesuque, 1 in Santa Clara, 2 at Northern Pueblos Agency). - Improve water storage capabilities for wildfire suppression on tribal lands	2021	- Fire Prevention and Safety Grants - SAFER Grants	High
Utilize spatial communication tools to support emergency response	County	There are many GIS solutions that could be applied to emergency response. ESRI ArcGIS Solutions for Emergency Management are a suite of free (with an ESRI license), supported, and customizable applications, maps, workflows, and data management tools centered around preparedness, response, recovery, and mitigation. These solutions can help agencies prepare for and respond to emergencies in their communities with a cohesive, accessible, and adaptive GIS system. They also provide a platform that enables coordination across jurisdictions. While many agencies have developed their own tools and systems, these “in-house” efforts can be costly to build and maintain and can restrict information flow between departments as well as the public. Whether using ESRI products or other systems, it is important to recognize the value of—and invest in—comprehensive GIS systems for emergency response that solve communication problems; reduce training, infrastructure, and maintenance costs; and can adapt and grow to changing needs.	5 years	All agencies	Moderate

POST-FIRE RESPONSE AND REHABILITATION

Federal, state, and local post-fire response is often overlooked during the wildfire planning process. While neighboring counties have experienced high-severity, extensive wildfire, Santa Fe County has been fortunate to avoid catastrophic wildfire thus far. The 2011 Las Conchas fire in neighboring Los Alamos County burned more than 156,000 acres and highlighted the numerous complexities of post-fire response. Following the fire, heavy rains resulted in widespread floods carrying trees, boulders, and soil through canyons, ultimately damaging communities and critical infrastructure. Water utilities serving Albuquerque were forced to pump from shrinking groundwater reserves to avoid the sediment- and debris-filled Rio Grande. In Santa Fe, with The Nature Conservancy and USFS, the city has established a water fund for restoration efforts in forest areas that source the city's water. The project will require millions of dollars for forest thinning and watershed rehabilitation projects carried out over the next 20 years (National Geographic 2011).

Ongoing research indicates that a moderate- to high-severity wildfire followed by a rainfall event in the upper Santa Fe watershed could result in a debris flow filling 39% of McClure Reservoir with sediment. McClure Reservoir provides an average of 40% of Santa Fe's annual water use.²¹ Creating a plan that outlines steps for agencies, municipalities, and the county to follow will streamline post-fire recovery efforts and reduce the inherent stress to the community.

There are many facets to post-fire recovery, including but not limited to:

- Ensuring public health and safety—prompt removal of downed and hazard trees, addressing watershed damage, and mitigating potential flooding.
- Rebuilding communities and assessing economic needs—securing the financial resources necessary for communities to rebuild homes, business, and infrastructure.
- Restoring the damaged landscape—restoration of watersheds, soil stabilization, and tree planting.
- Reducing fire risk in the future—identifying hazard areas and implementing mitigation.

Recovery of the vegetated landscape is often more straightforward than recovery of the human environment. Assessments of the burned landscape are often well-coordinated through the use of interagency crews who are mobilized immediately after a fire to assess the post-fire environment and make recommendations for rehabilitation efforts.

For the community impacted by fire, however, there is often very little planning at the local level to guide their return after the fire. Residents impacted by the fire need assistance making insurance claims; finding temporary accommodation for themselves, pets, and livestock; rebuilding or repairing damaged property; removing debris and burned trees; stabilizing the land for construction; mitigating potential flood damage; repairing infrastructure; reconnecting to utilities; and mitigating impacts to health. Oftentimes, physical impacts can be mitigated over time, but emotional impacts of the loss and change to surroundings are long-lasting and require support and compassion from the community.

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 normal routines 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

²¹ https://static1.squarespace.com/static/57b62cb1ebbd1a48387a40ef/t/5c7454f27817f77ef6beaa7f/1551127809168/postfire_impacts_highres.pdf

damaged utilities if you did not do so previously. Request that the fire department or utility companies turn the utilities back on once the area is secured. Similarly, water supply systems may have been damaged; do not drink from the tap until you have been advised that it is safe to do so. Finally, keep a “fire watch”; look for smoke or sparks in houses and other buildings.

Note any changes of address with the U.S. Postal Service, banks, utilities, credit card companies, and newspapers. If you do stay elsewhere, try to locate any legal documents, medications, valuables, etc. before relocating (NMSF 2020).

If your home is safe to enter, vacuum all surfaces, clean any airflow filters, and remove soot and smoke from walls if possible. Clean all mattresses and kitchenware. Any perishables exposed to heat should not be consumed (City of Phoenix Fire Department 2009). For additional safety information, see afterwildfirenm.org/immediate-safety.

Insurance Claims

Your insurance agent is the best source of information for submitting a claim. The insurance claim process will be much easier if you photographed your home and valuables before the fire and have kept the photographs in a safe place. Most of the expenses incurred during the time you are forced to live elsewhere may be reimbursed, so be sure to keep all receipts. Do not start any repairs without the approval of your claims adjuster. If you are a renter, you may also contact your property owner or management company (City of Phoenix Fire Department 2009). If you are not insured, contact the American Red Cross (NMSF 2020).

Community Safety: Post-Fire Floods and Debris Flows

There are numerous natural hazards after a wildfire. Perhaps most dangerous are potential flash floods and landslides following rainfall in a burned area upstream from a community. Wildfires increase risk of flooding because burned soil is unable to absorb rainfall and it becomes hydrophobic. Even small rainfall can cause a flash flood, transporting debris and damaging homes and other structures. Listen and look for emergency updates, weather reports, and flash flood warnings. Develop an evacuation plan with your family and stay away from waterways, storm channels, and arroyos (NMSF 2020). Checklists to prepare for flooding are available at <https://www.afterwildfirenm.org/flood-information/before-the-flood-checklists>.

Mobilizing Your Community

When your community is safe and capable of monitoring potential storms, coordination for recovery efforts can begin. Depending on community size, one person or a team of post-fire coordinators can be appointed to work directly with agencies or teams helping with wildfire response. It is important that this person have demonstrated management and computer skills, community knowledge, and experience with federal and state agencies. The post-fire coordinator(s) can delegate any identified recovery tasks or needs to volunteers; however, it may be helpful to specifically appoint a volunteer coordinator. Responsibilities of a volunteer coordinator include creating a volunteer database, recruitment, management, and coordination of community volunteers (NMSF 2020).

The recovery coordinator should become familiar with representatives from local, state, and government agencies that will be helping with coordination or funding of post-fire recovery. The following are resources that may be helpful for the post-fire and volunteer coordinators (Coalition for the Upper South Platte [CUSP] 2016):

- The New Mexico Department of Homeland Security and Management
- The Federal Emergency Management Agency (FEMA)
- The American Red Cross
- NMSF
- Continuing Authorities Program & Emergency Flood Protection: U.S. Army Corps of Engineers

- Emergency Watershed Protection (EWP): Natural Resources Conservation Service (NRCS)
- Food Assistance and Farm Service Agency: USDA
- Forest Restoration Assistance: NMSF
- Conservation Districts
- USFS
- NRCS, including Earth Team
- Disaster Distress Helpline

Any large wildfire will also involve an Incident Command System (ICS), an appropriately sized team assigned to aid in post-fire recovery. Learn more at <https://www.nps.gov/articles/wildland-fire-incident-command-system-levels.htm>.

The following should be considered when assessing community needs (NMSF 2020):

- Are there paid staff that will be dedicated to helping with recovery?
- Who is familiar with the ICS? Who has technical skills to help with post-fire treatments? Which community members will be able to write grants and apply for assistance? Who has accounting skills? Management skills?
- How much money will the community need? How can you acquire it?
- How will the community address immediate needs such as shelter, food, and health care? Counseling and mental health?

Communication

After a team is assembled and immediate tasks are identified, find the best way to spread information in your community. You may distribute flyers, set up a voicemail box, work to find pets or livestock that have been displaced, develop a mailing list for property owners, hold regular public meetings, etc. It is important that a long-term communications plan is developed (CUSP 2016). Communication ideas include (NMSF 2020):

- Newspaper communications with emergency information (and phone numbers for emergency services) on flooding, landslides, and debris flows.
- Published information about ongoing flood and landslide mitigation projects.
- Information about safe flooding responses: stay out of the car and off the roads, escape to dry land as soon as possible, do not attempt to cross flowing water.
- Remind residents to listen to weather reports and remain aware of rainfall. Be alert for changes in water flow and stay away from areas prone to landslides and flooding.
- Information on volunteer needs and planned repair projects.

Post-Fire Rehabilitation and Resources

Post-fire land rehabilitation is critical to protect your community from flooding, erosion, and debris flows. Your community response coordinator can identify a team of federal, state, and local agencies to assess impacts and prioritize areas for treatment (NMSF 2020). It is important that this treatment team include experts such as foresters, engineers, and hydrologists (CUSP 2016).

Burned Area Emergency Rehabilitation (BAER) teams are interdisciplinary teams of professionals who work to mitigate the effects of post-fire flooding and erosion if a fire has occurred on **federal** land. The NRCS Emergency Watershed Protection (EWP) program provides technical and financial services for watershed repair on **public (state and local) and private land**. The goal is reduced flood risk via funding and expert advice for land treatments. The EWP program can provide up to 75% of funds;

remaining funds can be paid with in-kind volunteer labor (CUSP 2016). This funding is used by the State Emergency Rehabilitation Team (SERT) to develop specific recovery and treatment plans.

Examples of potential treatments include (NMSF 2020):

- Hillside stabilization (ex: placing bundles of straw parallel to the slope to slow erosion)
- Hazard tree cutting
- Felling trees perpendicular to the slope contour to reduce runoff
- Mulching areas seeded with native vegetation
- Stream enhancements and construction of catchments to control erosion, runoff, and debris flows
- Fencing cattle and people out of unstable, steep slopes
- Planting or seeding native species to limit spread of invasive species.

A comparison of potential hillside, channel, and road treatments is available at <https://www.afterwildfirenm.org/post-fire-treatments/which-treatment-do-i-use>.

The effectiveness of various treatments is described at https://www.fws.gov/fire/downloads/ES_BAR/Post-Fire_Hillslope_Treatment_Synthesis.pdf.

Specific Treatment Details

Hillslope Treatments

Cover Applications:

- Dry mulch provides immediate ground cover with mulch to reduce erosion and downstream flow.
- Wet mulch (hydromulch) provides immediate cover to hold moisture and seeds on slopes using a combination of organic fibers, glue, suspension agents, and seeds (most effective on inaccessible slopes).
- Slash spreading provides ground cover to reduce erosion by felling trees in burned areas.
- Seeding reduces soil erosion over time with an application of native seed mixtures (most successful in combination with mulching). Breaking up and loosening topsoil to break down the hydrophobic layer on top of the soil is also effective.

Erosion Barrier Applications:

- Erosion control mat: organic mats staked on the soil surface to provide stability for vegetation establishment.
- Log erosion barrier: trees felled perpendicular to the hillslope to slow runoff.
- Fiber rolls (wattles): rolls placed perpendicular to the hillslope to reduce surface flows and reduce erosion.
- Silt fencing: permeable fabric fencing installed parallel to the slope contour to trap sediment as water flows down the hillslope.

Channel Treatments

- Check dam: small dams built to trap and store sediment in stream channels.
- In-channel tree felling: felling trees in a staggered pattern in a channel to trap debris and sediment.
- Grade stabilizer: structures made of natural materials placed in ephemeral channels for stabilization.

- Stream bank armoring: reinforcing streambanks with natural materials to reduce bank cutting during stream flow.
- Channel deflector: an engineered structure to direct flow away from unstable banks or nearby roads.
- Debris basin: constructed to store large amounts of sediment moving in a stream channel.

Road and Trail Treatments

- Outsloping and rolling dips (water bars) alter the road shape or template to disperse water and reduce erosion.
- Overflow structures protect the road by controlling runoff and diverting stream flow to constructed channels.
- Low water stream crossing: culverts replaced by natural fords to prevent stream diversion and keep water in the natural channel.
- Culvert modification: upgrading culvert size to prevent road damage.
- Debris rack and deflectors: structure placed in a stream channel to collect debris before reaching a culvert.
- Riser pipes filter out debris and allow the passage of water in stream channels.
- Catchment-basin cleanout: using machinery to clean debris and sediment out of stream channels and catchment basins.
- Trail stabilization: constructing water bars and spillways to provide drainage away from the trail surface.

These treatments and descriptions are further detailed at <https://afterwildfirenm.org/post-fire-treatments/treatment-descriptions>.

For more information about how to install and build treatments, see the Wildfire Restoration Handbook at https://www.rmfi.org/sites/default/files/hero-content-files/Fire-Restoration-HandbookDraft_2015_2.compressed_0.pdf.

Timber Salvage

Many private landowners may decide to harvest trees killed in the fire, a decision that can be highly controversial. Any remaining trees post-fire can be instrumental for soil and wildlife habitat recovery. Furthermore, burned soils are especially susceptible to soil compaction and erosion. Therefore, timber salvage must be performed by professionals. Several programs assist landowners with timber salvage, including the NRCS Environmental Quality Incentives Program (EQIP) (CUSP 2016).

Invasive Species Management and Native Revegetation

Wildfire provides opportunity for many invasive species to dominate the landscape because many of these species thrive on recently burned landscapes. It is imperative that landowners prevent invasive establishment by eradicating weeds early, planting native species, and limiting invasive seed dispersal (CUSP 2016).

Planting native seeds is an economical way to restore a disturbed landscape. Vegetation provides protection against erosion and stabilizes exposed soils. In order to be successful, seeds must be planted during the proper time of year and using correct techniques. Use a native seed mixture with a diversity of species and consider the species' ability to compete with invasive species. Before planting, the seedbed must be prepared with topsoil and by raking to break up the hydrophobic soil layer. If you choose to transplant or plant native species, consider whether the landscape has made a sufficient recovery to ensure the safety of the individuals (CUSP 2016).

Long-Term Community Recovery

On non-federal land, recovery efforts are the responsibility of local governments and private landowners. Challenges associated with long-term recovery include homes that were severely damaged or were saved but are located in high-severity burn areas. Furthermore, homes saved but located on unstable slopes or in areas in danger of flooding or landslides present a more complicated challenge.

Economically, essential businesses that were burned or were otherwise forced to close pose a challenge to communities of all sizes. Given these complications, rebuilding and recovery efforts can last for years, with invasive species control and ecosystem restoration lasting even longer (CUSP 2016). It is critical that a long-term plan is in place and there is sufficient funding and support for all necessary ecosystem and community recovery.^{22,23}

²² <http://www.afterwildfirenm.org/>

²³ <https://nmfireinfo.com/information/after-a-wildfire/>



Developing an action plan and an assessment strategy that identifies roles and responsibilities, funding needs, and timetables for completing highest-priority projects is an important step in organizing the implementation of the SCCWPP. Table 4.1 in the previous section identifies tentative timelines and monitoring protocols for fuels reduction treatments, the details of which are outlined below.

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.

The strategies outlined in this section consider several variables:

- Do the priorities identified for treatment reflect the goals stated in the plan? 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 require periodic assessment. Monitoring these changes can help decision-makers identify appropriate treatment intervals.

As the CWPP evolves over time, there may be a need to track changes in policy, requirements, stakeholder changes, and levels of preparedness. These can be significant for any future revisions and/or addendums to the CWPP.

Table 5.1 identifies recommended monitoring strategies, both quantifiable and non-quantifiable, for assessing the progress of the CWPP and increase sustainability. It must be emphasized that these strategies are 1) not exhaustive and 2) dependent on available funds and personnel to implement them.

There are many resources for designing and implementing community based, multi-party monitoring that could support and further inform a monitoring program for the CWPP (Egan 2013; NPS 2003).^{24,25,26} Multiparty monitoring involves a diverse group consisting of community members, community-based groups, regional and national interest groups, and public agencies. This approach increases understanding of the effects of restoration efforts and trust among restoration partners. Multiparty monitoring may be more time-consuming due to the collaborative nature of the work; therefore, a clear and concise monitoring plan must be developed.

Table 5.1. Recommended Monitoring Strategies

Strategy	Task/Tool	Lead	Remarks
Project tracking system	On-line web app to track hazardous fuels projects spatially, integrating wildfire risk layer to show progress towards wildfire hazard and risk reduction. Web app would include attribute tables that outline project details	County	Interactive tool will be easily updated and identify areas that require additional efforts.
Photographic 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	Homeowner	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 and 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	<i>Collaboration</i>	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

²⁴ https://nrmfwri.org/restoration-information/cfrp/restoration-papers/restoration-papers-resources/wp5_-draft_2.pdf/view

²⁵ <https://cdm17192.contentdm.oclc.org/digital/collection/p17192coll1/id/609/rec/6>

²⁶ https://nrmfwri.org/restoration-information/cfrp/cfrp-resources/CFRP_MonitoringShortGuide.pdf

An often overlooked but critical component of fuel treatment is monitoring. It is important to evaluate whether fuel treatments have accomplished their defined objectives and whether any unexpected outcomes have occurred. In addition to monitoring mechanical treatments, it is important to carry out comprehensive monitoring of burned areas to establish the success of fuels reduction treatments on fire behavior, as well as monitoring for ecological impacts, repercussions of burning on wildlife, and effects on soil chemistry and physics. Adaptive management is a term that refers to adjusting future management based on the effects of past management. Monitoring is required to gather the information necessary to inform future management decisions. Economic and legal questions may also be addressed through monitoring. In addition, monitoring activities can provide valuable educational opportunities for students.

The monitoring of each fuel's reduction project would be site-specific, and decisions regarding the timeline for monitoring and the type of monitoring to be used would be determined by project. Monitoring and reporting contribute to the long-term evaluation of changes in ecosystems, as well as the knowledge base about how natural resource management decisions affect both the environment and the people who live in it.

The most important part of choosing a monitoring program is selecting a method appropriate to the people, place, and available time. Several levels of monitoring activities meet different objectives, have different levels of time intensity, and are appropriate for different groups of people. They include the following:

Minimum—Level 1: Pre- and Post-project Photographs

Appropriate for many individual homeowners who conduct fuels reduction projects on their properties.

Moderate—Level 2: Multiple Permanent Photo Points

Permanent photo locations are established using rebar or wood posts, global positioning system (GPS)-recorded locations, and photographs taken on a regular basis. Ideally, this process would continue over several years. This approach might be appropriate for more enthusiastic homeowners or for agencies conducting small-scale, general treatments.

High—Level 3: Basic Vegetation Plots

A series of plots can allow monitors to evaluate vegetation characteristics such as species composition, percentage of cover, and frequency. Monitors then can record site characteristics such as slope, aspect, and elevation. Parameters would be assessed pre- and post-treatment. The monitoring agency should establish plot protocols based on the types of vegetation present and the level of detail needed to analyze the management objectives.

Intense—Level 4: Basic Vegetation Plus Dead and Downed Fuels Inventory

The protocol for this level would include the vegetation plots described above but would add more details regarding fuel loading. Crown height or canopy closure might be included for live fuels. Dead and downed fuels could be assessed using other methods, such as Brown's transects (Brown 1974), an appropriate photo series (Ottmar et al. 2000), or fire monitoring (Fire Effects Monitoring and Inventory System [FIREMON]) plots. Identify Timeline for Updating the CWPP

The HFRA allows for maximum flexibility in the CWPP planning process, permitting the Core Team to determine the time frame for updating the CWPP; it is suggested that a formal revision be made on the fifth anniversary of signing and every 5 years following. The Core Team members are encouraged to meet on an annual basis to review the project list, discuss project successes, and strategize regarding project implementation funding. If possible, the CWPP revision should coincide with the revision of the County HMP. A goal of the 2018 HMP is to maintain and implement the CWPP, including project recommendations.

IMPLEMENTATION

The SCCWPP makes recommendations for prioritized fuels reduction projects and measures to reduce structural ignitability and carry out public education and outreach. Implementation of fuels reduction projects need to be tailored to the specific project and will be unique to the location depending on available resources and regulations. On-the-ground implementation of the recommendations in the SCCWPP planning area will require development of an action plan and assessment strategy for completing each project. This step will identify the roles and responsibilities of the people and agencies involved, as well as funding needs and timetables for completing the highest-priority projects (SAF 2004). Information pertaining to funding is provided in Appendix F.

REFERENCES

- Abatzoglou, J.T. and A.P. Williams. 2016. Impact of anthropogenic climate change on wildfire across western US forests. PNAS, Vol 113, no.42. https://www.climatesignals.org/sites/default/files/reports/climate_signals_abatzoglou_and_williams_2016_pnas.pdf
- Agee, J.K. 1993. Fire ecology of Pacific Northwest forests. Island Press. Covelo. CA
- Agee, J.K. 1998. The landscape ecology of western forest fire regimes. *Northwest Science* 72 (special issue 1):24–34.
- Agee, J.K. 2003. Historical range of variability in eastern Cascade forests, Washington, USA. *Landscape Ecology* 18:725–740.
- Agee, 2005. The Complex Nature of Mixed Severity Fire Regimes. Available at: <https://www.ltrr.arizona.edu/~ellisqm/outgoing/dendroecology2014/readings/Agee2005.pdf>. Accessed February 2020.
- Alexander L, Zhang X, Peterson T, Caesar J, Gleason B, Klein Tank A, Haylock M, Collins D, Trewin B, Rahimzadeh F, Tagipour A, Ambenje P, Rupa Kumar K, Revadekar J, Griffiths G (2006) Global observed changes in daily climate extremes of temperature. *J Geophys Res* 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. Ecological Restoration of Southwestern Ponderosa Pine Ecosystems: A Broad Perspective. *Ecological Applications* 12(5):1418–1433. <https://www.biologicaldiversity.org/publications/papers/Allen-Restoration-2002.pdf>
- Anderson, H.E. 1982. *Aids to Determining Fuel Models for Estimating Fire Behavior*. General Technical Report INT-122. Ogden, Utah: United States Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station.
- Baker, W. L. and Shinneman, D.J. 2004. Fire and restoration of pinon-juniper woodlands in the western United States: a review. *Forest Ecology and Management* 189(1–3):1–21.
- Betancourt, J.L. 1987. Paleobotany of pinyon-juniper woodlands: summary. In *Proceedings - Pinyon-Juniper Conference*, pp. 129–140. U.S. Department of Agriculture Forest Service. GTR-INT-215.
- Breshears et al. 2005. Regional vegetation die-off in response to global-change-type drought. <https://www.pnas.org/content/102/42/15144.short>. Accessed May 5, 2020.
- Brown, J.K. 1974. *Handbook for Inventorying Downed Woody Material*. Gen. Tech. Rep. No. GTR-INT-16. Ogden, Utah: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station.
- Brown, J. K. 1995. Fire regimes and their relevance to ecosystem management, Proceedings of the 1994 Society of American Foresters Annual Convention, 18-22 September 1994, Anchorage, AK. Society of American Foresters, Bethesda, MD. p. 171-178.
- Brown, R. D., and P. W. Mote, 2009: The response of Northern Hemisphere snow cover to a changing climate. *J. Climate* 22:2124–2145, doi:10.1175/2008JCLI2665.1.

- Burgess, T.L. 1995. Desert grassland, mixed shrub savanna, shrub steppe, or semidesert scrub? The dilemma of coexisting growth forms. In: McClaran, M.P. & Van Devender, T.R. (eds.) The desert grassland, pp. 31-67. University of Arizona Press, Tucson, AZ, US.
- Butler, B.W. and Cohen, J.D. 1996. An Analytical Evaluation of Firefighter Safety Zones. 12th Fire and Forest Meteorology Conference, Lorne, Australia, 1996.
- Caggiano, M.D., O'Connor, C.D., and Sack, R.B. (2020). Potential Operational Delineations and Northern New Mexico's 2019 Fire Season. CFRI-2002.
- Coalition for the Upper South Platte (CUSP). 2016. The Phoenix Guide. Available at: https://cusp.ws/wp-content/uploads/2016/12/phoenix_guide.pdf. Accessed 4/2/2020.
- Colavito, M. 2019. Assessment of Community Wildfire Protection Plans (CWPPs) in Arizona and Communities-at-Risk throughout the West Project Report. December, 2019. Arizona Department of Forestry and Fire Management and Northern Arizona Institute Ecological Restoration Institute.
- City of Phoenix Fire Department. 2009. After the Fire. Available at: https://www.phoenix.gov/firesite/Documents/fire_after_the_fire_brochure.pdf. Accessed April 4, 2020.
- Cooper, C.F. 1960. Changes in vegetation, structure, and growth of southwestern pine forests since white settlement. *Ecological Monographs* 30:129–64.
- 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.T. Baker, and J.C. Boren. 2006. Wildland fire effects in silvicultural treated vs. untreated stands 011 New Mexico and Arizona. Research Paper RMRS- RP-55. Fort Collins, CO: Rocky Mountain Research Station, USDA Forest Service
- Dick-Peddie, W.A. 1993. New Mexico vegetation--past, present, and future. Albuquerque, NM: University of New Mexico Press. EMNRD 2016. <http://www.emnrd.state.nm.us/SFD/documents/2016NMSFFAPReviewReport.pdf>
- Egan, Dave. 2013. Monitoring- Organizing a Landscape-Scale Forest Restoration Multi-Party Monitoring Program. 38pp.
- EMNRD. 2018. <http://www.emnrd.state.nm.us/ADMIN/documents/bw2018AR30Feb.pdf>
- EMNRD. 2020. New Mexico Forest Action Plan (DRAFT). Available at: http://www.emnrd.state.nm.us/SFD/documents/NMFAP_DraftforReview4.22.2020.pdf
- Evans, A., S. Auerbach, L.W. Miller, R.Wood, K. Nystrom, J. Loevner, A. Argon, M. Piccarello, E. Krasilovsky. 2015. Evaluating the Effectiveness of Wildfire Mitigation Activities in the Wildland Urban Interface. Forest Guild, October 2015.
- Forests and Rangelands. 2006. *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Strategy Implementation Plan*. Available at: https://www.forestsandrangelands.gov/resources/plan/documents/10-yearstrategyfinal_dec2006.pdf. Accessed January 2016.
- . 2014. *The National Strategy: The Final Phase in the Development of the National Cohesive Wildland Fire Management Strategy*. Available at: <https://www.forestsandrangelands.gov/strategy/documents/strategy/CSPHaseIIINationalStrategyApr2014.pdf>. Accessed January 2016.

- Forest Stewards Guild. n.d. Fire History in the Greater Santa Fe Fireshed. Available at: <https://static1.squarespace.com/static/57b62cb1ebbd1a48387a40ef/t/5ab3c6130e2e72ea769892c7/1521731100713/Fire+History+Fact+Sheet.pdf>. Accessed August 4, 2020.
- Fulé, P.Z., J.E. Crouse, T.A. Heinlein, 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.
- 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*. Gen. Tech Rep. RMRS-GTR-120. Fort Collins, Colorado: U.S. Department of Agriculture Forest Service, Rocky Mountain Research Station.
- Griffith, G.E., Omernik, J.M., McGraw, M.M., Jacobi, G.Z., Canavan, C.M., Schrader, T.S., Mercer, D., Hill, R., and Moran, B.C., 2006, Ecoregions of New Mexico (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,400,000).
- Grissino-Mayer, H. D.; Romme, W.H.; Floyd, L.M.; Hanna, D. D. 2004. Climatic and Human Influences on Fire Regimes of the Southern San Juan Mountains, Colorado, USA. *Ecology* 85(6):1708–1724.
- Gutzler, D. S., 2013: Regional climatic considerations for borderlands sustainability. *Ecosphere* 4(1):1-12. doi:<https://doi.org/10.1890/ES12-00283.1>.
- Gutzler, D. S., and T. O. Robbins, 2011: Climate variability and projected change in the western United States: Regional downscaling and drought statistics. *Climate Dyn.* (37):835–849. doi:<https://doi.org/10.1007/s00382-010-0838-7>.
- Haines, T.K., C.R. Renner, and M.A. Reams. 2005. A Review of State and Local Regulation for Wildfire Mitigation. Available at: http://www.srs.fs.usda.gov/pubs/ja/ja_haines005.pdf. Accessed August 2016.
- Hann, W.J., and D.L. Bunnell. 2001. Fire and land management planning and implementation across multiple scales. *International Journal of Wildland Fire* 10:389–403.
- Hann, W., A. Shlisky, D. Havlina, K. Schon, S. Barrett, T. DeMeo, K. Pohl, J. Menakis, D. Hamilton, J. Jones, M. Levesque, and C. Frame. 2004. *Interagency Fire Regime Condition Class Guidebook*. Version 1.2.0 Homepage of the Interagency and the Nature Conservancy fire regime condition class website, U.S. Department of Agriculture Forest Service, U.S. Department of the Interior, the Nature Conservancy, and Systems for Environmental Management.
- Harden, G. R. 2020. Fighting Wildfire with PODs (Potential Operational Delineations). Available at https://forestry.usu.edu/news/utah-forest-newsletter/PODs_NM.pdf. Accessed July 15, 2020.
- Hurd, B. H., and Coonrod, J. 2008. Climate Change and its implications for New Mexico's Water resources and economic opportunities. NM State University Technical Report 45, 28p
- International Code Council (ICC). 2006. International Wildland Urban Interface Code. Available at: <http://www.iccsafe.org/dyn/prod/3850S06.html>. Accessed August 7, 2019.
- Kaye, M. W., and T. W. Swetnam. 1999. An assessment of fire, climate, and Apache history in the Sacramento Mountains, New Mexico. *Physical Geography* 20:305–330.

- Keane et al. 2002. Cascading effects of fire exclusion in Rocky Mountain ecosystems: a literature review. RMRS-GTR-91:24 p.
- Leopold, A. 1924. Grass, brush, timber, and fire in southern Arizona. *Journal of Forestry* 22:1–10.
- Loehman, R., W. Flatley, L. Holsinger, and A. Thode. 2018. Can Land Management Buffer Impacts of Climate Changes and LAttered Fire Regimes on Ecosystems of the Southwestern United States. *Forests*, 9. 192.
- LANDFIRE 2012. Data Products, Data Notifications. Available at: <http://www.landfire.gov/notifications33.php>. Accessed September 11, 2019.
- McCaffrey, S.M. 2004. Fighting fire with education: what is the best way to reach out to homeowners? *Journal of Forestry* 102:12–19.
- McCaffrey, S.M. and C.S. Olsen, 2012. Research Perspectives on the Public and Fire Management: A Synthesis of Current Social Science on Eight Essential Questions. Northern Research Station GTR -104. Available at: https://www.firescience.gov/projects/06-4-1-26/project/06-4-1-26_gtr_nrs104.pdf. Accessed September 17, 2020.
- McCaffery, S. (2020, March 16 / June 30) *What motivates Homeowners to Mitigate Fire Risk? Lessons from Social Science* [conference presentation]. Bill Lane Center for the American West, Virtual Wildfire Series: Wildfire management during COVID. <https://www.youtube.com/watch?v=3dmbenV-ZsM>. Accessed August 14, 2020.
- McPherson, G.R. 1995. The role of fire in the desert grasslands. Pages 130-151 in M.P. McClaran and T. Van Devender (editors), *The Desert Grassland*. University of Arizona Press, Tucson, Arizona.
- Millar and Stephenson 2015. Temperate forest health in an era of emerging megadisturbance. <https://science.sciencemag.org/content/349/6250/823>. Accessed May 5, 2020.
- Mueller et al. 2020. Climate relationships with increasing wildfire in the southwestern US from 1984 to 2015. <https://www.sciencedirect.com/science/article/abs/pii/S0378112719314744>. Accessed May 5, 2020.
- National Geographic. 2011. Fire and Rain: The One-Two Punch of Flooding after Blazes. Available at: <https://blog.nationalgeographic.org/2011/08/31/fire-and-rain-the-one-two-punch-of-flooding-after-blazes/>. Accessed April 3, 2020.
- National Interagency Fire Center (NIFC). 2019. Wildland Fire Statistics. Available at: https://www.nifc.gov/fireInfo/fireInfo_stats_totalFires.html. Accessed August 2019.
- National Wildfire Coordinating Group (NWCG). 1998. *Fireline Handbook*. NWCG Handbook 3. PMS 410–1. NFES 0065. Boise, Idaho: National Interagency Fire Center.
- Neilson, R., J. Lenihan, R. Drapek, and D. Bachelet. 2004. *Forests Fire Risk and Climate Change*. Pacific Northwest Research Station-Science Update. Issue 6. January 2004.
- National Park Service 2005. <https://www.nps.gov/gicl/learn/management/upload/GILAFMPfinal.pdf>
- National Wildfire Coordinating Group (NWCG). 1998. *Fireline Handbook*. NWCG Handbook 3. PMS 410–1. NFES 0065. Boise: National Interagency Fire Center.
- New Mexico Bureau of Geology and Mineral Resources. 2007. Virtual Geologic Tour of New Mexico: Physiographic Provinces. Available at: <http://geoinfo.nmt.edu/tour/provinces/home.html>. Accessed August 7, 2012.

- New Mexico Forest and Watershed Restoration Institute, 2020. Vegetation Treatment Mapping Site. Available at: <https://nmfwri.org/gis-projects/nm-vegetation-treatment-mapping>
- New Mexico State Forestry (NMSF). After Wildfire. Available at: <https://afterwildfirenm.org/>. Accessed April 2, 2020.
- New Mexico Wildland Fire Management Joint Powers Master Agreement [no date]. Available at: https://gacc.nifc.gov/swcc/dc/nmadc/management_admin/incident_business/documents/New%20Mexico%20JPA.pdf
- Ottmar, R., R. Vihnanek, and J. Regelbrugge. 2000. *Wildland Fire in Ecosystems: Effects of Fire on Fauna*. Vol. 1. Gen. Tech. Rep. RMRS-GTR-42. Ogden, Utah: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
- Pyne, S.J. 2001. The fires this time, and next. *Science* 294(2):12–17.
- . 2002. *Fire in America: a Cultural History of Wildland and Rural Fire*. Seattle: University of Washington Press.
- Reams, M.A., Haines, T.K. Renner, C.R., Wascom, M.W. and Kingre, H. 2005. Goals, obstacles and effective strategies of wildfire mitigation programs in the Wildland-Urban Interface. *Forest Policy and Economics*, 7. 818-826. Available at: https://www.srs.fs.usda.gov/pubs/ja/ja_haines004.pdf. Accessed September 16, 2020.
- Ready, Set, Go! 2016. Ready, Set, Go! Home. Available at: <http://wildlandfirersg.org/>. Accessed October 2019.
- Reinhardt, E.D., R.E. Keane, D.E. Calkin, and J.D. Cohen. 2008. Objectives and considerations for wildland fuel treatment in forested ecosystems of the interior western United States. *Forest Ecology and Management*. Available at: http://www.fs.fed.us/rm/pubs_other/rmrs_2008_reinhardt_e001.pdf. Accessed September 2019.
- Rothermel, R.C. 1983. *How to Predict the Spread and Intensity of Forest and Range Fires*. Gen. Tech. Rep. INT-143. Ogden, Utah: U.S. Department of Agriculture, Forest Service, Intermountain 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. 1972. *A Mathematical Model for Predicting Fire Spread in Wildland Fuels*. Res. Pap. INT-115. Ogden, Utah: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station.
- . 1991. *Predicting Behavior and Size of Crown Fires in the Northern Rocky Mountains*. Res. Pap. INT-438. Ogden, Utah: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station.
- Santa Fe County, 2018. Santa Fe County Hazard Mitigation Plan. Amec Foster and Wheeler. May 2018.
- Savage, M., and T.W. Swetnam. 1990. Early 19th-century fire decline following sheep pasturing in a Navajo ponderosa pine forest. *Ecology* 71:2374–2378.
- 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*. Gen. Tech. Rep. RMRS-GTR-87.

- Fort Collins, Colorado: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research 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*. Gen. Tech. Rep. RMRS-GTR-153. Fort Collins, Colorado: U.S. Department of Agriculture, U.S. 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. Available at: http://www.fs.fed.us/rm/pubs/rmrs_gtr005.pdf. Accessed August 12, 2012.
- Seager R., Y. Kushnir, M. Ting, M. A. Cane, N. Naik, and J. Velez, 2008: Would advance knowledge of 1930s SSTs have allowed prediction of the Dust Bowl drought? *Journal of Climate* 21:3261–3281.
- Sivinski, R.C. 2007. Checklist of vascular plants in the Sandia and Manzano Mountains of central New Mexico. *Occasional Papers of the Museum of Southwest Biology* 10:1–67.
- Smith, D.M., J.F. Kelly, and D.M. Finch. 2006. Wildfire, exotic vegetation, and breeding bird habitat in the Rio Grande bosque. In *Monitoring Science and Technology Symposium: Unifying Knowledge for Sustainability in the Western Hemisphere Proceedings*, edited by C. Aguirre-Bravo, P.J. Pellicane, D.P. Burns, and S. Draggan, pp. 230–237. RMRSP-42CD. Fort Collins, Colorado: U.S. Department of Agriculture Forest Service, Rocky Mountain Research Station.
- Smith, S.D., D.A. Devitt, A. Sala, J.R. 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.safnet.org/policyandpress/cwpphandbook.pdf>. Accessed July 20, 2012.
- Stephens, S.L., and L.W. Ruth. 2005. Federal forest-fire policy in the United States. *Ecological Applications* 15(2):532–542.
- Stevens-Rumann et al. 2018. Evidence for declining forest resilience to wildfires under climate change. <https://onlinelibrary.wiley.com/doi/abs/10.1111/ele.12889>. Accessed May 5, 2020.
- Stewart, S.I., V.C. Radeloff, R.B. Hammer, and T.J. Hawbaker. 2007. Defining the Wildland-Urban Interface. *Journal of Forestry* 105:201–207.
- 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., and J.L. Betancourt. 1998. Mesoscale disturbance and ecological response to decadal climatic variability in the American Southwest. *Journal of Climate* 11(12):3128–3147.
- Swetnam, T ; C. Baisan, A. Caprio & P. Brown. (1992). Fire history in a Mexican oak-pine woodland and adjacent montane conifer gallery forest in southeastern Arizona. Symposium on the Ecology and Management of Oak and Associated Woodlands: Perspectives in the Southwestern United States and Northern Mexico, Volume: RMRS-GTR-218, 165-173
- Swetnam, T.W. and Dieterich, J.H. 1985. Fire history of ponderosa pine forests in the Gila Wilderness, New Mexico. Available at: https://www.researchgate.net/profile/Thomas_Swetnam/publication/

228116957_Fire_history_of_ponderosa_pine_forests_in_the_Gila_Wilderness_New_Mexico/links/0fcd4ff609e953130000000.pdf.

- Thornton, P. E., Thornton, M. M., Mayer, B. W., Wilhelmi, N., Wei, Y., Devarakonda, R., & Cook, R. B. (2012). Daymet: Daily surface weather data on a 1-km grid for North America, Version 2.
- Touchan, R., C. D. Allen, and T. W. Swetnam. 1996. Fire history and climatic patterns in ponderosa pine and mixedconifer forests of the Jemez Mountains, northern New Mexico. Pages 33–46 in U.S. Forest Service General Technical Report RM-GTR-286.
- U.S. Census Bureau. 2020. Santa Fe County, Quick Facts. <https://www.census.gov/quickfacts/fact/table/santafecountynewmexico/PST045219#PST045219>
- U.S. Department of the Interior (USDI) 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.
- Veblen, T.T.; Kitzberger, T.; Donnegan, J. 2000. Climatic and Human Influences on Fire Regimes in Ponderosa Pine Forests in the Colorado Front Range. *Ecological Applications* 10(4):1178–1195.
- Weaver, H. 1947. Fire- Nature's Thinning Agent in Ponderosa Pine Stands. *Forestry* 45(6):437–444.
- Wells, G. 2007. The fire-climate connection. *Fire Science Digest* 1(1):1–10.
- West, N. E. 1984. Successional patterns and productivity of pinyon-juniper ecosystems. In *Developing Strategies for Range Management* pp. 1301–1322. Boulder, CO: 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.
- Westerling, 2016. http://ulmo.ucmerced.edu/pdffiles/16RSTB_Westerling.pdf
- Western Governors' Association. 2006. A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Strategy Implementation Plan. Available at: <http://www.westgov.org/wga/publicat/TYIP.pdf>. Accessed August 12, 2012.
- Wildland Fire Decision Support System (WFDSS). 2015. WFDSS Spatial Fire Planning Guide. October 2015. Available at: https://wfdss.usgs.gov/wfdss/pdfs/WFDSS_SFP_Guide.pdf. Accessed July 15, 2020.
- Wildland Fire Leadership Council. 2012. A National Cohesive Wildland Fire Management Strategy, Phase II National Report. May 2012. Available at: http://www.forestsandrangelands.gov/strategy/documents/reports/phase2/CSPPhaseIIReport_FINAL20120524.pdf. Accessed July 17, 2012.
- Winter, G., and J.S. Fried. 2000. Homeowner perspectives on fire hazard, responsibility, and management strategies at the wildland-urban interface. *Society and Natural Resources* 13:33–49.



APPENDIX A:

Community and CWPP Background Information

SCA

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OVERVIEW OF COMMUNITY WILDFIRE PROTECTION PLANS

FEDERAL DIRECTION

In response to a landmark fire season in 2000, the National Fire Plan (NFP) was established to develop a collaborative approach among various governmental agencies to actively respond to severe wildland fires and ensure sufficient firefighting capacity for the future. The NFP was followed by a report in 2001 entitled *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: A 10-year Comprehensive Strategy*, which was updated in 2002 to include an implementation plan. This plan was updated once more in 2006, with a similar focus on using a collaborative framework for restoring fire-adapted ecosystems, reducing hazardous fuels, mitigating risks to communities, providing economic benefits, and improving fire prevention and suppression strategies. The 2006 implementation plan also emphasizes information sharing and monitoring of accomplishments and forest conditions, a long-term commitment to maintaining the essential resources for implementation, a landscape-level vision for restoration of fire-adapted ecosystems, the importance of using fire as a management tool, and continued improvements to collaboration efforts (Forests and Rangelands 2006). Progress reports and lessons learned reports for community fire prevention are provided annually.

In 2003, the U.S. Congress recognized widespread declining forest health by passing the Healthy Forests Restoration Act (HFRA), and President Bush signed the act into law (Public Law 108–148, 2003). The HFRA was revised in 2009 to address changes to funding and provide a renewed focus on wildfire mitigation (H.R. 4233 - Healthy Forest Restoration Amendments Act of 2009). 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 Community Wildlife Protection Plans (CWPPs), which facilitates 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, which is used to delineate priority areas for treatment. In addition, priority is placed upon municipal watersheds, critical wildlife habitat, and areas impacted by wind throw, insects, and disease. Communities with an established CWPP are given priority for funding of hazardous fuels reduction projects carried out in accordance with the HFRA.

In 2014, the final stage of the development of a national cohesive strategy for wildfire was developed: *The National Strategy: The Final Phase in the Development of the National Cohesive Wildland Fire Management Strategy* (Forests and Rangelands 2014). The national strategy takes a holistic approach to the future of wildfire management:

To safely and effectively extinguish fire, when needed; use fire where allowable; manage our natural resources; and as a Nation, live with wildland fire.

In order to achieve this vision, the national strategy goals are:

- **Restore and maintain landscapes:** Landscapes across all jurisdictions are resilient to fire-related disturbances in accordance with management objectives.
- **Fire-adapted communities:** Human populations and infrastructure can withstand a wildfire without loss of life and property.
- **Wildfire response:** All jurisdictions participate in making and implementing safe, effective, efficient risk-based wildfire management decisions. (Forests and Rangelands 2014:3)

STATE DIRECTION

The 2020 New Mexico State Forest Action Plan (in draft format at time of writing) recognizes that New Mexico faces continued and urgent threats from catastrophic wildfire.²⁷ The State Forest Action Plan

²⁷ NM State Forest Action Plan (2020): http://www.emnrd.state.nm.us/SFD/documents/NMFAP_DraftforReview4.22.2020.pdf

includes a resource assessment to identify threats to resources, including wildfire, post-wildfire flooding, erosion and debris flow, disease and insects, climate changes, development and fragmentation, and use and forest management activities. The Plan then provides strategies to protect these resources over the next decade. There are several strategies and sub-strategies outlined in the Draft Plan; those specific to wildfire include:

- **Restore Forests and Watersheds:** addresses the legacy of fire exclusion and excessive fuels.
- **Fire Management:** addresses wildfire response on state and private land; supports regional, state, and national wildfire response for all jurisdictions; and restores the ecological role of fire to foster resilient landscapes and watershed health.

The recent passing of H.B. 266, the Forest and Watershed Restoration Act (2019) provides support for landscape resilience throughout the State, by allocating state funds to the EMNRD for the purpose of forest and watershed restoration. EMNRA has been tasked with determining which proposed projects will be funded, in coordination with a newly established Advisory Board (EMNRD 2020).

Like the 2014 national strategy, the NFP, the State Forest Action Plan, 10-year comprehensive strategy, and 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 multiagency cooperation. In compliance with Title 1 of the HFRA, a CWPP must be mutually agreed upon by the local government, local fire departments, and the state agency responsible for forest management (New Mexico State Forestry Division [NMSF]). As outlined in HFRA, this CWPP is developed in consultation with interested parties and the federal agencies managing land surrounding the at-risk communities.

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. Another goal of the CWPP is to enhance public awareness by helping residents better understand the natural- and human-caused risk of wildland fires that threaten lives, safety, and the local economy. The minimum requirements for a CWPP, as stated in the HFRA, are:

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).

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

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

PLANNING PROCESS

The SAF, in collaboration with the National Association of Counties and the National Association of State Foresters, developed a guide entitled *Preparing a Community Wildfire Protection Plan: A Handbook for Wildland-Urban Interface Communities* (SAF 2004) to provide communities with a clear process in developing a CWPP. The guide outlines eight steps for developing a CWPP and has been followed in preparing the SCCWPP:

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 federal representatives and 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 base map(s) defining the community's WUI and showing inhabited areas at risk, wildland areas that contain critical human infrastructure, and wildland 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 community values at risk (CVARs); and local preparedness capability. Rate the level of risk for each factor and incorporate this information into the base map as appropriate.

Step Six: Establish Community Priorities and Recommendations. Use the base map and community risk assessment to facilitate a collaborative community discussion that leads to the identification of local priorities for treating fuels, reducing structural ignitability and other issues of interest, such as improving fire response capability. Clearly indicate whether priority projects are directly related to the 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.

LOCATION AND GEOGRAPHY

Santa Fe County is 1,910 square miles and is bordered by seven New Mexico counties: Rio Arriba to the north, Sandoval and Los Alamos to the west, Bernalillo at the southwest corner, Torrance to the south, and San Miguel and Mora to the east. Santa Fe County is between the Rio Grande to the west in Sandoval County and the Pecos River to the east in San Miguel County. The main transportation corridors include Interstate 25, which bisects the County at the city of Santa Fe, and Interstate 40, which runs east–west along the southern portion of the County. Other local transportation corridors include U.S. Route 285/84, which runs north–south through the southeast corner of the project area; New Mexico State Routes 14 and 41, which run north–south at the southwest and southern portions of the project area; and New Mexico State Routes 4, 502, 30, 74, 76, 399, and 68 in the northern section of the project area. Access to other County lands consists of narrow, winding roads, including maintained two-lane roads, some one-lane gravel roads, several four-wheel drive dirt roads, and multiple dead-end roads (Santa Fe County 2006).

Santa Fe County is primarily composed of privately owned land. Other landowners include the USFS, New Mexico State Land Office, BLM, Department of Energy (DOE), U.S. Department of Defense, and National Park Service (NPS), as well as private entities. The USFS manages the Santa Fe Watershed portion within the CWPP project area (Table A.1).

Table A.1. Breakdown of Land Ownership in Santa Fe County

Land Ownership	Square Miles	Percentage of the County
Private	1,141	59.73%
U.S. Forest Service	384	20.09%
Tribal Land	145	7.59%
State	119	6.22%
Bureau of Land Management	109	5.72%
Department of Energy	6	0.32%
Department of Defense	4	0.23%
National Park Service	2	0.10%

Santa Fe County contains two mountain ranges. The Ortiz Mountains are located in the southwest corner of the County, bordering the intersection of Sandoval and Bernalillo Counties. The Sangre de Cristo Mountains, Spanish for "the blood of Christ," are the southernmost subrange of the Rocky Mountains, and extend into the northeastern portion of New Mexico and into Santa Fe County. The highest peak in this range within Santa Fe County is Santa Fe Baldy, standing at 12,622 feet and located in the Pecos Wilderness (Sangres 2007). The Pecos Wilderness is within the Santa Fe National Forest, comprising 1.6 million acres (USFS 2007). The topography of Santa Fe County is discussed further below.



Figure A.1. Typical landscape in Santa Fe County, showing mountains, a valley, and pinyon-juniper vegetation.

TOPOGRAPHY

The SCCWPP project area rises from the point at which Interstate 25 crosses from Sandoval County in the west (at 5,436 feet) to the summit of Santa Fe Baldy to the northeast. The Sangre de Cristo

Mountains were formed 27 million years ago when major fault lines running through the range pushed the bedrock skyward (Sangres 2007). Despite the dramatic elevations of Santa Fe County, the majority of the land area is relatively flat. The southern portion of the County exhibits only small hills and large spans of high desert plains (Santa Fe County 2006).

Although much of the County is relatively flat, the topography varies greatly throughout the CWPP project area. The percent of slope is an important factor in determining the types of treatments that should be implemented.

POPULATION

The following information is drawn primarily from U.S. census data (U.S. Census Bureau 2020). In 2019, the population estimate of Santa Fe County was 150,358 persons, an increase of 4.2% over the 2010 census numbers of 144,170. Between 2014 and 2018, there were 61,972 housing units in the County. The County has a population density of 75.5 people per square mile. The majority of the population live within the city limits of Santa Fe, with estimates in 2018 of 84,612 residents.

RECREATION

Outdoor recreation is extremely popular in the County, with the Santa Fe National Forest, Bandelier National Monument, city and state parks, and cultural attractions throughout the County, attracting thousands of visitors. Hunting and camping are popular on public land (Figure A.2).

During peak seasons and large events, a significant number of people can congregate in a relatively small space, which constitutes a large population to evacuate.



Figure A.2. Runners on the new Santa Fe Trail during an event.

Source: <https://www.usafa.af.mil/News/News-Display/Article/1413087/usafa-to-close-portion-of-santa-fe-trail-intermittently/>

PUBLIC LAND MANAGEMENT

SANTA FE NATIONAL FOREST

The Santa Fe National Forest covers 1,558,452 acres, with elevations ranging from 5,300 feet to 13,103 feet at the summit of Trunchas Peak, located within the Pecos Wilderness. The Forest comprises land in Santa Fe County, as well as Rio Arriba, San Miguel, Sandoval, Mora, and Los Alamos Counties. The Forest is broken into five Ranger Districts; portions of the Espanola and Pecos/Las Vegas Ranger Districts fall within the County boundary.

The Santa Fe National Forest Land and Resource Management Plan (Forest Plan) is the guiding policy document for forest and fire management on the forest. The Forest is currently revising their Forest Plan, with a decision document expected following completion of this CWPP. During update to this 2020 CWPP, the Core Team should review and revise recommendations, based on the final Forest Plan and Decision Document.

The Santa Fe National Forest works closely with neighboring entities to develop cross-boundary landscape projects focused on landscape resiliency and forest health (Figure A.3).



Figure A.3. The Santa Fe National Forest has an active prescribed burning program.

Source: NM Fire Info.

STATE LAND

The New Mexico State Forestry Division (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 land and within rural communities on all non-federal and non-municipal lands in the state (New Mexico Statutes Annotated 1978, Section 68-2-8). As a result, the NMSF is involved in the CWPP planning process. The New Mexico Fire Planning Task Force (NM-FPTF) was created in 2003 by the New Mexico legislature to identify the WUI areas (CARs) in the state that were most vulnerable to wildland fire danger. The task force updates its CARs list annually, reviews completed CWPPs, and approves CWPPs that are compliant with the HFRA.

CLIMATE AND WEATHER PATTERNS

Differences in topographical characteristics throughout the state of New Mexico and Santa Fe County contribute to the divergent climatic regimes within the planning area. The state generally 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. Across the state, the annual average number of hours of sunshine ranges from nearly 3,700 hours in the southwestern portions of the state to 2,800 hours in the north-central portions (New Mexico Climate Center [NMCC] 2008).

July is generally the warmest month of the year in New Mexico, with average monthly maximum temperatures ranging from 90 degrees Fahrenheit (°F) at lower elevations to 75°F to 80°F at higher elevations. January is the coldest month, with average daytime temperatures ranging from 43°F to 47°F. Mean annual temperatures do not vary significantly across Santa Fe County, and from lower to higher elevations, mean annual temperatures only range from approximately 49°F to 51°F. Within the County, maximum mean annual temperatures range from 64.9°F in the city of Santa Fe to 67.6°F in Turquoise. Minimum annual temperatures range from 33.7°F in Stanley to 36.0°F in Santa Fe (Table A.2) (Western Regional Climate Center [WRCC] 2020). Within the entire state, the freeze-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 (NMCC 2008).

Table A.2. Mean Annual Temperature and Precipitation by Station in Santa Fe County

Station	Elevation (feet)	Mean Annual Temperature (°F)			Annual Precipitation (inches)			Period of Record
		Max	Min	Mean Annual	Max	Min	Mean Snowfall	
Glorieta	7,520	Insufficient Data	Insufficient Data	15.78	22.86	8.73	31.1	1915–2010
Santa Fe	6,720	64.9	36.0	13.81	20.09	7.23	21.0	1972–2016
Golden	6,700	Insufficient Data	Insufficient Data	13.79	23.44	4.07	23.7	1901–2016
Stanley	6,380	65.8	33.7	12.08	22.43	4.65	18.7	1909–2016
Turquoise	6,200	67.6	35.1	15.5	22.21	4.54	22.90	1981–2010

Source: WRCC (2020)

Throughout the entire state of New Mexico, average annual precipitation ranges from less than 10 inches over much of the southern desert and the Rio Grande and San Juan valleys to greater than 20 inches in the higher elevations (Thornton et al. 2012). The mean annual precipitation within the County is typically light and ranges from as low as 12.08 inches in Stanley to 15.78 inches in Glorieta. The maximum annual rainfall within the planning area has been recorded as high as 23.44 inches in 1986 in Golden. Golden also had the lowest minimum average annual precipitation at 4.07 inches in 1956 (see Table A.2) (WRCC 2008). July and August mark the onset of the region's monsoonal weather patterns and are typically the hottest and wettest months of the year, accounting for 30% to 40% of the state's annual precipitation (Figures A.4 and A.5) (NMCC 2008). These seasonal rains generally take place as frequent and brief intense thunderstorms. The moisture associated with these storms originates in the Gulf of Mexico. These storms also generate intense lightning activity, which may result in multiple fire ignitions from one storm across a fire management district.

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 (NMCC 2008).

Overall climate regimes in the state typically consist of cyclical drought/wet year patterns that are driven by El Niño-Southern Oscillation. Landscape-scale drought and above-average precipitation have historically occurred at irregular intervals in the past as documented by tree-ring and other data with varying degrees of intensity (Swetnam and Betancourt 1998). Severe and prolonged droughts on record have occurred once every century on average (Gray et al. 2003).

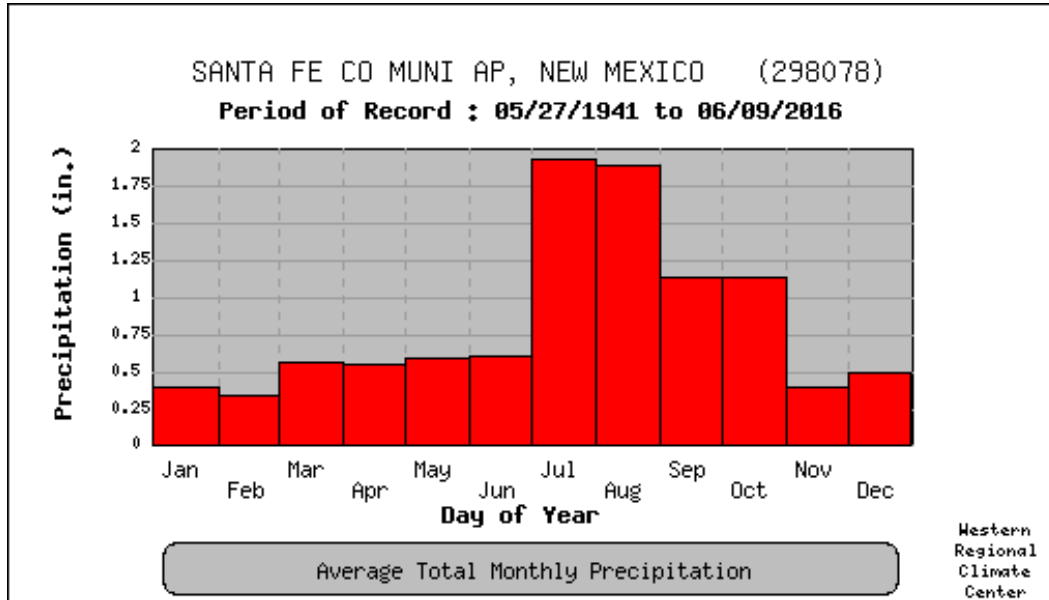


Figure A.4. Monthly average total precipitation for the City of Santa Fe for the period of record (1941–2016).

Source: WRCC (2020)

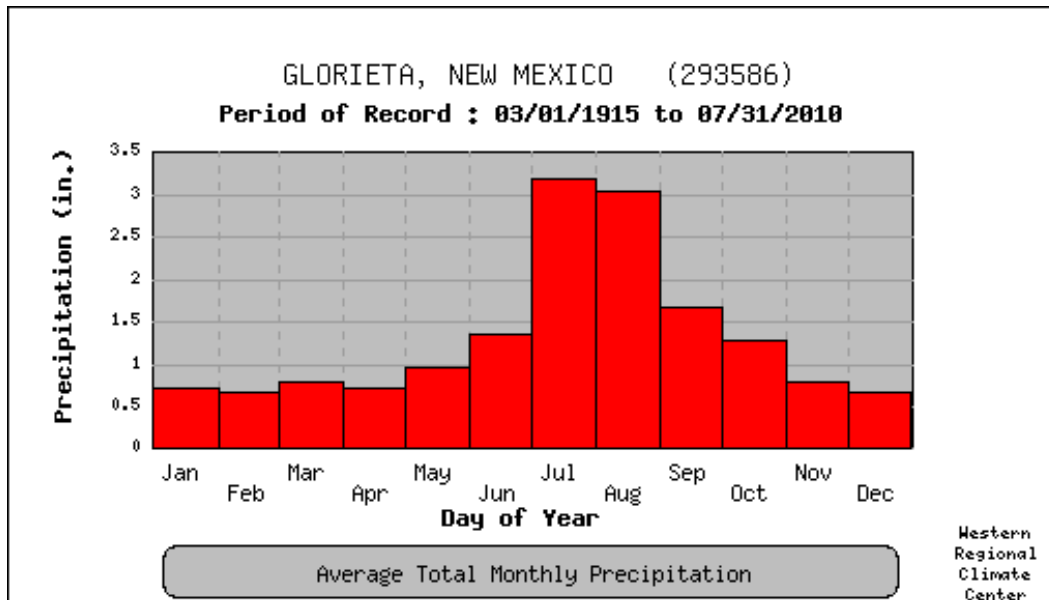


Figure A.5. Monthly average total precipitation for Glorieta for the period of record (1915–2016).

Source: WRCC (2020)

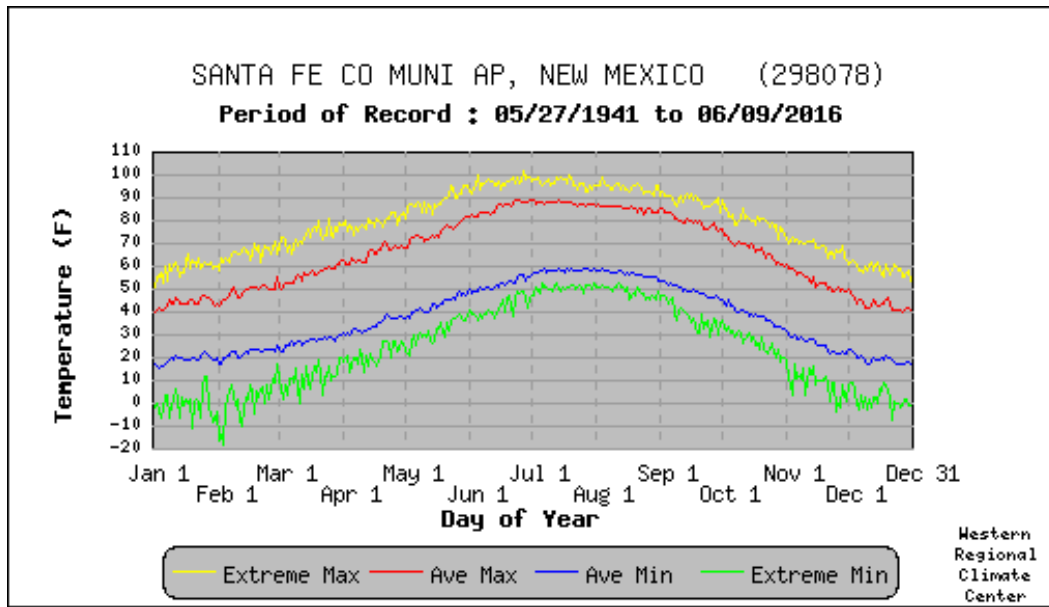


Figure A.6. Daily temperature averages and extremes for the City of Santa Fe for the period of record (1941–2016).

Source: WRCC (2020)

VEGETATION AND LAND COVER

Vegetation zones within Santa Fe County are primarily a function of elevation, slope, aspect, substrate, and associated climatic regimes. Since a broad range in elevation and topography exists across the County, characteristics in vegetative communities are quite variable from site to site (Figure A.7).

Dominant vegetation types within the County are described based on a large spatial scale and represent the overall community structure that will play a general role in fire occurrence and behavior. Although the vegetation types are outlined and described for the entire County in this plan, site-specific evaluations of the vegetative composition and structure in each area of focus should be taken into consideration when planning fuels treatments.

The major vegetation types in Santa Fe County are listed in Table A.3 and are described below the table in more detail using the NatureServe United States Ecological Systems categories (NatureServe 2007). Other types of land cover (e.g., agricultural and developed) also exist in a very small percentage of the County and are not described in more detail as they do not play a significant role in fire behavior.

Table A.3. Major Vegetation Types within Santa Fe County

Existing Vegetation Type	Acres	Percent
<i>Overall Grassland Communities</i>	671,907	48%
Western Great Plains Shortgrass Prairie	292,290	21%
Inter-mountain Basins Semi-desert Grassland	152,450	11%
Southern Rocky Mountain Juniper Woodland and Savanna	145,263	10%
Western Great Plains Foothill and Piedmont Grassland	23,292	2%
Inter-mountain Basins Montane Sagebrush Steppe	23,070	2%
Inter-mountain Basins Semi-desert Shrub-steppe	21,731	1%

Existing Vegetation Type	Acres	Percent
Other Miscellaneous Grassland Types	13,811	1%
<i>Overall Forested Communities</i>	<i>625,845</i>	<i>46%</i>
Southern Rocky Mountain Piñon-juniper Woodland	409,101	29%
Southern Rocky Mountain Ponderosa Pine Woodland	102,485	8%
Rocky Mountain Dry-mesic and Mesic Montane Mixed Conifer Forest and Woodland	94,045	7%
Rocky Mountain Aspen Forest and Woodland	10,324	1%
Other Miscellaneous Forested Types	9,890	1%
<i>Riparian Woodlands and Wetlands</i>	<i>21,952</i>	<i>2%</i>
<i>Other Types</i>	<i>25,892</i>	<i>4%</i>

Source: NatureServe (2007)

GRASSLAND COMMUNITIES

Most of the vegetation in Santa Fe County consists primarily of grassland and evergreen forest communities. Grasslands within the County are composed almost entirely of shortgrass prairie, but also include areas of sagebrush steppe or juniper savanna type ecosystems. Graminoid species that are typical within grassland communities throughout the County include blue grama (*Bouteloua gracilis*) as the dominant graminoid mixed with a variety of different species that vary from site to site. Other associated graminoid species may include threeawn (*Aristida* spp.), needle and thread (*Hesperostipa comata*), prairie Junegrass (*Koeleria macrantha*), western wheatgrass (*Pascopyrum smithii*), James's galleta (*Pleuraphis jamesii*), dropseed (*Sporobolus* spp.), muhly (*Muhlenbergia* spp.), Indian ricegrass (*Achnatherum hymenoides*), fescue (*Festuca* spp.), and bluegrass (*Poa* spp.).

In some grasslands where shrubs or dwarf-shrubs are present, sand sagebrush (*Artemisia filifolia*), big sagebrush (*A. tridentata*), prairie sagewort (*A. frigida*), fourwing saltbush (*Atriplex canescens*), spreading buckwheat (*Eriogonum effusum*), broom snakeweed (*Gutierrezia sarothrae*), winterfat (*Krascheninnikovia lanata*), and pricklypear (*Opuntia* spp.) may be present. Juniper savannas are best represented just below the lower elevational range of ponderosa pine (*Pinus ponderosa*) forests and contain widely spaced, mature, juniper trees (*Juniperus scopulorum* or *J. monosperma*) and occasionally piñon pine (*P. edulis*).

FORESTED COMMUNITIES

The most common forested community consists of piñon-juniper woodlands. This ecological system occurs on dry mountains and plateaus of north-central New Mexico and is represented in the elevational region between ponderosa pine and grassland communities. Piñon pine and/or oneseed juniper (*J. monosperma*) dominate the tree canopy; however, Rocky Mountain juniper (*J. scopulorum*) may co-dominate or replace oneseed juniper in higher elevations. Understory layers are variable and may be dominated by shrubs or graminoids, or may be absent. Associated understory species may include blue grama, James's galleta, Arizona fescue (*F. arizonica*), Bigelow sage (*A. bigelovii*), mountain mahogany (*Cercocarpus montanus*), and Gambel oak (*Quercus gambelii*).

Ponderosa pine forests exist in mountainous areas on all slopes and aspects within the County above an elevation of approximately 9,000 feet where the transition from piñon-juniper woodlands to ponderosa pine communities typically takes place. Ponderosa pine is the predominant conifer in these forests; however, Douglas-fir (*Pseudotsuga menziesii*), piñon pine, and Rocky Mountain juniper may also be present in the sub-canopy. The understory of this community is usually shrubby and includes species such as big sagebrush, mountain mahogany, wild rose (*Rosa* spp.), Gambel oak, and snowberry.

(*Symphoricarpos* sp.). Common graminoids are similar to those of other communities in the County including needle and thread, fescue, muhly, and grama species.

Mixed-conifer forests also exist in the more mesic, higher elevations of the County above ponderosa pine and consist primarily of Douglas-fir, white fir (*Abies concolor*), and Engelmann spruce (*Picea engelmannii*); however, ponderosa pine may also be present in some areas. Associated understory species may include kinnikinnick (*Arctostaphylos uva-ursi*), creeping barberry (*Mahonia repens*), Oregon boxleaf (*Paxistima myrsinites*), snowberry, fivepetal cliffbush (*Jamesia americana*), Gambel oak, and Rocky Mountain maple (*Acer glabrum*). Herbaceous species include sedge species (*Carex* spp.), muhly grass, Arizona fescue, strawberry (*Fragaria* sp.), and meadow rue (*Thalictrum* sp.).

A small amount of aspen (*Populus tremuloides*) woodlands exist in the County but are not well represented. These deciduous forests are dominated by aspen but may have some shade-tolerant coniferous species such as white fir and spruce developing in the understory in older stands. The understory may consist of shrub and herbaceous layers or may only have a simple herbaceous layer. Understory species may consist of snowberry, serviceberry (*Amelanchier* spp.), kinnikinnick, and thimbleberry (*Rubus parviflorus*). This community type is typically created and maintained by stand-replacing disturbances, including fire.

RIPARIAN WOODLAND COMMUNITIES

Riparian woodlands exist in the County along the flood zones of river corridors and surrounding lakes. This vegetation type exists in a very small percentage of the County and consists primarily of cottonwood (*Populus* spp.), willow (*Salix* spp.), and a variety of other riparian species.

OTHER TYPES

Other types of land cover include a very small percentage of shrub communities, sparsely vegetated or barren areas, altered or disturbed areas, agricultural land, and developed areas.

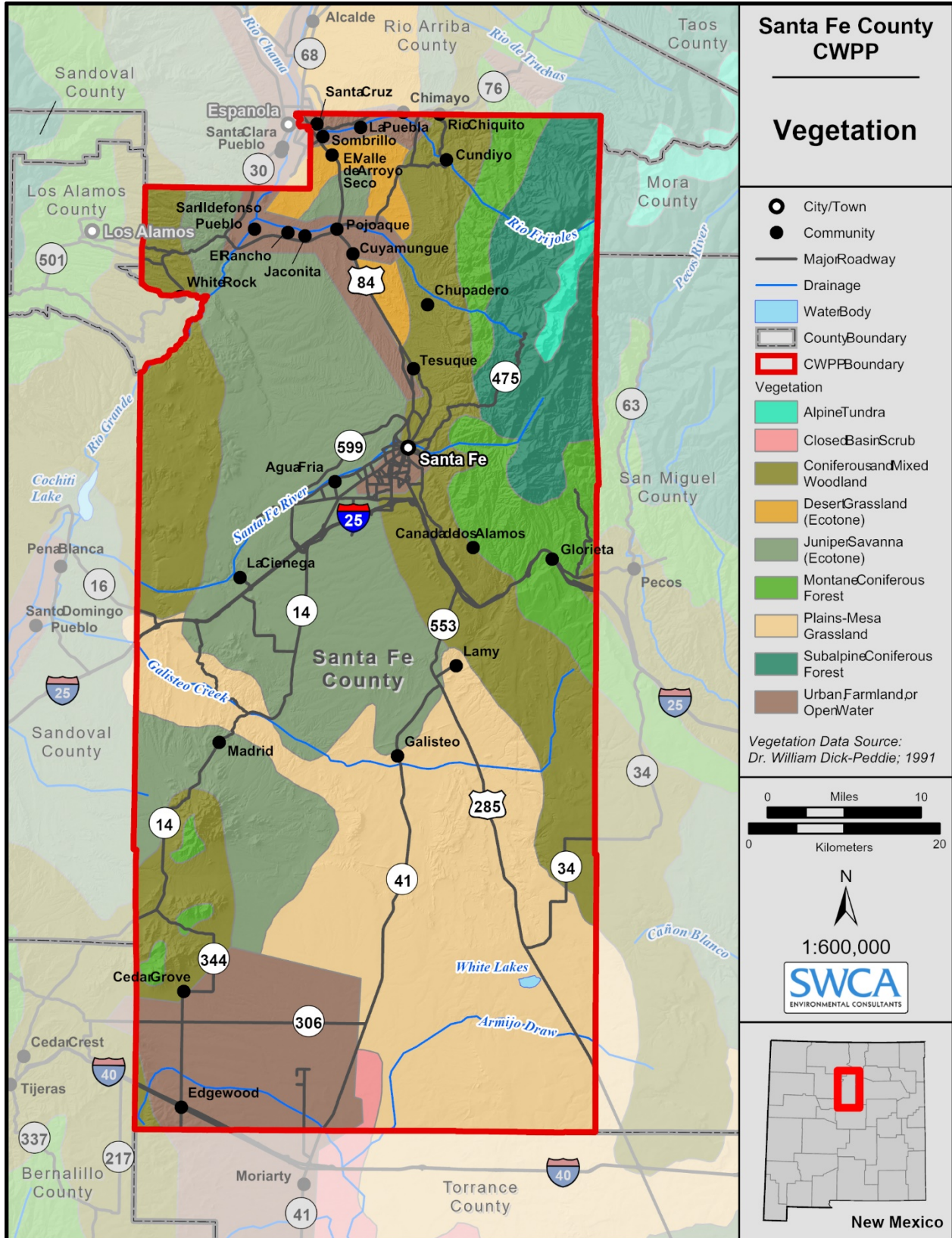


Figure A.7. Santa Fe County existing vegetation cover.

FOREST HEALTH CONSIDERATIONS

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 faster completion of insect life cycles due to warmer climate regimes. Stands of trees that have been killed by insects have varying degrees of associated fire danger 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 SCCWPP planning area are discussed below.

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. 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 confusus*), 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).

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 piñon die-off in the region over the last several years. *Dendroctonus* beetles attack medium to large ponderosa pines, blue spruce (*Picea pungens*), Engelmann spruce, and Douglas-fir. 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.

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.

Diseases

Diseases of trees, such as parasitic plants, fungi, and bacteria, can also affect forests in the SCCWPP 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 County 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 pine, 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 the year-old needles turn brown 6 to 12 mm from the needle base.

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.

WILDLIFE

Vegetation management treatments are commonly applied throughout the County to benefit habitat for general wildlife species or game habitat. Most native wildlife species found in the region evolved with a frequent fire regime.

Threatened and Endangered Species

The County is home to several threatened and endangered species, including 11 birds, one mollusk and three mammals.²⁸ Treatments on federal land would be subject to the National Environmental Policy Act (NEPA) and associated analysis of impacts to these species. Treatments in areas that may impact threatened and endangered species would require application of certain mitigation measures to prevent degradation to habitat.

ROADS AND TRANSPORTATION

There are several transport routes throughout the County that connect communities within the WUI. Interstate 25 passes from Albuquerque through Santa Fe and southeast to Glorieta. Highway 14 connects the East Mountains communities to Santa Fe, through Madrid. Route 285 connects the southeast corner of the County and bridges between Interstate 40 and Interstate 25. Route 84 connects the communities and Pueblos in the northwest portion of the County to Santa Fe and surrounding areas.

In addition to the surfaced highways, numerous smaller roads, and forest roads traverse the County, with variable road conditions. Some steep grades and gravel road surfaces may impede travel in the event of a wildfire evacuation or emergency response (Figure A.8).

²⁸ https://bison-m.org/ReportPDFs/rptSpecies_153130218.pdf



Figure A.8. Photograph showing the steep grade and unsurfaced road surface of a WUI community

FIRE HISTORY

Prior to European settlement, Native Americans used fire as a tool to open land for agriculture, 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).

PAST FIRE MANAGEMENT POLICIES AND LAND MANAGEMENT ACTIONS

Several 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, and heavy grazing (Baker and Shinneman 2004; Savage and Swetnam 1990) 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, and the NPS, 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.

FIRE REGIMES

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.

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).

Fires are characterized by their intensity, the frequency with which they occur, the season in which they occur, their spatial pattern or extent, and their type. Combined, these attributes describe the fire regime. Fire regimes in the western United States have changed dramatically within the past several decades. Historically, frequent, low-intensity surface fires have burned throughout many areas within Santa Fe County, creating a mosaic of different stages of vegetative structure across the landscape. For the most part, these fires have helped to preserve an open vegetative community structure by consuming fuels on the ground surface, which has maintained open meadows and cleared the forest understory of encroaching vegetation.

However, large areas of the Sangre de Cristos that adjoin Santa Fe County have not burned in more than 100 years. This departure from historical, low-intensity fire regimes has caused recent wildland fires to burn much more intensely and unpredictably in many areas of northern New Mexico. It is important to address here the common misconception that all southwestern forests have historically exhibited low intensity frequent surface fire regimes. This is not always the case, as many of the higher elevation (8,500 feet and above) spruce-fir as well as mid-elevation mixed-conifer forests would have naturally experienced infrequent stand replacing fires as part of their natural regeneration cycle, so for these forest types, restoration to more open stands is not always appropriate. At lower elevations, plants and animals are adapted to historical frequent, low-severity fire regimes and are therefore not resilient to the high-severity, extensive wildfires burning today (Keane et al. 2002). Human influences on fire regimes have therefore been greatest at these low-elevation sites. An additional factor contributing to the natural disturbance regime in southwestern forests are outbreaks of bark beetle (*Ips*, *Dendroctonus*, and *Scolytus* spp.), which have locally killed significant numbers of spruce, fir, Douglas-fir, and pine trees throughout the planning area. The effect of bark beetle infestation is particularly evident within Santa Fe County in the area west of Glorieta Pass. Currently, many needles have dropped to the ground and have left only skeletons of trees where fire is less likely to be carried through the canopy due to the absence of light and flashy aerial fuels. In areas where the canopy is still maintaining dead needles, the risk of fire being carried through the canopy is much greater and should be mitigated appropriately.

FUELS AND TOPOGRAPHY WITHIN THE WUI IN SANTA FE COUNTY

The southern half of the County is predominantly composed of grassland fuels, transitioning into shrubsteppe- or shrubland-dominated fuels to the north. Forested communities exist primarily in the higher elevations of the Sangre de Cristo Mountains in the northeastern portion of the County. Grassland communities are primarily characterized by shortgrass prairie, which is relatively sparse and usually occurs on flat to rolling topography at lower elevations. Grasslands may occur as pure herbaceous stands, as a shrubsteppe community, or as a juniper savanna.

Grasslands

Grassland fires have the potential to move quickly under dry, windy, and steep conditions and can easily spread at a surprisingly rapid rate, often reaching over 300 feet per minute. Many authors have suggested that the historical fire-return intervals (FRIs) for grasslands throughout the seventeenth to early nineteenth centuries are thought to have been every 5 to 10 years (Leopold 1924; Swetnam et al. 1992). Fire-suppression policies may have contributed to declining fire frequency in this cover type, but other interacting factors may have contributed as well. About the time of the Civil War, intensive livestock grazing is thought to have been responsible for a decline in grassland fires (Touchan et al. 1996; West 1984). Heavy grazing reduced the fuels 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 lifespans 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 County 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 compared with adjacent ponderosa pine and grassland ecosystems. In a recent review of piñon-juniper disturbance regimes, Romme et al. (2007) has 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, which are subject to different climatic, topographic, and disturbance conditions.

Areas of potential expansion and contraction are those zones wherein the boundaries of the piñon-juniper ecotones have shifted. 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. 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 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 tree expansion are complex as is 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 was 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 are 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. Most scientists agree that fire has been more common in savannas and areas of expansion and contraction than in persistent woodlands, but debate remains on the exact range of fire frequency. Overall, frequent, low-intensity surface fires are not the predominant fire regime in piñon-juniper woodlands. Therefore, fire exclusion may not have altered forest structure as dramatically in this forest type. The degree of departure from historical conditions and the causes of any observed changes remain uncertain; therefore, restoration treatments in woodlands should be approached with caution (Romme et al. 2007).

Ponderosa Pine Forests

In general, studies have found that pre-1900 Mean Fire Intervals (MFIs)—the arithmetic average of all fire frequencies for a specific study site—ranged from 4 to 25 years across the Jemez Mountains and that fire frequencies and areas burned were the greatest in mid-elevation ponderosa pine forests (Allen 2001, Fulé et al. 2003, Grissino-Mayer et al. 2004; Swetnam and Dieterich 1985; Veblen et al. 2000). Ponderosa pine stands, which exist in the higher, steeper elevations within the County, are fire-adapted ecosystems that are maintained by frequent, low-intensity fires. Throughout the Southwest, extensive fire history studies have documented historic fire frequencies in ponderosa pine using tree-ring data (Allen et al. 2002; Richardson 1998). Large variation in the spatial and temporal scales of fires in ponderosa pine was common and was usually based on forcing factors, such as seasonality, regional climate, elevation, aspect, and other site conditions (Brown et al. 2001). The effects of fire exclusion on forest structure are thought to be more 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. Historically, frequent fire would have 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; Covington and Moore 1994; Weaver 1947). In contrast to this historic structure, modern ponderosa stands are often overly dense with an understory of younger trees, increasing the likelihood for a fire to be lifted into the canopy. In areas where canopy spacing is less than 20 feet, there is increased crown fire hazard and potential for long-range spotting, especially in the presence of wind and steep slopes.

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 patches (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 Engelman 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 (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 County exhibit high densities (782–1382 trees/acre), high basal areas (28–39 square meters per hectare [m^2/ha]), continuous canopy cover (52%–61%), and increased woody debris (28–39 m^2/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.

Riparian Communities

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 (*Tamarix* spp.) and Russian olive (*Elaeagnus angustifolia*), 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.

FIRE MANAGEMENT POLICY

The primary responsibility for WUI fire prevention and protection lies with property owners and state and local governments. Property owners must comply with existing state statutes and local regulations. These primary responsibilities should be carried out in partnership with the federal government and private sector areas. The current Federal Fire Policy states that protection priorities are 1) life, 2) property, and 3) natural resources. These priorities often limit flexibility in the decision-making process, especially when a wildland fire occurs within the WUI.

LAWS, ORDINANCES, STANDARDS, AND CODES FOR WILDFIRE PREVENTION

In 2018 the County established a County Fire Code. The Code adopted and modified the 2015 edition of the International Wildland-Urban Interface Code; regulates fireworks and excessive fire alarms; requires fire inspections; provides for fire protection system plan reviews; regulates gates obstructing access to properties; provides for issuance of permits and collection of fees; and repeals several previous Santa Fe County Ordinance related to fire prevention.²⁹

The Fire Code provisions are implemented, administered, and enforced by the Fire Prevention Division of the Santa Fe County Fire Department, under direction of the County Fire Marshall.

²⁹ https://www.santafecountynm.gov/documents/ordinances/Ordinance_2018-8.pdf

FIRE PLANNING

There are a number of existing documents relating to fire management in Santa Fe County. This CWPP is meant to supplement and not replace any other existing plans. See Chapter 2 for information on agency fire management planning and the growing use of spatial fire planning and decision support tools.

EMERGENCY MANAGEMENT PLANNING

Santa Fe County updated their County Hazard Mitigation Plan (HMP) in 2018. This CWPP dovetails with the wildfire section of the HMP by incorporating wildfire hazard mitigations identified in that plan. In the future, the County should consider revising both plans in unison.

LAND MANAGEMENT STRATEGIES

In 2014, New Mexico launched a Watershed Restoration Initiative with a \$6.2 million appropriation for severance tax dollars to treat priority watersheds on public land. Restoration projects under the initiative are planned and implemented with collaboration between the New Mexico State Forestry Division and partnering organizations, including state, federal, tribal and private partners (New Mexico Energy, Minerals, and Natural Resources Department [EMNRD] 2016). In 2018, EMNRD reported that \$13.3 million dollars in state funding for watershed restoration has been spent on public land in New Mexico as a result of the initiative (EMNRD 2018).

The Forestry Division's Forest and Watershed Health Office has been concentrating on three work areas related to forest and watershed health: 1) Supporting collaborations that expand the State's capacity to get more work done on the ground; 2) implementing the National Cohesive Strategy in New Mexico; and 3) using science, policy and legislation to facilitate the Forestry Division mission.

Forest managers in the region are addressing land management objectives through the use of prescribed fire, mechanical and manual treatments to promote more resilient forest lands. Private, state, and federal lands are interspersed creating a matrix of land ownership, which is often a hurdle to implementation of landscape level treatments. By working with private landowners, forest managers are enhancing landscape-scale efforts to create more resilient forest communities.

PUBLIC EDUCATION AND OUTREACH PROGRAMS

Public education and outreach programs are a common factor in virtually every agency and organization involved with the wildfire issue.

Local and State Programs

Santa Fe County

The County and VFDs have held community outreach events and community workdays throughout the County to raise awareness of fire prevention. The County utilizes Firewise and Ready, Set, Go! literature to support these education efforts.

Greater Santa Fe Fireshed Coalition

The Greater Santa Fe Fireshed Coalition works to identify and implement projects to increase community wildfire resilience using a collaborative approach. Collaborators work on large-scale projects to minimize wildfire risk to the water supply, critical infrastructure, and cultural resources in the fireshed. The Coalition recommends preparing for wildfire diligently and remaining alert year-round. Following simple precautions could save homes and lives from fire. The Coalition's suggestions include the following:³⁰

³⁰ <https://www.santafefireshed.org/getready>

- Becoming familiar with the Ready, Set, Go! Wildfire Action Plan (see *National Programs*).
- Watching the City of Santa Fe Fire Department's story map: [Story Map](#)
- Conducting a [Home Hazard Assessment](#)
- Reviewing the City of Santa Fe [Fire Prevention Booklet](#)
- Signing up for the Santa Fe emergency communications: [E911 Alert Santa Fe](#)

More broadly, the Coalition recommends preparing for any emergency by taking the following actions³¹:

- Creating an evacuation bag with a 3-day supply of personal items
- Reviewing the following resources:
 - The Department of Homeland Security's [Ready.gov](#)
 - [Emergency Planning Tips Flyer](#)
 - [Go Kits and Emergency Planning Presentation](#)
 - [The Ready Santa Fe](#) application

If you are interested in becoming a Fireshed ambassador, [click here](#).

New Mexico State Forestry Division

The State Forestry Division employs several fire prevention programs to educate residents and visitors. According to the EMNRD 2018 Annual Report, the Forestry Division has helped facilitate various educational programs including Ready, Set, Go!, Fire Adapted Community concept, and Firewise USA. In 2018, a total of 25 communities throughout the state remain dedicated to the Firewise program. Numerous other communities are in the process of applying (EMNRD 2018). There are currently three communities in Santa Fe County that are certified Firewise.

Additional wildfire prevention efforts include the Living with Fire Guide for the Homeowner, New Mexico. This publication has been updated for 2018 incorporating the Fire Adapted Community concept in partnership with the University of Nevada Extension, Bureau of Land Management, USFS, Department of Homeland Security, Bureau of Indian Affairs, and NPS (EMNRD 2018).

Bureau of Land Management

The BLM New Mexico conducts fire prevention and education programs and coordinates interagency fire messaging throughout the state and within the Southwest Geographic Area. This includes broad and targeted public messaging via social media, traditional media, and interagency prevention and mitigation publications with cooperators such as the recent revisions of Ready, Set, Go and NM Living with Fire. This also includes the funding and maintenance of the primary interagency fire information site in the state, NMFIREInfo.com. Through a partnership with the New Mexico Counties, the BLM funds the Wildfire Risk Reduction Grant Program that includes awards for education and outreach, CWPPs and fuels reduction projects to local government, tribes and non-profit entities. In addition, BLM provides support to the Fire Adapted New Mexico Learning Network and has provided support to the Greater Santa Fe Fireshed Coalition through grants. Also, in the County, BLM regularly engages in STEM events and other outreach opportunities. Informational tools and regulatory signing are posted in popular recreation locations of the County to prevent wildfires.

³¹ <https://www.santafefireshed.org/emergency>

National Programs

Ready, Set, Go!

The Ready, Set, Go! Program, which is managed by the International Association of Fire Chiefs, was launched in 2011 at the WUI conference. The program seeks to develop and improve the dialogue between fire departments and residents, providing teaching for residents who live in high-risk wildfire areas—and the WUI—on how to best prepare themselves and their properties against fire threats (Ready, Set, Go! 2016). The County utilizes the Ready, Set, Go Program for their public outreach with a focus on making communities “fire adapted”. Specific Ready, Set, Go information has been developed for the County.^{32 33}

The tenets of Ready, Set, Go! as included on the website (<http://www.wildlandfirersg.org>) are:

Ready – Take personal responsibility and prepare long before the threat of a wildland fire so your home is ready in case of a fire. Create defensible space by clearing brush away from your home. Use fire-resistant landscaping and harden your home with fire-safe construction measures. Assemble emergency supplies and belongings in a safe place. Plan escape routes and ensure all those residing within the home know the plan of action.

Set – Pack your emergency items. Stay aware of the latest news and information on the fire from local media, your local fire department, and public safety.

Go – Follow your personal wildland fire action plan. Doing so will not only support your safety but will allow firefighters to best maneuver resources to combat the fire.

Parameters for developing defensible space around a home are described in the County Ready, Set, Go Guide and are illustrated in Figure A.9. Three zones for defensible space actions are described. These include:

Zone 1 This zone, which consists of an area of 0 to 30 feet around the structure, features the most intense modification and treatment. This distance is measured from the outside edge of the home’s eaves and any attached structures, such as decks. Do not plant directly beneath windows or next to foundation vents. Frequently prune and maintain plants in this zone to ensure vigorous growth and a low growth habit. Remove dead branches, stems, and leaves. Do not store firewood or other combustible materials in this area. Enclose or screen decks with metal screening. Extend gravel coverage under the decks. Do not use areas under decks for storage. Prune low-lying branches (ladder fuels that would allow a surface fire to climb into the tree) and any branches that interfere with the roof or are within 10 feet of the chimney. In all other areas, prune all branches of shrubs or trees up to a height of 10 feet above ground (or 1/3 the height, whichever is the least).

Zone 2 This zone features fuel reduction efforts and serves as a transitional area between Zones 1 and 3. The size of Zone 2 depends on the slope of the ground where the structure is built. Typically, the defensible space should extend at least 100 feet from the structure. Remove stressed, diseased, dead, or dying trees and shrubs. Thin and prune the remaining larger trees and shrubs. Be sure to extend thinning along either side of your driveway all the way to your main access road. These actions help eliminate the continuous fuel surrounding a structure while enhancing home site safety and the aesthetics of the property. Keep grass and wildflowers under 8 inches in height. Regularly remove leaf and needle debris from the yard.

Zone 3 This area extends from the edge of your defensible space to your property boundaries. The healthiest forest is one that has multiple ages, sizes, and species of trees where adequate growing room is maintained over time, so maintain a distance of at least 10 feet between the tops of trees. Remove ladder fuels, creating a separation between low-level vegetation and tree branches to keep fire

³² Santa Fe County Ready, Set, Go: <https://www.santafecountynm.gov/media/files/SantaFeRSGGuide2017.pdf>

³³ Ready, Set, Go, Santa Fe Fireshed- You Tube: <https://www.youtube.com/watch?v=JFXoaKa72bA>

from climbing up trees. A greater number of wildlife trees can remain in Zone 3, but regularly remove dead trees and shrubs. Ensure trees in this area do not pose a threat to power lines or access roads.

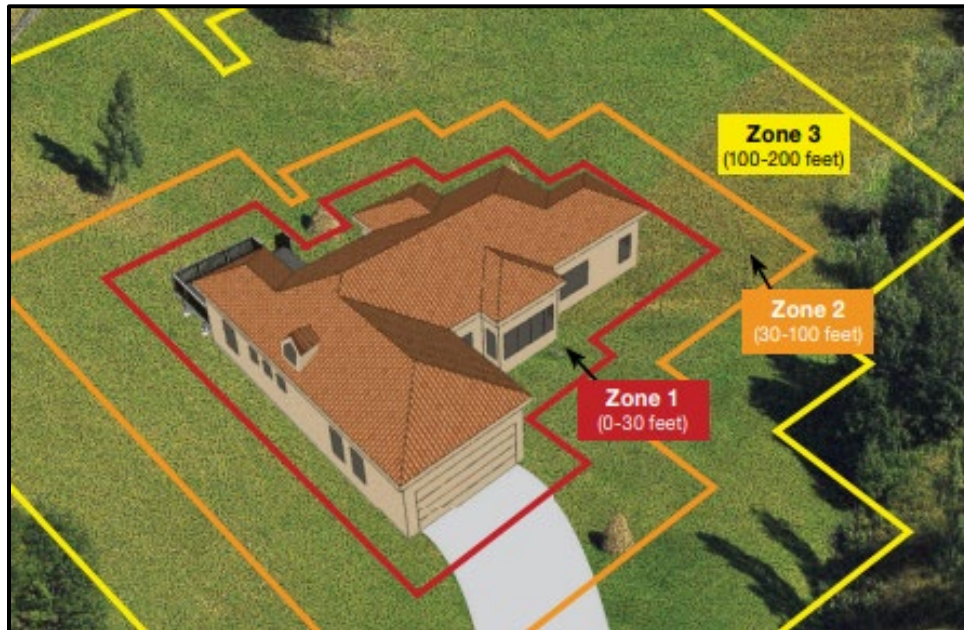


Figure A.9. Defensible Space Zones.

Source: Santa Fe County Ready, Set, Go Guide (2017).

National Fire Protection Association

The NFPA is a global non-profit organization devoted to eliminating death, injury, property, and economic loss due to fire, electrical, and related hazards. Its 300 codes and standards are designed to minimize the risk and effects of fire by establishing criteria for building, processing, design, service, and installation around the world.

The NFPA develops easy-to-use educational programs, tools, and resources for all ages and audiences, including Fire Prevention Week, an annual campaign that addresses a specific fire safety theme. The NFPA's Firewise Communities program (www.firewise.org) encourages local solutions for wildfire safety by involving homeowners, community leaders, planners, developers, firefighters, and others in the effort to protect people and property from wildfire risks.

The NFPA is a premier resource for fire data analysis, research, and analysis. The Fire Analysis and Research division conducts investigations of fire incidents and produces a wide range of annual reports and special studies on all aspects of the nation's fire problem.

U.S. Fire Administration's WUI Toolkit

The U.S. Fire Administration (USFA) is an entity of the U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA) that aids in the preparation for and response to fire. Their WUI toolkit consists of a list of websites and other information regarding risk assessment, public outreach, and community training. Find the toolkit here: https://www.usfa.fema.gov/wui_toolkit/wui_training.html.

RISK ASSESSMENT COMPONENTS

FIRE BEHAVIOR MODELS

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 USFS and the USDI 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. 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 SCCWPP to predict fire behavior across the landscape under extreme (97% worst case) weather scenarios. For this CWPP assessment, the model was run within the Interagency Fuel Treatment Decision Support System (IFTDSS) modeling platform.

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 surface fire spread equations, and each vegetation and litter type is broken down into 40 fuel models.

The general classification of fuels is by fire-carrying fuel type (Scott and Burgan 2005):

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

Table A.4 provides a description of each fuel type.

Map 1 in Appendix B illustrates the fuels classification throughout the planning area.

Table A.4. Fuel Model Classification for SCCWPP Planning Area

1. Nearly pure grass and/or forb type (Grass)	
i.	GR1: Grass is short, patchy, and possibly heavily grazed. Spread rate is moderate (5–20 chains/hour); flame length low (1–4 feet); fine fuel load (0.40 ton/acre).
ii.	GR2: Moderately coarse continuous grass, average depth about 1 foot. Spread rate high (20–50 chains/hour); flame length moderate (4–8 feet); fine fuel load (1.10 tons/acre).
iii.	GR3: Very coarse grass, average depth 2 feet. Spread rate high (20–50 chains/hour); flame length moderate (4–8 feet).
iv.	GR4: Moderately coarse continuous grass, average depth 2 feet. Spread rate very high (50–150 chains/hour); flame length high (8–12 feet).
2. Mixture of grass and shrub, up to about 50% shrub cover (Grass-Shrub)	
i.	GS1: Shrubs are about 1 foot high, low grass load. Spread rate moderate (5–20 chains/hour); flame length low (1–4 feet); fine fuel load (1.35 tons/acre).
ii.	GS2: Shrubs are 1–3 feet high, moderate grass load. Spread rate high (20–50 chains/hour); flame length moderate (4–8 feet); fine fuel load (2.1 tons/acre).
3. Shrubs cover at least 50% of the site; grass sparse to non-existent (Shrub)	
i.	SH1: Low fuel load, depth about 1 foot, some grass fuels present. Spread rate very low (0–2 chains/hour); flame length very low (0–1 feet).
ii.	SH2: Moderate fuel load (higher than SH1), depth about 1 foot, no grass fuels present. Spread rate low (2–5 chains/hour); flame length low (1–4 feet); fine fuel load (5.2 tons/acre).
iii.	SH5: Heavy shrub load. Fuel bed depth 4–6 feet. Spread rate very high (50–150 chains/hour), flame length very high (12–25 feet).
iv.	SH7: Very heavy shrub load, possibly with pine overstory. Fuel bed depth 4–6 feet. Spread rate high (20–50 chains/hour); flame length very high (12–25 feet).
4. Grass or shrubs mixed with litter from forest canopy (Timber-Understory)	
i.	TU1: Fuel bed is low load of grass and/or shrub with litter. Spread rate low (2–5 chains/hour); flame length low (1–4 feet); fine fuel load (1.3 tons/acre).
ii.	TU5: Fuel bed high load conifer with shrub understory. Spread rate moderate (5–20 chains/hour); flame length moderate (4–8 feet).
5. Dead and downed woody fuel (litter) beneath a forest canopy (Timber Litter)	
i.	TL1: Low to moderate load, fuels 1–2 inches deep. Spread rate very low (0–2 chains/hour); flame length very low (0–1 foot).
ii.	TL2: Low load, compact. Spread rate very low (0–2 chains/hour); flame length very low (0–1 foot).
iii.	TL3: Moderate load. Spread rate very slow (0–2 chains/hour); flame length low (1–4 foot); fine fuel load (0.5 ton/acre).
iv.	TL4: Moderate load. Spread rate very slow (0–2 chains/hour); flame length low (1–4 foot).
v.	TL5: High load conifer litter. Spread rate slow (2–5 chains/hour); flame length low (1–4 foot).
vi.	TL6: Moderate load. Spread rate moderate (5–20 chains/hour); flame length low (1–4 foot).
vii.	TL7: Heavy load. Spread rate low (2–5 chains/hour); flame length low (1–4 feet).
viii.	TL8: Long needle litter; long needle fuel. Spread rate moderate (5–20 chains/hour); flame length low (1–4 feet).
6. Insufficient wildland fuel to carry wildland fire under any condition (Non-burnable)	
i.	NB1: Urban or suburban development; insufficient wildland fuel to carry wildland fire.
ii.	NB3: Agricultural field, maintained in non-burnable condition.
iii.	NB8: Open water.

Notes: Based on Scott and Burgan's (2005) 40 Fuel Model System.

Topography

Topography is important in determining fire behavior. Steepness of slope, aspect (direction the slope faces), elevation, and landscape features can all affect fuels, local weather (by channeling winds and affecting local temperatures), and rate of spread of wildfire. There are some steep slopes in Santa Fe County that would influence fire behavior and spread.

Weather

Of the three fire behavior components, weather is the most likely to fluctuate. Accurately predicting fire weather remains a challenge for forecasters. As winds and rising temperatures dry fuels in the spring and summer, conditions can deteriorate rapidly, creating an environment that is susceptible to wildland fire. Fine fuels (grass and leaf litter) can cure rapidly, making them highly flammable in as little as 1 hour following light precipitation. Low live fuel moistures of shrubs and trees 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, improving their ability to suppress 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 (NWCG 2012), a fire weather database maintained by the NWCG. A remote automated weather station was selected (Burro Mountain 292504), and data were downloaded from the website.

Using an additional fire program (FireFamily Plus) with the remote automated weather station data, weather files that included prevailing wind direction (Table A.5, Figure A.10) 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; 95 to 100 percentile weather is used to predict the most extreme scenarios for fire behavior.

Table A.5. Weather Parameters Used in the Fire Behavior Model

Parameter	Low	Moderate	High	Extreme
Percentile range	0–15	16–85	86–94	95–100
1-hour fuel moisture	8.26	3.49	1.56	0.99
10-hour fuel moisture	9.40	4.01	1.99	1.45
100-hour fuel moisture	13.96	6.10	3.69	3.28
Herbaceous fuel moisture	47.88	19.62	20.25	25.15
Woody fuel moisture	114.08	60.91	60.00	60.00
1,000-hour fuel moisture	14.52	6.73	5.53	4.96
20-foot wind speed	8.10	13.27	12.60	11.67

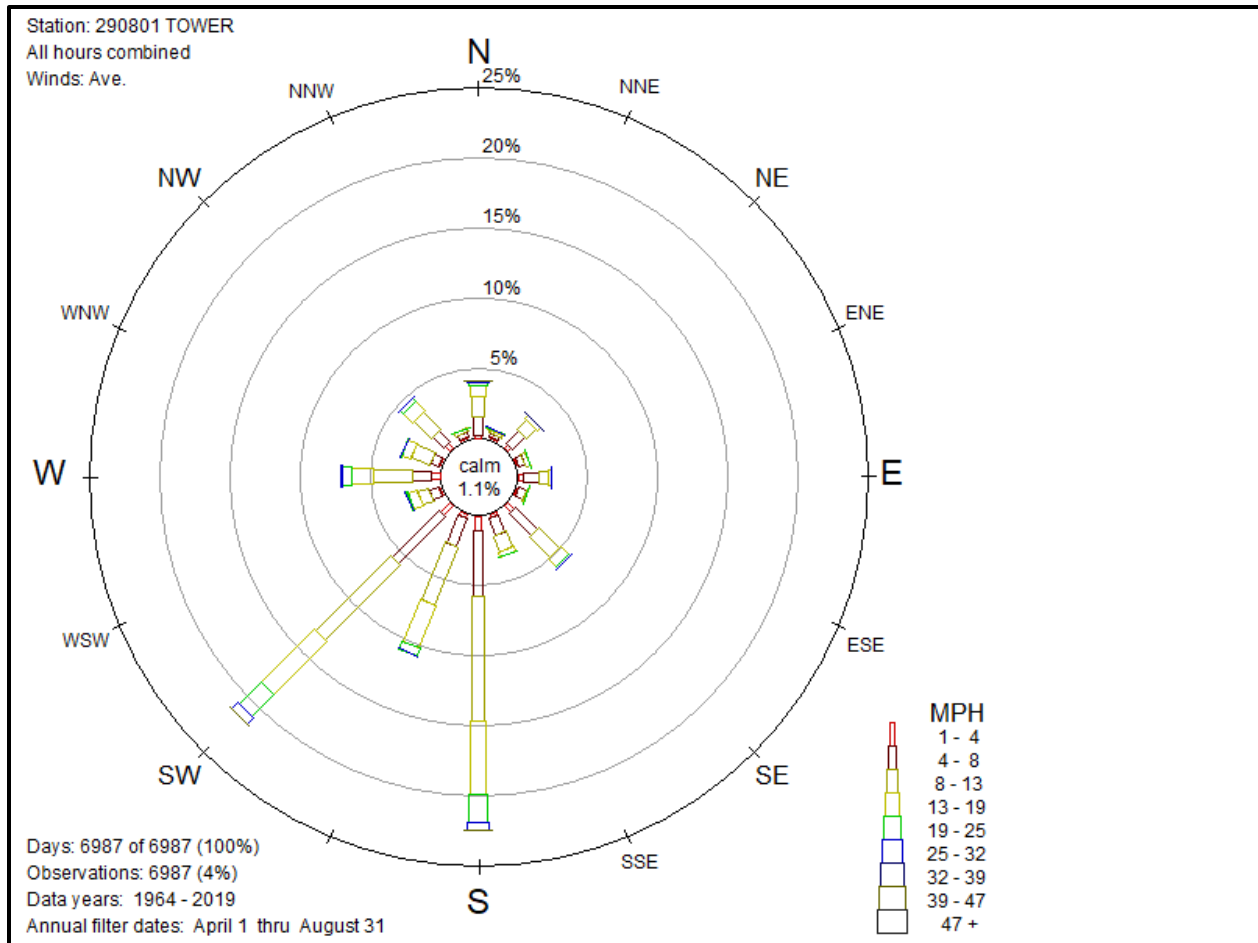


Figure A.10. Wind Rose used in the fire behavior modelling in FlamMap.

FIRE BEHAVIOR MODEL OUTPUTS

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

Flame Length

Map 2 in Appendix B illustrates the flame length classifications for the planning area. Flame lengths are determined by fuels, weather, and topography. Flame length is a particularly important component of the risk assessment because it relates to potential crown fire (particularly important in timber areas) and suppression tactics. Direct attack by hand lines is usually limited to flame lengths less than 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 with flame lengths in excess of 8 feet.

Flame lengths across the planning area range from 0 to more than 11 feet. The highest flame lengths are associated with the timber fuels found in the higher elevations in the north east corner of the County.

Fireline Intensity

Map 3 in Appendix B 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). This is a good measure of intensity and is used for planning suppression activities. The expected fireline intensity throughout the planning area is similar in pattern to predicted flame length, as fireline intensity is a function of flame length. The pattern for fireline intensity is

similar to flame length in that intensities range from low (less than 100 Btu/ft/sec) through moderate (100–500 Btu/ft/sec) high and extreme intensity (greater than 500 Btu/ft/sec), which tend to be associated with areas dominated by tall shrub and timber fuel loads.

Rate of Spread

Map 4 in Appendix B illustrates the rate of spread classifications for the planning area. The rates of spread in the project area range from 0 to 5 chains/hour up to 50 chains/hour. Low rates of spread are associated with timber dominated areas, while moderate and high rates of spread are associated with grass and shrub fuels. Agricultural areas are modelled with low rate of spread; however, these fuel types can also pose a severe hazard during certain times of the year (prior to harvest or following harvest when residual materials remain) and are often areas of ignition through human activity such as agricultural burning practices.

Crown Fire Potential

Map 5 in Appendix B illustrates the range of crown fire activity from surface fire (in grass-dominated areas) to passive and active crown fire (in timber dominated fuels).

Fire Occurrence/Density of Starts

Map 6 in Appendix B illustrates the fire occurrence density for the planning area. Fire occurrence density has been determined by performing a density analysis on fire start locations with ArcGIS Desktop Spatial Analyst. These locations have been provided by the USFS, NMSF, and fire departments in Santa Fe County, and when combined the points show the location of fire starts within the planning area from 1970 to 2020. The density analysis has been performed as a kernel density, using a 2,500-meter search radius. The density of previous fire starts is used to determine the risk of ignition of a fire. Map 6 in Appendix B reveals a cluster pattern of fires in the northeast corner of the County, associated with forested areas and USFS land. Some fire occurrence clusters at intersections and along highways.

The fire occurrence maps are used to provide information on areas where human-ignited fires are prevalent and hence could be more prone to fire in the future and where there are a higher density of lightning ignitions due to topographic conditions and receptive forest fuels.

Composite Hazard Assessment Model

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

All fire parameter datasets have been converted to a raster format (a common GIS data format comprising a grid of cells or pixels, with each pixel containing a single value). The cell size for the data is 30 × 30 meters (98 × 98 feet). Each of the original cell values have been 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 datasets, each of the input parameters have been weighted; that is, they are assigned a percentage value reflecting that parameter's importance in the model. The parameters were then placed into a Weighted Sum Model, which "stacks" each geographically aligned dataset and evaluates an output value derived from each cell value of the overlaid dataset in combination with the weighted assessment. In a Weighted Sum Model, the weighted values of each pixel from each parameter dataset are added together so that the resulting dataset contains pixels with summed values of all the parameters. This method ensures that the model resolution is maintained in the results and thus provides finer detail and range of values for denoting fire risk.

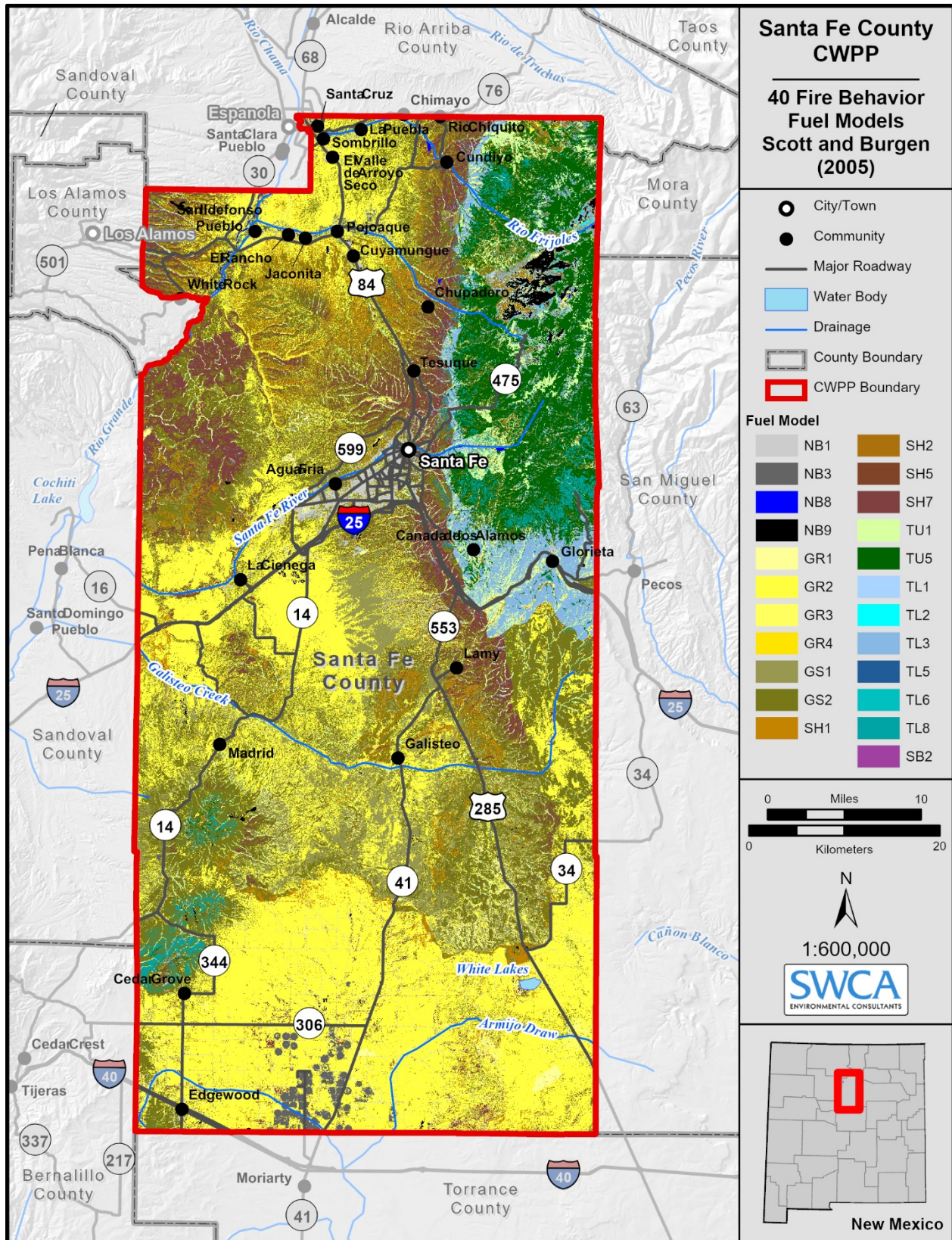
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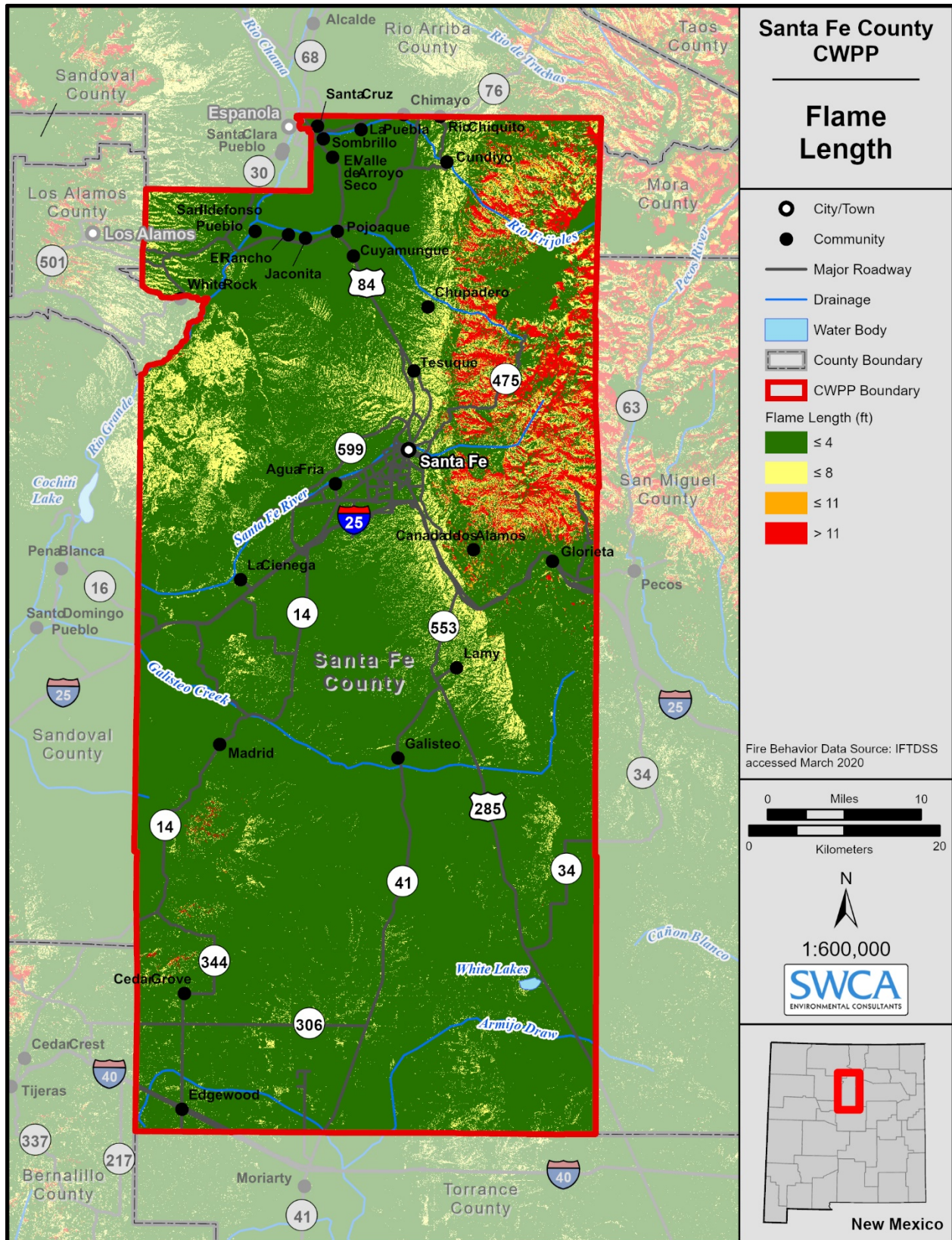
APPENDIX B:

Maps

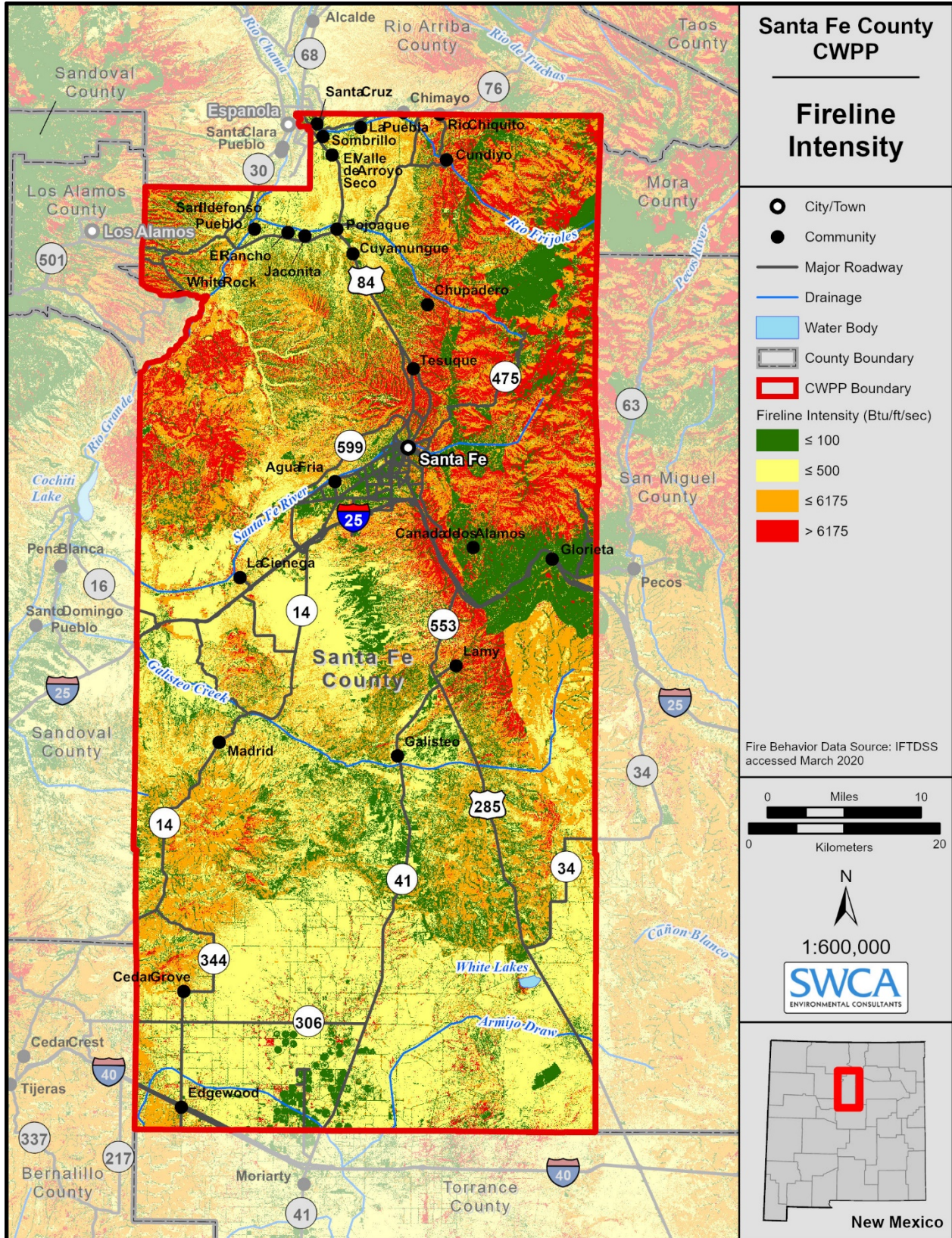
SCA



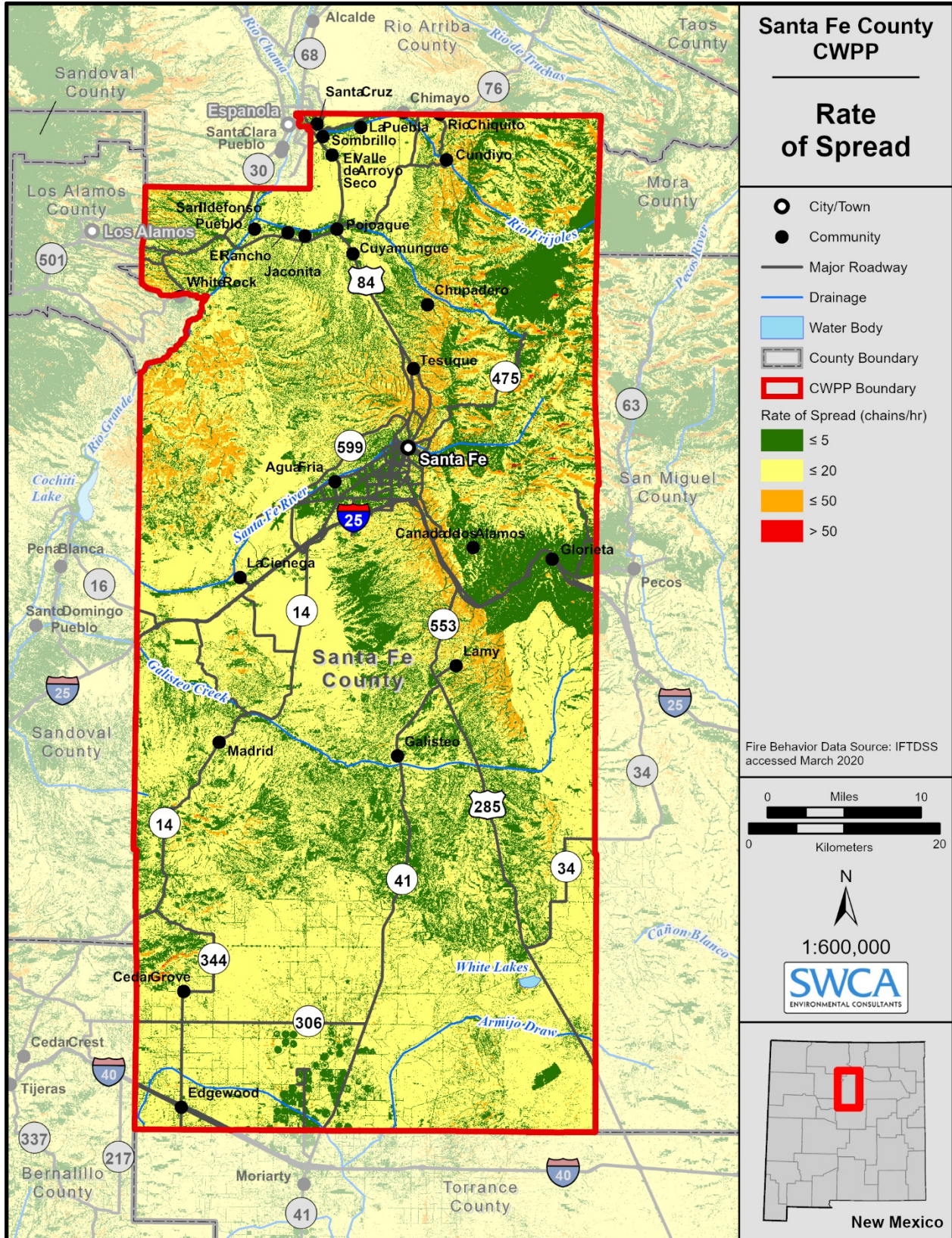
Map 1. Scott and Burgan 40 Fire Behavior Fuel Models.



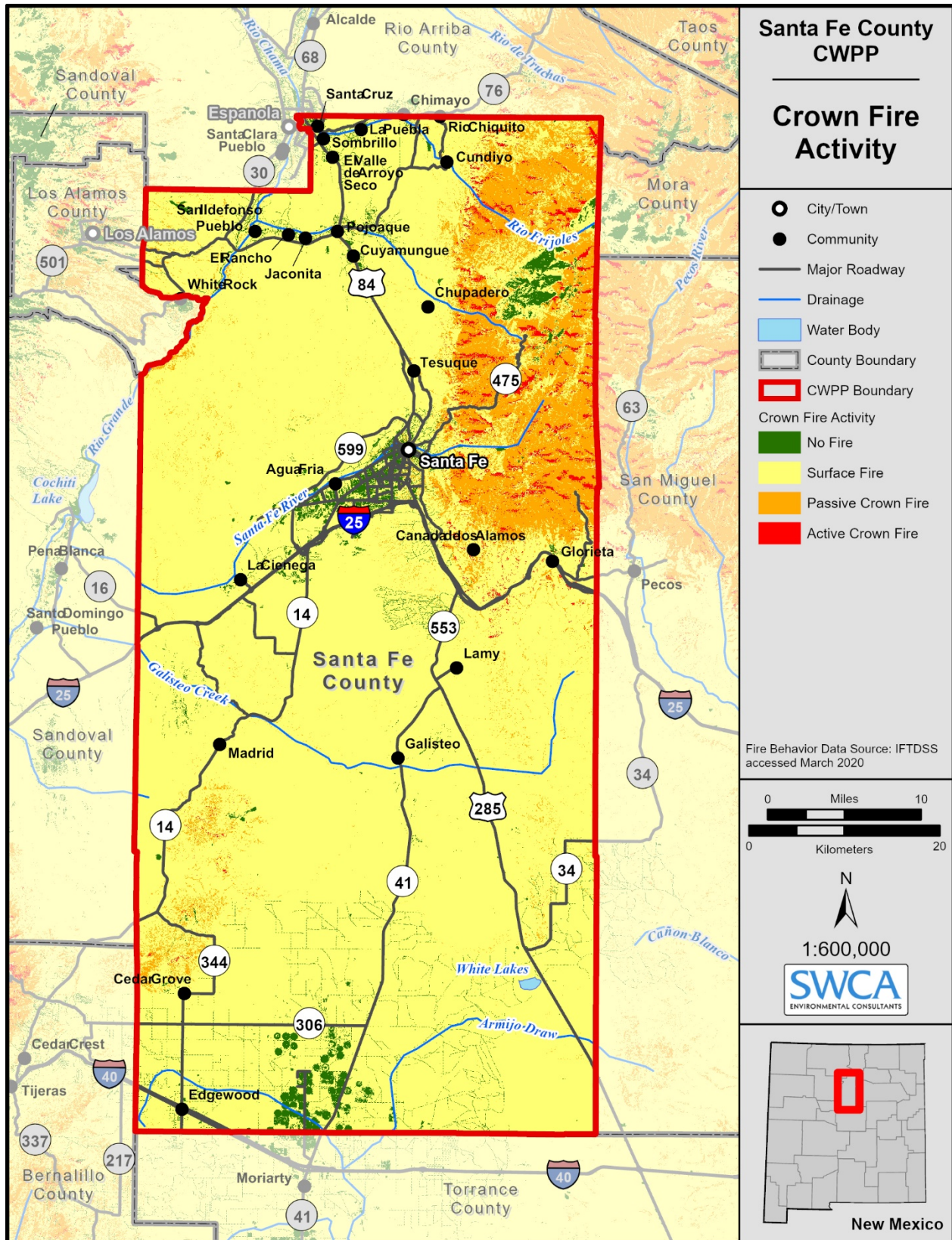
Map 2. Risk assessment inputs: flame length.



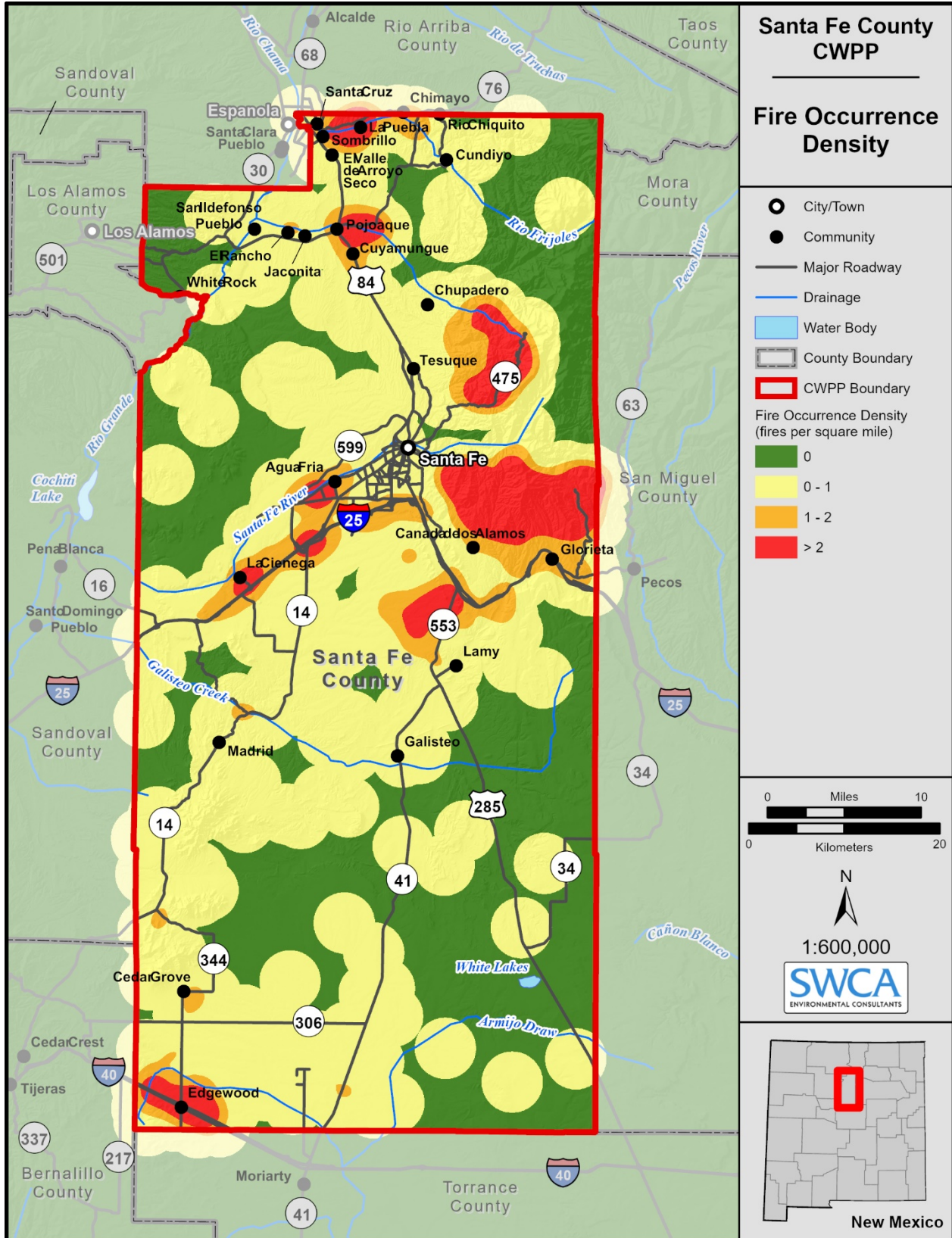
Map 3. Risk assessment inputs: fireline intensity.



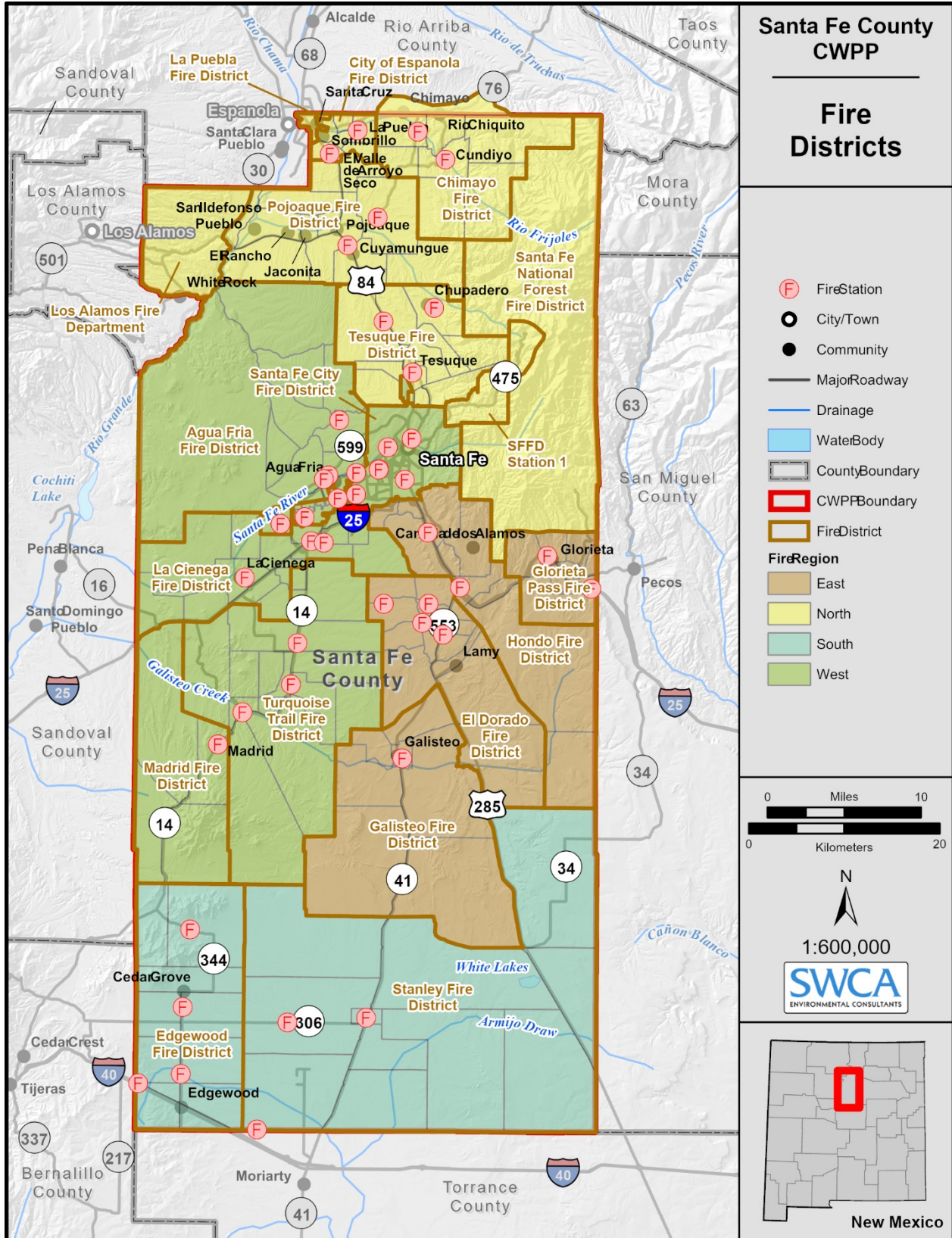
Map 4. Risk assessment inputs: rate of spread.



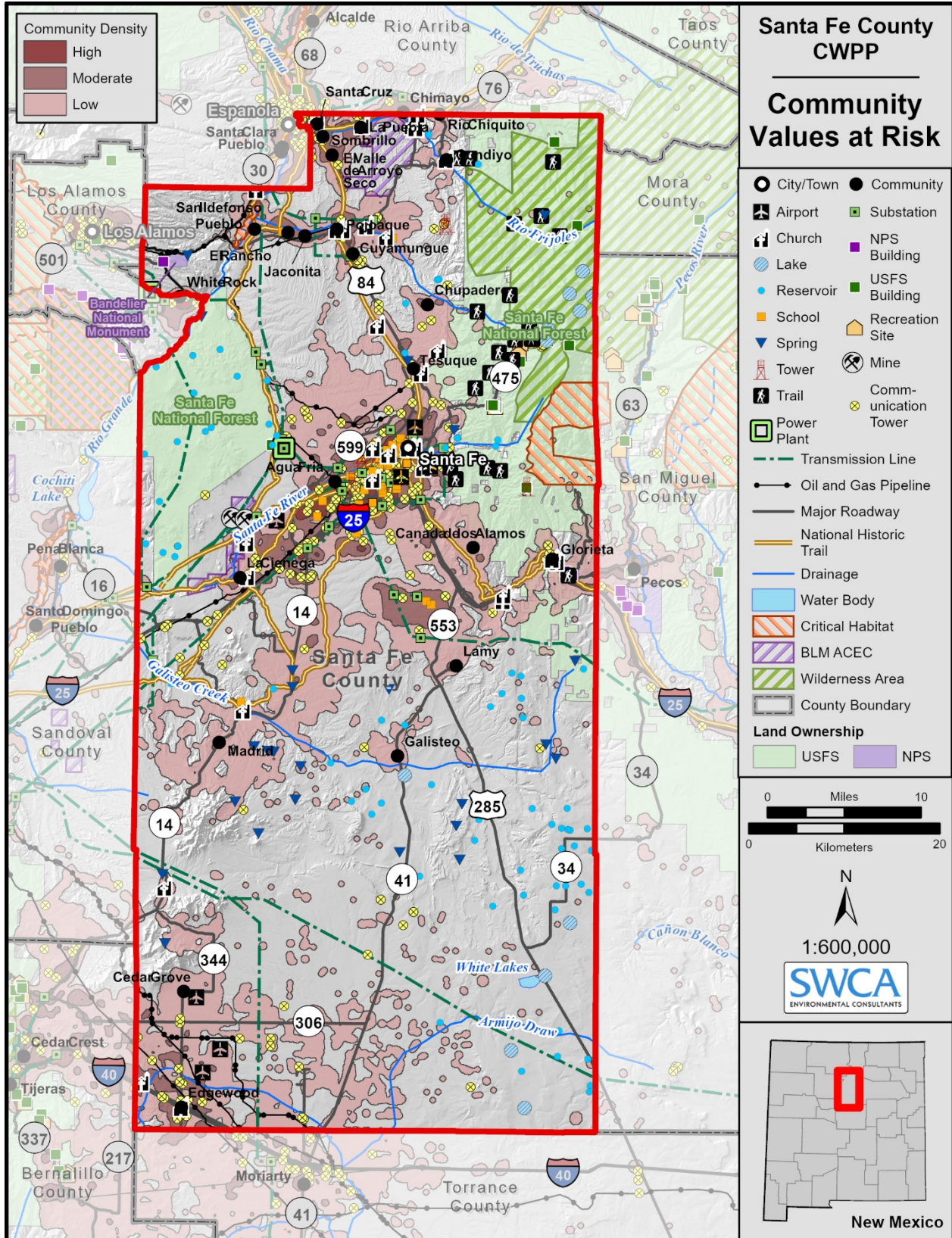
Map 5. Risk assessment inputs: Crown Fire activity.



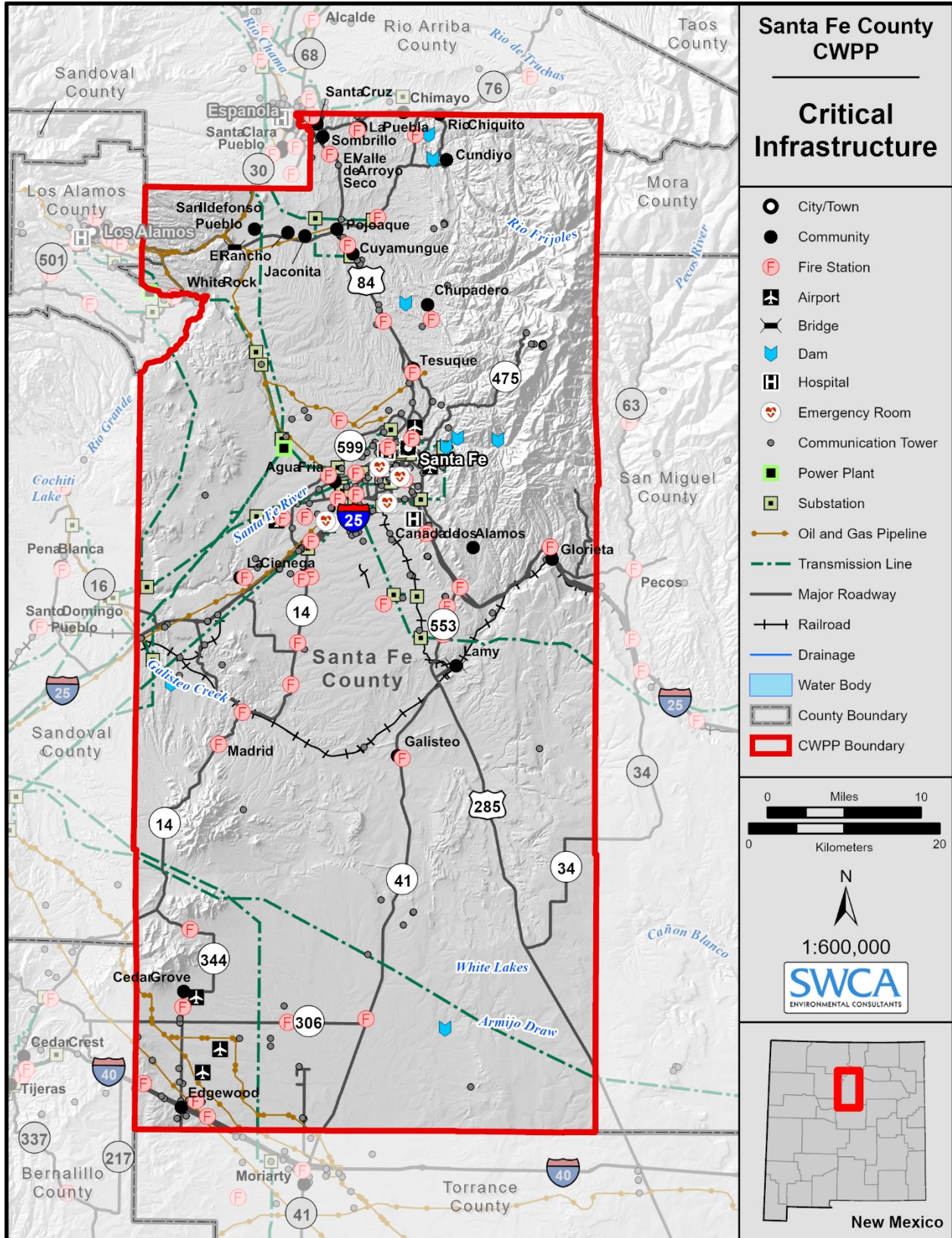
Map 6. Risk assessment inputs: fire occurrence density.



Map 7. Fire district boundaries.



Map 8. Community Values at Risk.



Map 9. Critical infrastructure.

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CLAS

APPENDIX C:

Core Team List

SCA

Name	Organization
Captain Michael Feulner	Santa Fe County Fire Department
Remington Gillum	Santa Fe County Fire Department
Captain Martin Vigil	Santa Fe County
Porfirio Chavarria	City of Santa Fe Fire Department
Carlos Saiz	City of Santa Fe Fire Department
Greg Gallegos	City of Santa Fe Fire Department
Dennis Carril	United States Forest Service
David Isackson	United States Forest Service
Teresa Rigby	Bureau of Land Management
Robert Brown	New Mexico State Forestry
Randy Baker	Bureau of Indian Affairs
Erik Litzenberg	Santa Fe County
Brenda Smythe	Edgewood Soil & Water Conservation District
Kelly Smith	Edgewood Soil & Water Conservation District
Todd Haines	New Mexico State Forestry
Victoria Amato	SWCA Environmental Consultants
Cody Stropki	SWCA Environmental Consultants
Anne Russell	SWCA Environmental Consultants
Arianna Porter	SWCA Environmental Consultants

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WASH STATE

APPENDIX D:

Community Descriptions and Hazard Ratings

SCA

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SANTA FE COUNTY WILDLAND URBAN INTERFACE COMMUNITIES

La Puebla Fire District

Sombrillo and Cuartelez

LEGAL: Santa Cruz Land Grant

DESCRIPTIVE LOCATION: 2 miles east of Espanola

VEGETATION FUELS: bosque fuels

POPULATION: 1,107

NUMBER OF LOTS: 1,105

CONSTRUCTION MATERIALS: varies

ROOF: varies

TERRAIN: flat river bottom **SLOPE:**0-5% **ASPECT:**

ACCESS: Hwys 76 and 106 out of Espanola

ROADS: Hwy 76, Hwy 106, Sombrillo Road

BRIDGES: Bridge on HWY 88 that goes south out of Cuarteles

DRIVEWAYS: narrow and mostly unmarked

WATER AVAILABILITY: pressurized hydrants are in community

CLOSEST FIRE DEPARTMENT: (in miles): >1 mile to La Puebla Fire Station 1

VALUES AT RISK: Residential structures, churches, schools, commercial businesses

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$83,817,506.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 70- Medium



Figure D.1. Sombrillo residence, within some thick vegetation.



Figure D.2. Google Earth Imagery showing the road layout and residential density within the Sombrillo and Cuartelez communities.

Chimayo Fire District

Chimayo

LEGAL: Santa Cruz Land Grant

DESCRIPTIVE LOCATION: Located 30 miles north of Santa Fe off Hwy 76 east of Espanola

VEGETATION FUELS: Bosque fuels

POPULATION: 3,177

NUMBER OF LOTS: 717

CONSTRUCTION MATERIALS: varies

ROOF: varies

TERRAIN: flat to rolling hills **SLOPE:** 0-20% **ASPECT:** All

ACCESS: HWY 76 East from Espanola for 6 miles

ROADS: Highway 76, numerous side roads

BRIDGES: 4 bridges on RA 99, RA 97, RA 94, and Shadow Ln, with limit restrictions.

DRIVEWAYS: narrow and poorly marked with limited to no signage

WATER AVAILABILITY: Limited hydrants on main road through town (Hwy 76)

CLOSEST FIRE DEPARTMENT: (in miles): >1 miles from Chimayo Fire Station 1. The northern portion of the community falls in Rio Arriba County; however, Santa Fe County provide fire response.

VALUES AT RISK: Residential structures, commercial businesses, infrastructure, tourism, cultural heritage, historic structures, churches.

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$30,852,603.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 69- Medium



Figure D.3. Google Earth Imagery showing the road layout and residential density in and around Chimayo.

Cundiyo

LEGAL: Section 17 T20N R10E

DESCRIPTIVE LOCATION: 30 miles north of Santa Fe

VEGETATION FUELS: piñon-juniper, bosque fuels, agricultural

POPULATION: 110

NUMBER OF LOTS: 140

CONSTRUCTION MATERIALS: varies

ROOF: varies

TERRAIN: Rolling hills **SLOPE:** 0-15% **ASPECT:**

ACCESS: 30 miles north of Santa Fe off Hwy 503. Roads narrow in places through town.

ROADS: Cundiyo Road, Highway 503

BRIDGES: One on SR 503

DRIVEWAYS: narrow and poorly marked

WATER AVAILABILITY: some pressurized hydrants in town

CLOSEST FIRE DEPARTMENT: (in miles): In Cundiyo, <1 mile located at #5 Jose Simon Drive

VALUES AT RISK: Santa Cruz Lake, agricultural lands, historic structures.

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$7,508,405.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 62- Medium



Figure D.4. Google Earth road view, showing narrow road widths in the community.

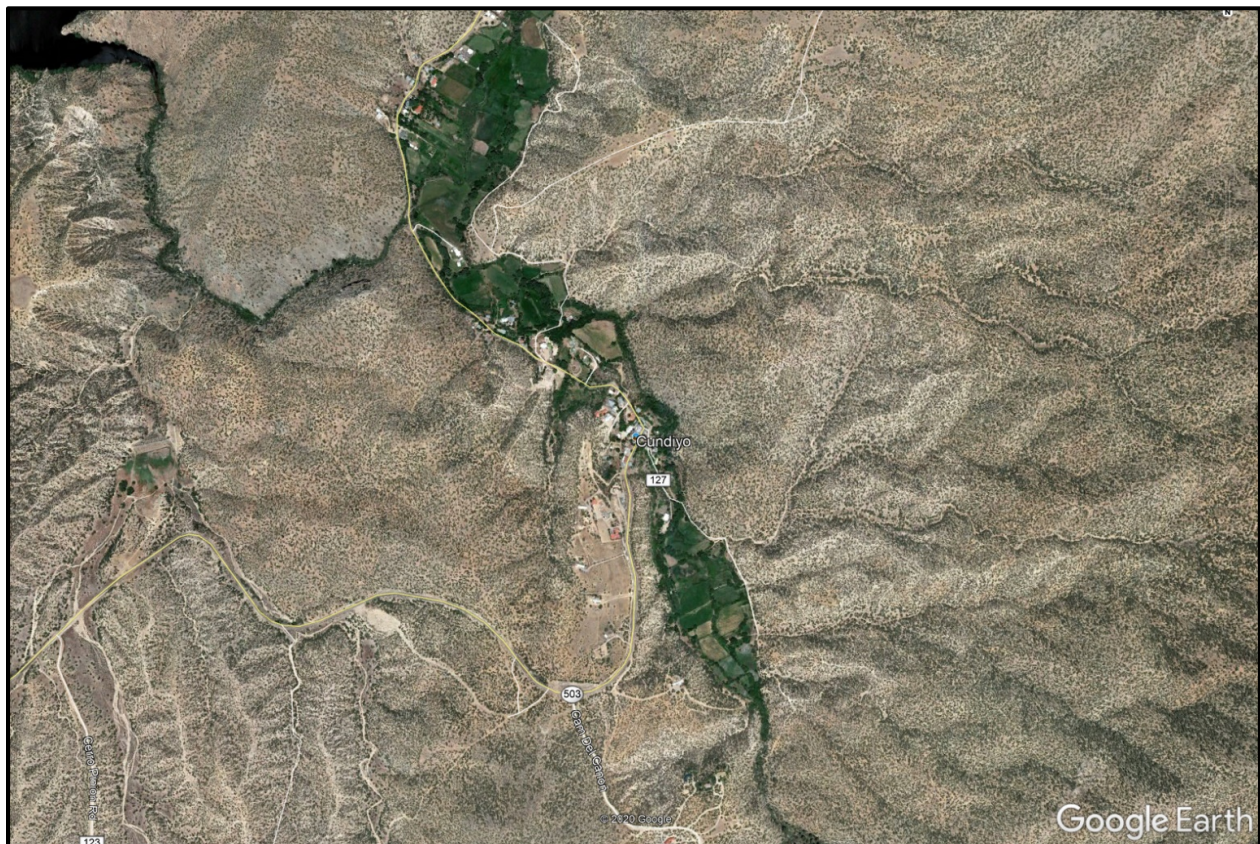


Figure D.5. Google Earth Imagery showing the road layout and residential density within the Cundiyo community.

Tesuque Fire District

Tesuque Village

LEGAL: Section 25 T18N R09E- Tesuque Village.

DESCRIPTIVE LOCATION: Located 6 miles north of Santa Fe on the east side of HWY 285.

VEGETATION FUELS: Bosque fuels, piñon-juniper

POPULATION: 1,004

NUMBER OF LOTS: 748

CONSTRUCTION MATERIALS: varies

ROOF: varies

TERRAIN: flat **SLOPE:** 0-10% **ASPECT:**

ACCESS: HWY 285 North from Santa Fe

ROADS: HWY 285, Bishops Lodge Road, Tesuque Village Road

BRIDGES: none

DRIVEWAYS: Narrow and poorly marked, many areas with dense vegetation over driveway

WATER AVAILABILITY: limited hydrants in town, Tesuque Reservoir north of town

CLOSEST FIRE DEPARTMENT: (in miles): 0 miles to Tesuque Fire Station 1

VALUES AT RISK: Residential structures, commercial businesses, historic structures, watershed values.

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$255,716,544.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 69- Medium



Figure D.6. There are a number of commercial businesses located within Tesuque Village.



Figure D.7. Google Earth Imagery showing the road layout and residential density within Tesuque Village.

Chupadero

LEGAL: Section 16 T18N R10E

DESCRIPTIVE LOCATION: 13 miles north of Santa Fe

VEGETATION FUELS: piñon-juniper, bosque fuels

POPULATION: 594

NUMBER OF LOTS: 650

CONSTRUCTION MATERIALS: varies

ROOF: varies

TERRAIN: river bottoms to slight slopes **SLOPE:** 0-20% **ASPECT:** S-SW

ACCESS: via Highway 84 and 592, both surfaced roads.

ROADS: Camino Chupadero, Hwy 592

BRIDGES: none

DRIVEWAYS: most homes situated off Camino Chupadero, narrow with limited space to turnaround

WATER AVAILABILITY: possibly draft from Rio En Medio

CLOSEST FIRE DEPARTMENT: (in miles): 0 miles to Tesuque Fire Station 2

VALUES AT RISK: Rio En Medio and Trail Head

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$153,324,797.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 70- Medium



Figure D.8. Google Earth Street View image, showing residences within the community of Chupadero.



Figure D.9. Google Earth Imagery showing the road layout and residential density within the Chupadero community.

Pacheco Canyon

LEGAL: Section 16 T18N R10E

DESCRIPTIVE LOCATION: Pacheco Canyon is located 13 miles north of Santa Fe

VEGETATION FUELS: piñon-juniper, ponderosa pine, mixed conifer, bosque fuels

POPULATION: 77

NUMBER OF LOTS: 143

CONSTRUCTION MATERIALS: varies

ROOF: varies

TERRAIN: rugged **SLOPE:** 0-40% **ASPECT:** N-NE

ACCESS: Pacheco Canyon Road

ROADS: Pacheco Canyon Road, Vista del Canon

BRIDGES: none

DRIVEWAYS: off Pacheco Canyon Road, some with gates

WATER AVAILABILITY: canyon bottom may have water that can be drafted

CLOSEST FIRE DEPARTMENT: (in miles): 3 miles from Tesuque Fire Station 2

VALUES AT RISK: residential structures (sparse), watershed values

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$25,921,740.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 95- High



Figure D.10. Mixed fuel types within Pacheco Canyon, note the riparian habitat at the bottom of the canyon with densely vegetated slopes above.



Figure D.11. Google Earth Imagery showing the road layout and residential density along Pacheco Canyon Road.

Tano Road

LEGAL: Section 02 T17N R09E

DESCRIPTIVE LOCATION: Located off HWY 599 just north of Santa Fe

VEGETATION FUELS: piñon-juniper

POPULATION: 786

NUMBER OF LOTS: 1676

CONSTRUCTION MATERIALS: wood frame and stucco

ROOF: flat and metal

TERRAIN: rolling hills, variable slopes, steep grades in places **SLOPE:** 5-40% **ASPECT:** S-SE

ACCESS: Accessed via Highway 599. Surfaced roads

ROADS: Tano Road

BRIDGES: none

DRIVEWAYS: most off Tano Road and side streets, large gated driveways are common. Many have turnarounds

WATER AVAILABILITY: limited

CLOSEST FIRE DEPARTMENT: (in miles): 4 miles from Tesuque Fire Station 1

VALUES AT RISK: Residential structures, watershed values

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$243,126,387.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 96- High



Figure D.12. Homes off Tano Road mixed into the heavy fuels.



Figure D.13. Google Earth Imagery showing the road layout and residential density along Tano Road.

Santa Fe City Fire District

Hyde Park

LEGAL: Section 09 T17N R10E

DESCRIPTIVE LOCATION: North from Santa Fe on Hyde Park Road towards the Santa Fe Ski area

VEGETATION FUELS: piñon-juniper (open and closed canopy), ponderosa pine, mixed conifer

POPULATION: 253

NUMBER OF LOTS: 205

CONSTRUCTION MATERIALS: wood framed and stucco, mostly high-end houses

ROOF: varies from flat to metal pitched to composite

TERRAIN: Rolling hills, foothills of the Mtns, narrow drainages **SLOPE:** 10-60% **ASPECT:** predominantly west facing slopes

ACCESS: Hyde Park Road

ROADS: Hyde Park Road is paved and in good shape the side roads are mostly paved and non-surface roads that are in good shape. Some areas have limited access, but over decent

BRIDGES: NA

DRIVEWAYS: Most driveways are well marked and a mix of paved and non-surfaced. Lots of driveways are gated.

WATER AVAILABILITY: Hydrants are available in neighborhoods

CLOSEST FIRE DEPARTMENT: (in miles): 2 miles from the City of Santa Fe Station 1

VALUES AT RISK: Residential structures, watershed values, commercial business, schools.

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$67,254,874.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 103- High

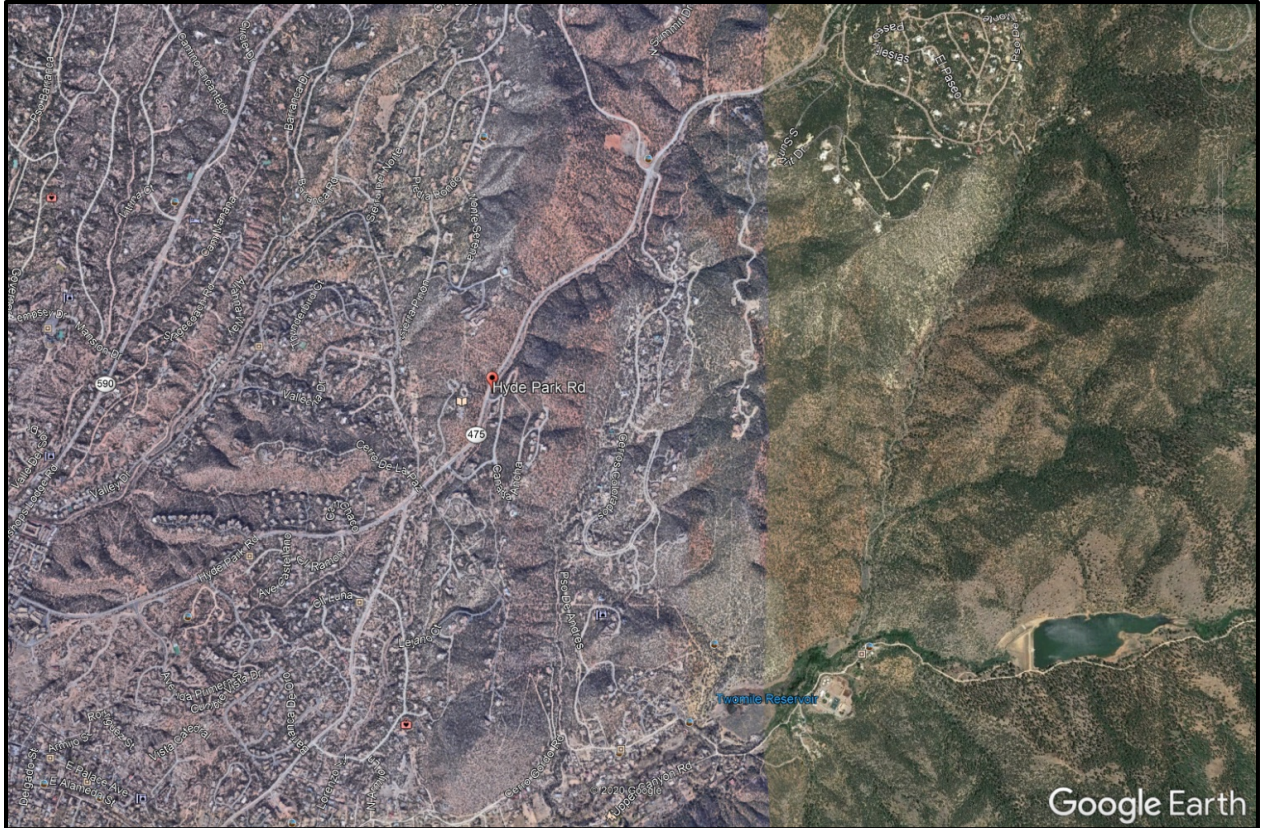


Figure D.16. Google Earth Imagery showing the road layout and residential density within the Hyde Park community.

Bishop's Lodge

LEGAL: Section 05 T17N R10E

DESCRIPTIVE LOCATION:

VEGETATION FUELS: piñon-juniper

POPULATION: 176

NUMBER OF LOTS: 805

CONSTRUCTION MATERIALS: varies, but mostly high-end homes

ROOF: varies

TERRAIN: Rolling hills **SLOPE:**5-30% **ASPECT:** W-SW

ACCESS: North on Bishops Lodge Rd. from the Santa Fe Plaza

ROADS: Bishops Lodge Rd,

BRIDGES: None

DRIVEWAYS: Most off Bishops Lodge Rd, mostly paved, lots of gates

WATER AVAILABILITY: There are hydrants near Bishops Lodge, but not common along main road

CLOSEST FIRE DEPARTMENT: (in miles): 3 miles from City of Santa Fe Station 1

VALUES AT RISK: Residential structures, historic structures, commercial businesses, watershed values.

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$119,081,136.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 96- High



Figure D.17. Bishops Lodge community



Figure D.18. Google Earth Imagery showing the road layout and residential density within the Bishops Lodge community.

Agua Fria Fire District

Agua Fria Village

LEGAL: Section 31 T17N R09E

DESCRIPTIVE LOCATION: West side of Santa Fe, located within County.

VEGETATION FUELS: piñon-juniper, grass, urban vegetation

POPULATION:

NUMBER OF LOTS:

CONSTRUCTION MATERIALS: wood framed and stucco

ROOF: flat and metal

TERRAIN: flat to rolling **SLOPE:**0-10% **ASPECT:** all

ACCESS: Good, surfaced streets, multiple routes

ROADS: Highway 599, Agua Fria Road. **BRIDGES:** none

DRIVEWAYS: Short, some with turnarounds

WATER AVAILABILITY: Hydrants available.

CLOSEST FIRE DEPARTMENT: (in miles): Agua Fria Fire and Rescue is in the community

VALUES AT RISK: Residential structures, commercial properties, historic properties

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 39- Low



Figure D.19. Google Earth Imagery showing the road layout and residential density in and around Agua Fria community.

La Tierra

LEGAL: Section 01 T17N R08E

DESCRIPTIVE LOCATION: HWY 599 and Camino La Tierra and head west

VEGETATION FUELS: piñon-juniper

POPULATION: 1,079

NUMBER OF LOTS: 337

CONSTRUCTION MATERIALS: wood framed and stucco

ROOF: flat and metal

TERRAIN: rolling hills **SLOPE:** 5-35% **ASPECT:** W-SW

ACCESS: Camino La Tierra Road to Headquarters Trail

ROADS: Camino La Tierra Road, Headquarters Trail

BRIDGES: none

DRIVEWAYS: private community

WATER AVAILABILITY: Limited, but hydrants are available off Camino La Tierra Road

CLOSEST FIRE DEPARTMENT: (in miles): >2 miles from Agua Fria Fire Station 2

VALUES AT RISK: Residential structures, watershed values

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$359,704,928.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 68- Medium



Figure D.20. Google Earth Imagery showing the road layout and residential density in and around the La Tierra Subdivision.

Las Campanas

LEGAL: Section 11 T17N R08E

DESCRIPTIVE LOCATION: South west of Santa Fe off Hwy 599

VEGETATION FUELS: piñon-juniper

POPULATION: 2,230

NUMBER OF LOTS: 1558

CONSTRUCTION MATERIALS: Wood framed and Stucco

ROOF: Flat and metal

TERRAIN: rolling hills **SLOPE:**0-20% **ASPECT:**

ACCESS: Hwy 599 to Camino La Tierra to Los Campanas Drive

ROADS: Los Campanas Drive and numerous side streets

BRIDGES: none

DRIVEWAYS: large paved driveways

WATER AVAILABILITY: Pressurized hydrants within community

CLOSEST FIRE DEPARTMENT: (in miles): >2 miles from Agua Fria Fire Station 2

VALUES AT RISK: Residential structures, recreational areas, infrastructure, golf course.

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$995,007,386.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 38- Low



Figure D.21. Google Earth Imagery showing the road layout and residential density in and around the Las Campanas community.

La Cienega Fire District

La Cienega

LEGAL: Section 06 T15N R08E

DESCRIPTIVE LOCATION: South of Santa Fe off I-25 along the Santa Fe River

VEGETATION FUELS: Bosque fuels

POPULATION: 1,034

NUMBER OF LOTS: 960

CONSTRUCTION MATERIALS: varies

ROOF: varies

TERRAIN: river bottom to moderate slopes **SLOPE:**0-25% **ASPECT:** S-SW

ACCESS: I-25 South from Santa Fe to La Cienega exit and head west

ROADS: Entrada La Cienega, Camino Capilla Vieja, Camino San Jose

BRIDGES: Bridge crosses over Santa Fe River on Entrada La Cienega

DRIVEWAYS: Narrow and unmarked, some are rugged and lots have dense vegetation

WATER AVAILABILITY: Hydrants available throughout town, some are pressurized

CLOSEST FIRE DEPARTMENT: (in miles): 0 miles to La Cienega Fire Station 1

VALUES AT RISK: Residential structures, infrastructure, Bosque vegetation, historic structures

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$101,217,689.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 70- Medium



Figure D.22. Crossing over the Santa Fe River showing the dense riparian vegetation mixed with homes.

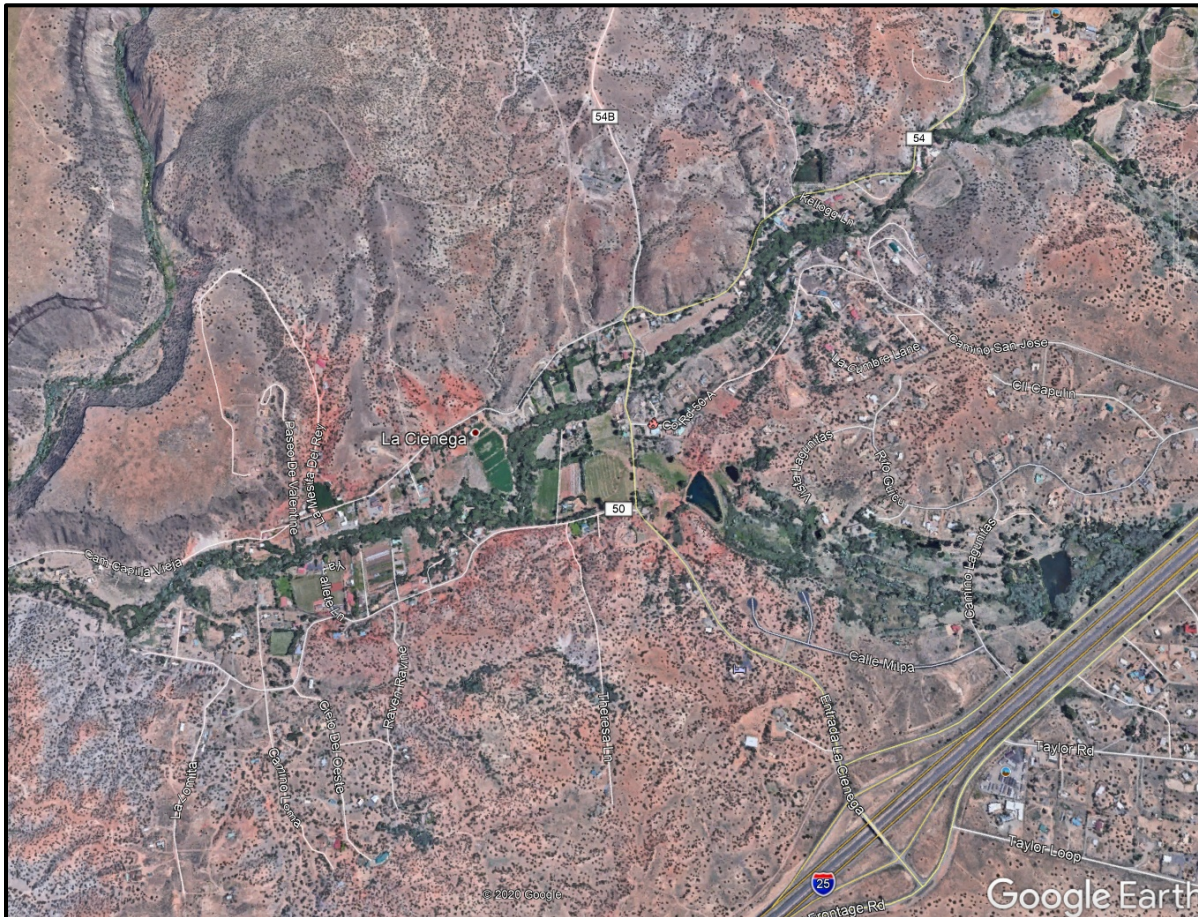


Figure D.23. Google Earth Imagery showing the road layout and residential density in and around La Cienega.

Los Pinos

LEGAL: Section 06 T15N R08E

DESCRIPTIVE LOCATION: South of Santa Fe off I-25 along the Santa Fe River

VEGETATION FUELS: Bosque fuels

POPULATION: 576

NUMBER OF LOTS: 582

CONSTRUCTION MATERIALS: varies

ROOF: varies

TERRAIN: river bottom to moderate slopes **SLOPE:**0-25% **ASPECT:** S-SW

ACCESS: I-25 South from Santa Fe to the 599 exit and head southwest

ROADS: Los Pinos Rd, Las Estrellas

BRIDGES: several throughout community

DRIVEWAYS: Narrow and unmarked, some are rugged and lots have dense vegetation

WATER AVAILABILITY: Hydrants available throughout town, some are pressurized

CLOSEST FIRE DEPARTMENT: (in miles): 2-3 miles to La Cienega Fire Station 1

VALUES AT RISK: Residential structures, infrastructure, commercial businesses, bosque vegetation, natural areas, Santa Fe Downs, historic structures

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$43,055,698.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 70- Medium



Glorieta Pass Fire District

Glorieta (including Glorieta Estates and Glorieta Mesa)

LEGAL: Section 21 T16N R11E (incorporates Glorieta, Glorieta Mesa and Glorieta Estates).

DESCRIPTIVE LOCATION: Located in the foothills of the Sangre de Cristo Mtns off I-25 south east of Santa Fe. Some homes back to USFS lands.

VEGETATION FUELS: piñon-juniper, ponderosa pine. Limited defensible space around some homes. Some continuous fuels adjacent to homes.

POPULATION: 203

NUMBER OF LOTS: 757

CONSTRUCTION MATERIALS: varies

ROOF: varies

TERRAIN: steep slopes to flat lands **SLOPE:** 0-40% **ASPECT:**

ACCESS: Glorieta is located 20 miles from Santa Fe, heading north on I-25

ROADS: Main roads are paved and well-marked within Glorieta, but road quality declines further from urban areas. Roads around Glorieta Estates and Glorieta Mesa are unsurfaced and narrow in places, with limited space to allow access by emergency equipment. Fuels are immediately adjacent to the road along sections of Avenida Ponderosa and other side roads.

BRIDGES: NA

DRIVEWAYS: Most are narrow and vary from paved to gravel. Limited signage makes it hard to know where certain addresses are located

WATER AVAILABILITY: Pressurized hydrants are available throughout Glorieta (on the north side of Interstate 25). Hydrant availability is limited in Glorieta Estates and Glorieta Mesa.

CLOSEST FIRE DEPARTMENT: (in miles): 1 mile from Glorieta Pass Fire Station 1

VALUES AT RISK: Residential structures, historic properties, commercial business, churches, watershed values, USFS lands

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$15,477,991.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 95- High



Figure D.25. The Glorieta Post Office is a community value at risk that is located adjacent to train tracks in Glorieta.

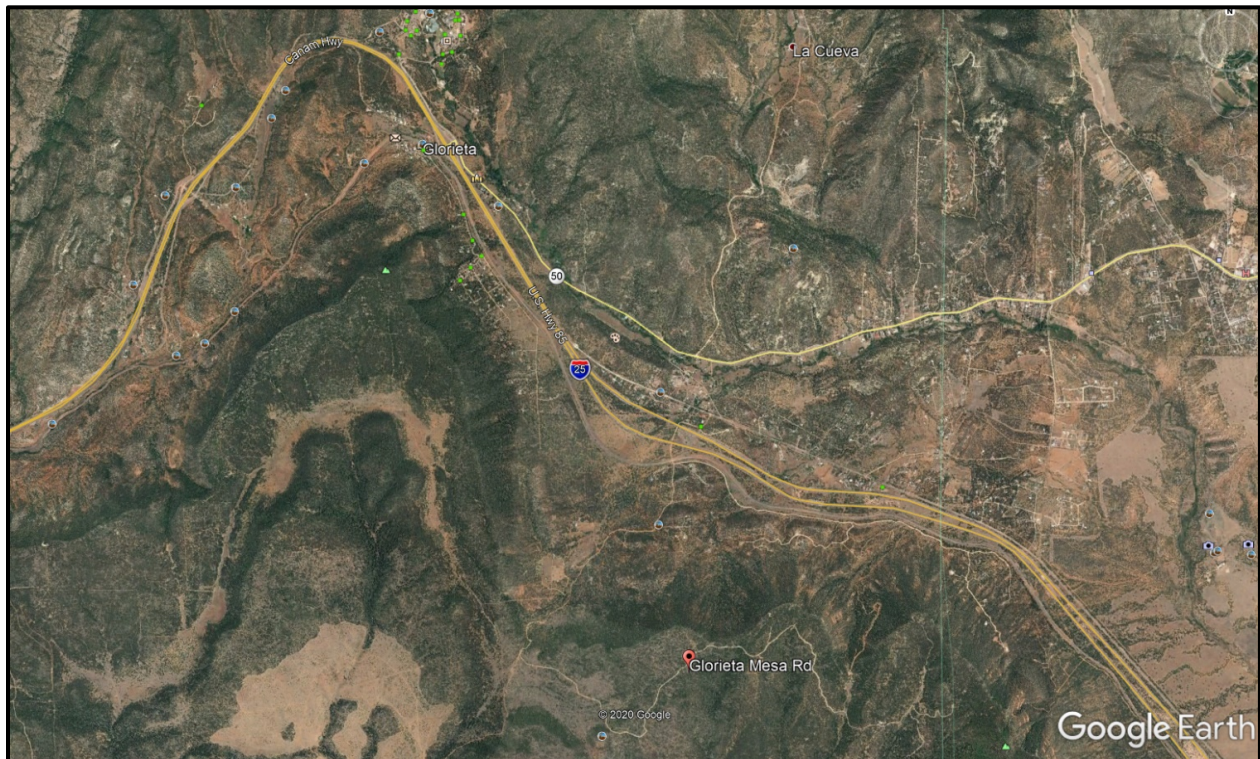


Figure D.26. Google Earth Imagery showing the road layout and residential density within the Glorieta community.

La Cueva Canyon

LEGAL: Section 25 T16N R11E

DESCRIPTIVE LOCATION: North of Hwy 50 out of Glorieta to La Cueva Canyon Rd

VEGETATION FUELS: grasslands, piñon-juniper, ponderosa pine, and mixed conifer

POPULATION: 253

NUMBER OF LOTS: 70

CONSTRUCTION MATERIALS: varies from trailers to wood framed stucco houses

ROOF: varies

TERRAIN: flat meadows to steep slopes **SLOPE:**0-45% **ASPECT:**

ACCESS: Hwy 50 to La Cueva Canyon Rd

ROADS: La Cueva Canyon Rd, La Cueva Rd (63A)

BRIDGES: NA

DRIVEWAYS: off La Cueva Rd, narrow, windy and many are unmarked

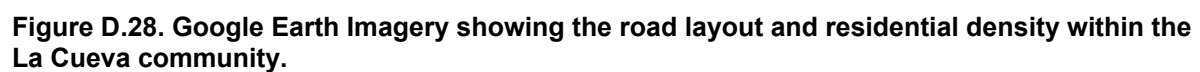
WATER AVAILABILITY: limited

CLOSEST FIRE DEPARTMENT: (in miles): 5 miles to Glorieta Pass Fire Station 1

VALUES AT RISK: Residential structures, commercial businesses, watershed values.

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$20,897,995.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 112- High



La Jolla

LEGAL: Section 02 T15N R11E

DESCRIPTIVE LOCATION: South on La Jolla Road from HWY 50 north of Glorieta

VEGETATION FUELS: grasslands, piñon-juniper

POPULATION: 276

NUMBER OF LOTS: 80

CONSTRUCTION MATERIALS: varies

ROOF: mostly metal roofs

TERRAIN: Flat **SLOPE:** 0-5% **ASPECT:** S-SE

ACCESS: La Jolla Road

ROADS: La Jolla Road, Old Denver Highway, lower La Jolla Road

BRIDGES: none

DRIVEWAYS: most off La Jolla Road and narrow

WATER AVAILABILITY: limited

CLOSEST FIRE DEPARTMENT: (in miles): 1 mile from Glorieta Pass Fire Station 2

VALUES AT RISK: Residential structures, watershed values.

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$19,542,402.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 92- High



Figure D.29. Poor defensible space within the La Jolla area.



Figure D.30. Google Earth Imagery showing the road layout and residential density within the La Jolla community.

Hondo Fire District

La Barbaria

LEGAL: Section 17 T16N R10E

DESCRIPTIVE LOCATION: 7 miles north of Santa Fe on Old Santa Fe Trail

VEGETATION FUELS: piñon-juniper, ponderosa pine, grass/litter understory.

POPULATION: 608

NUMBER OF LOTS: 100

CONSTRUCTION MATERIALS: mostly wood framed houses with stucco

ROOF: flat, metal, and composition

TERRAIN: Steep Slopes, narrow canyon **SLOPE:** >40% **ASPECT:** All

ACCESS: main road access goes from pavement to dirt and narrows as you go in further, one way in and out. Side roads are narrow with minimal areas to turn around. Entrapment potential on driveways and roads leading to mid-upper slope structure locations.

ROADS: Multiple side roads off La Barbaria

BRIDGES: There is a stream that flows down the canyon

DRIVEWAYS: Narrow, some paved, most gravel or dirt

WATER AVAILABILITY: limited, water can be in the creek seasonally, also seems to be a large impoundment near the end of the road

CLOSEST FIRE DEPARTMENT: (in miles): 2 miles from Honda Station 1

VALUES AT RISK: Residential structures, watershed values

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$126,594,927.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 110- High.



Figure D.14. Steep slopes and limited defensible space along La Barbara Road. Note the houses in the heavy fuels on steep slopes.

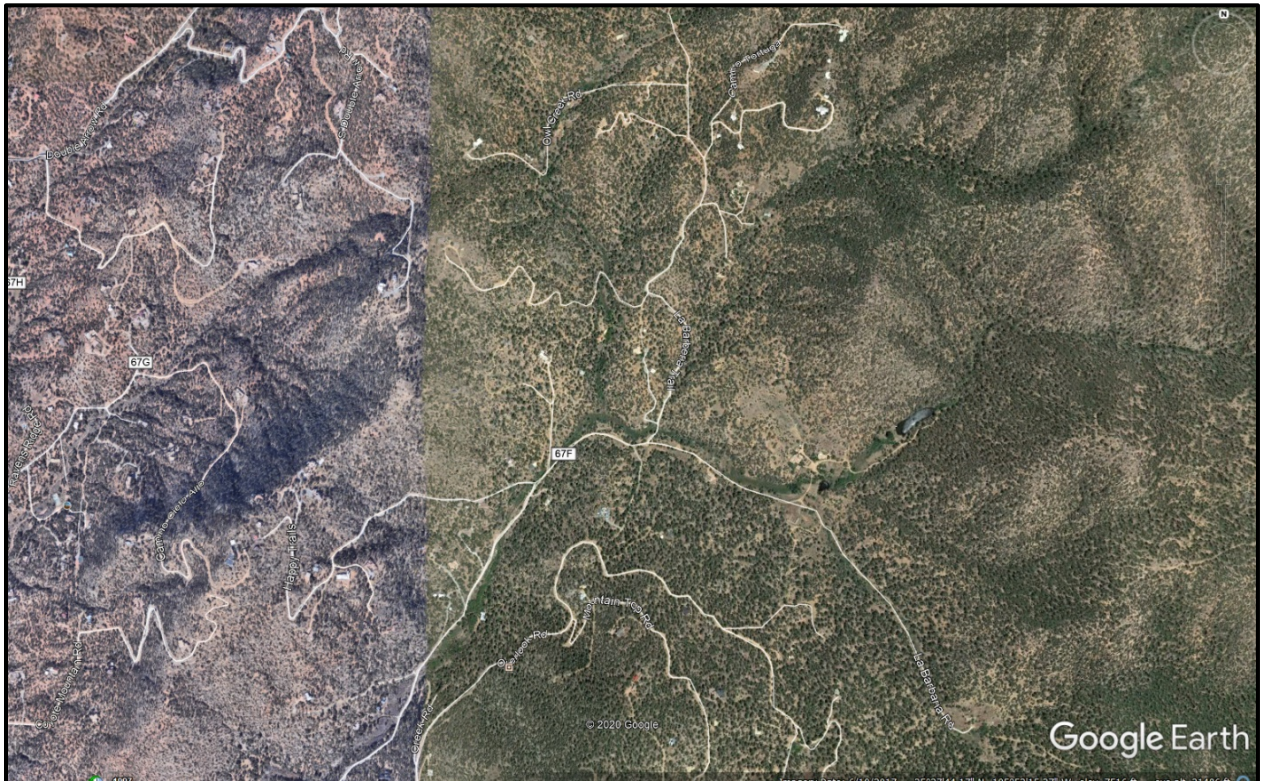


Figure D.15. Google Earth Imagery showing the road layout and residential density within the La Barbara community.

Ojo de la Vaca

LEGAL: Bishop John Lamy Grant

DESCRIPTIVE LOCATION: Accessed off old Las Vegas Hwy just 1 mile south of Canoncito

VEGETATION FUELS: piñon-juniper (open and closed canopy), ponderosa pine, grass and shrubs in canyon bottoms. Beetle kill prominent.

POPULATION: 157

NUMBER OF LOTS: 287

CONSTRUCTION MATERIALS: varies

ROOF: varies

TERRAIN: Steep Slopes, river bottom **SLOPE:** 0-40%+ **ASPECT:** E-NE

ACCESS: Accessed off old Las Vegas Hwy just south of Canoncito

ROADS: Ojo de la Vaca is a narrow paved road with steep slopes and hairpin turns

BRIDGES: low water crossing and bridge in fair condition

DRIVEWAYS: Appear to be narrow, but lots of driveways have gates

WATER AVAILABILITY: possible water in Galisteo Creek

CLOSEST FIRE DEPARTMENT: (in miles): ~4 miles to Hondo District Station 2

VALUES AT RISK: Residential structures, infrastructure, watershed values

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$15,367,041.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 99- High



Figure D.31. Homes in the Ojo de la Vaca community.



Figure D.32. Google Earth Imagery showing the road layout and residential density within the Ojo de la Vaca community.

Apache Ridge

LEGAL: Section 0 T15N R10E

DESCRIPTIVE LOCATION: Located near the junction of 285 and old Las Vegas Highway

VEGETATION FUELS: piñon-juniper, ponderosa pine and Gambel oak on woodland upper slopes. Beetle kill in areas. Some defensible space actions visible.

POPULATION: 367

NUMBER OF LOTS: 439

CONSTRUCTION MATERIALS: Varies, single-wide trailers to large single-family homes

ROOF: flat, metal, composite

TERRAIN: some steep slopes **SLOPE:**15-40+% **ASPECT:** SW-SE

ACCESS: 12 miles north of Santa Fe on Old Las Vegas Trail

ROADS: Apache Ridge road is well maintained; however, the side roads are in really poor condition and are very narrow and steep in places with limited turnaround space

BRIDGES: N/A

DRIVEWAYS: very narrow and some are in poor shape, limited room for emergency vehicles to turnaround

WATER AVAILABILITY: Limited, no hydrants in the area

CLOSEST FIRE DEPARTMENT: (in miles): >1 mile from Hondo Station 2

VALUES AT RISK: Residential structures, watershed values

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$49,767,851.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 114- High



Figure D.33. Narrow roads, dense vegetation, and limited defensible space is common along Apache Ridge Road.

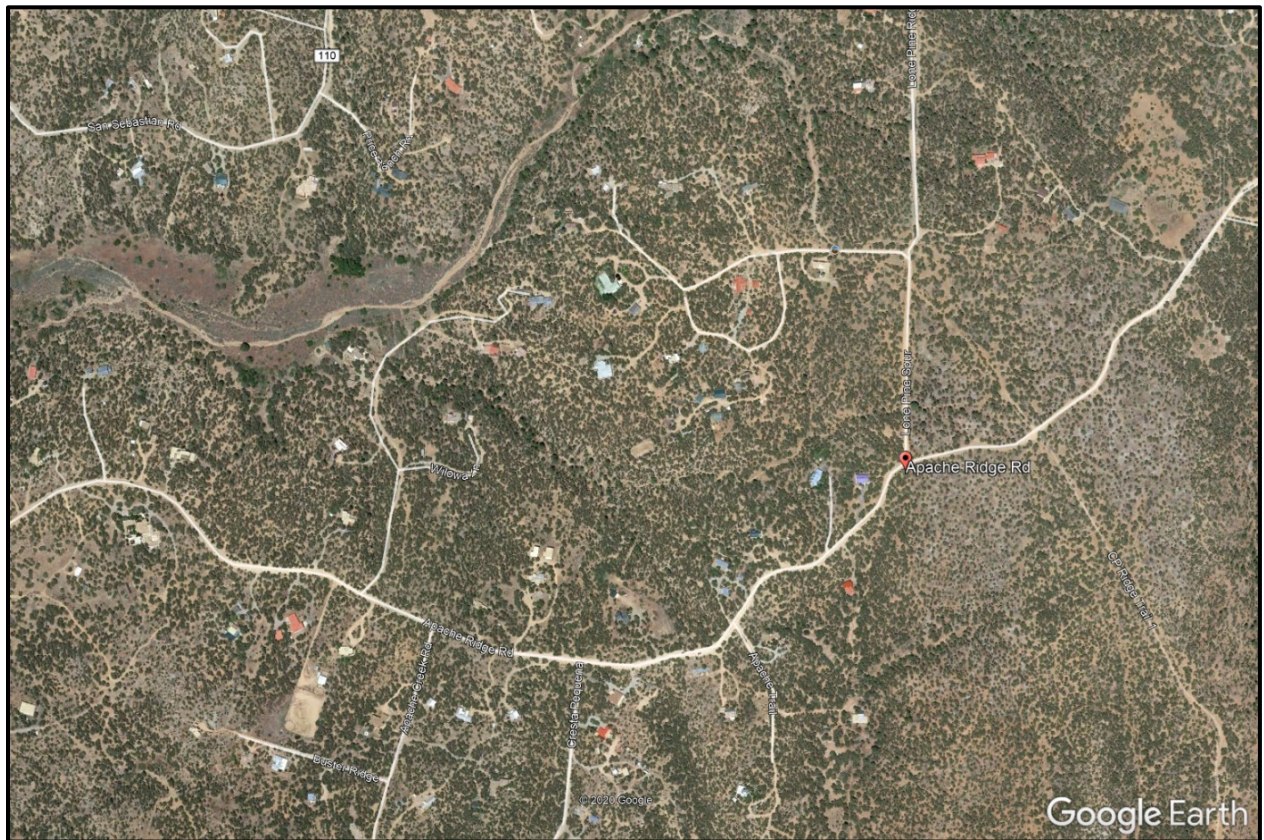


Figure D.34. Google Earth Imagery showing the road layout and residential density within the Apache Ridge Road community.

Canada de los Alamos

LEGAL: Section 27 T16N R10E

DESCRIPTIVE LOCATION: nine miles east of town on Old Santa Fe Trail

VEGETATION FUELS: piñon-juniper

POPULATION: 384

NUMBER OF LOTS: 256

CONSTRUCTION MATERIALS: varies

ROOF: metal and composite

TERRAIN: Rolling hills **SLOPE:**0-30% **ASPECT:** South

ACCESS: Old Santa Fe Trail to Canada Village Road

ROADS: Old Santa Fe Trail, Canada Village Road, Herencia De Prada, Ortiz Road

BRIDGES: none

DRIVEWAYS: Narrow and largely unmarked

WATER AVAILABILITY: none

CLOSEST FIRE DEPARTMENT: (in miles): 4.5 miles to Hondo Station 1

VALUES AT RISK: Residential structures, churches, historic structures, watershed values.

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$37,141,230.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 96- High



Figure D.35. Homes mixed into the pinon-juniper are common throughout Canada de los Alamos.



Figure D.36. Google Earth Imagery showing the road layout and residential density within the Canada de los Alamos community.

Canoncito

LEGAL: Section 12 T15N R10E

DESCRIPTIVE LOCATION: Located off Old Las Vegas Hwy and I-25 north of Santa Fe

VEGETATION FUELS: piñon-juniper

POPULATION: 264

NUMBER OF LOTS: 250

CONSTRUCTION MATERIALS: varies

ROOF: varies

TERRAIN: Steep slopes **SLOPE:**5-40% **ASPECT:** E-NE

ACCESS: Canoncito exit off of I-25

ROADS: Old Las Vegas HWY

BRIDGES: none

DRIVEWAYS: narrow and steep with poor markings; some rough

WATER AVAILABILITY: limited

CLOSEST FIRE DEPARTMENT: (in miles): 3 miles from Hondo Station 2

VALUES AT RISK: Residential structures, watershed values, churches, historic structures, campsites, trails.

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$24,866,959.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 90- High



Figure D.37. Nuestra Senora de Luz Church located in Canoncito.

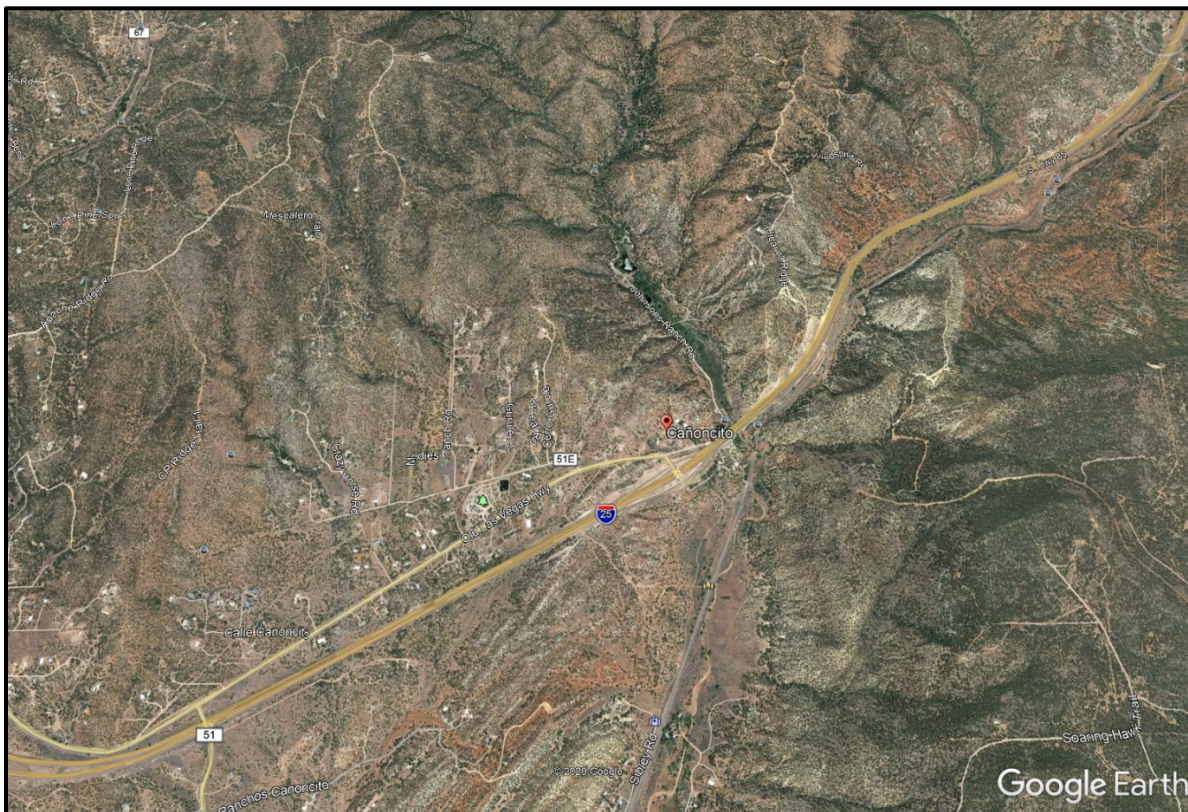


Figure D.38. Google Earth Imagery showing the road layout and residential density within the Canoncito community.

Old Santa Fe Trail

LEGAL: Section 21 T16N R10E

DESCRIPTIVE LOCATION: Old Santa Fe Trail heads north out of Santa Fe and parallels I-25

VEGETATION FUELS: piñon-juniper

POPULATION: 108

NUMBER OF LOTS: 822

CONSTRUCTION MATERIALS: varies

ROOF: varies

TERRAIN: Rugged and Steep **SLOPE:** 15-65% **ASPECT:** S-SW-SE

ACCESS: Old Santa Fe Trail from Santa Fe North

ROADS: Old Santa Fe Trail, numerous side streets

BRIDGES: none

DRIVEWAYS: off Santa Fe Trail and side streets, poorly marked, narrow, rugged, and steep

WATER AVAILABILITY: Some hydrants

CLOSEST FIRE DEPARTMENT: (in miles): >1 mile from Hondo Station 1

VALUES AT RISK: Trail network, historic structures, residential structures, watershed values, churches.

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$17,833,305.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 93- High



Figure D.39. Homes off Old Santa Fe Trail with minimal setbacks and poor defensible space.

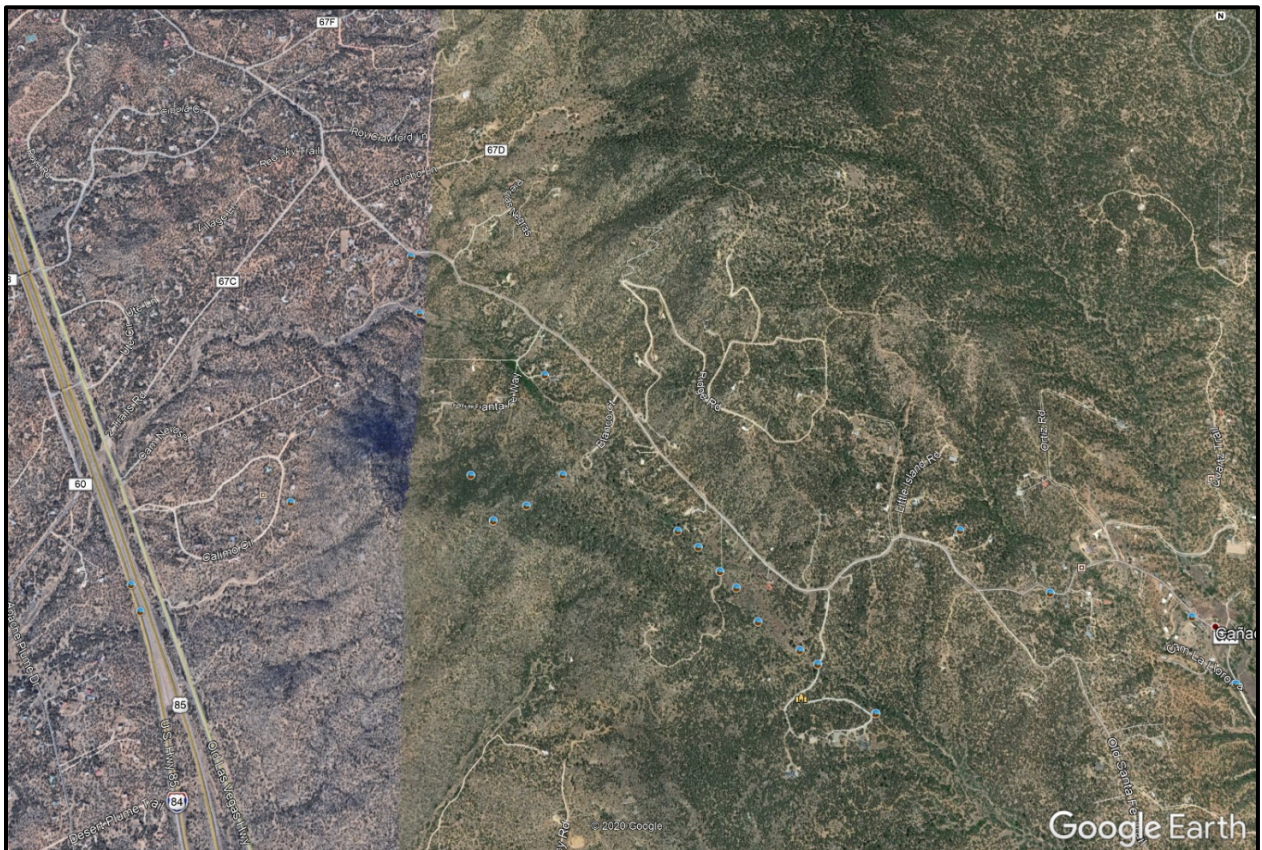


Figure D.40. Google Earth Imagery showing the road layout and residential density around the Old Santa Fe Trail.

Arroyo Hondo

LEGAL: Sebastian De Vargas Grant

DESCRIPTIVE LOCATION: South of I-25

VEGETATION FUELS: piñon-juniper

POPULATION: 651

NUMBER OF LOTS: 205

CONSTRUCTION MATERIALS: most wood framed and stucco

ROOF: flat and metal

TERRAIN: rolling hills **SLOPE:**5-50% **ASPECT:** varies

ACCESS: Old Las Vegas Highway North out of Santa Fe to Arroyo Hondo Road

ROADS: Arroyo Hondo, La Ventana Drive, Seton Village Road

BRIDGES: rail bridges

DRIVEWAYS: most are off side streets, some narrow, but mostly marked (nonreflective)

WATER AVAILABILITY: Limited Hydrants are in the area

CLOSEST FIRE DEPARTMENT: (in miles): 0 miles to Hondo Fire Station 1

VALUES AT RISK: Residential structures, commercial businesses, churches, post office, historical structures, infrastructure

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$160,819,273.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 63- Medium



Figure D.41. homes and rail infrastructure in the Arroyo Hondo area.



Figure D.42. Google Earth Imagery showing the road layout and residential density in the Arroyo Hondo community.

El Dorado Fire District

Lamy

LEGAL: Bishop John Lamy Grant

DESCRIPTIVE LOCATION: 20 miles south of Santa Fe off Highway 285

VEGETATION FUELS: grasslands, piñon-juniper

POPULATION: 147

NUMBER OF LOTS: 607

CONSTRUCTION MATERIALS: varies

ROOF: varies

TERRAIN: flat to moderate slopes **SLOPE:**0-45% **ASPECT:** E-SE

ACCESS: 285 south to Old Lamy Trail (Highway 33)

ROADS: Old Lamy Trail, Ravens View Road, Los Hornos Road

BRIDGES: none

DRIVEWAYS: narrow and unmarked

WATER AVAILABILITY: some pressurized hydrants in town. Water was extended from Eldorado during recent years, improving water availability to the northern portion of the community.

CLOSEST FIRE DEPARTMENT: (in miles): 5 miles to El Dorado Fire Station 3

VALUES AT RISK: Train Station, museum, historic structures, including the historic diner

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$14,533,510.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 68- Moderate



Figure D.43. The Legal Tender, which is a restaurant, is one of Lamy's oldest structures and is highly valued in the community.



Figure D.44. Google Earth Imagery showing the road layout and residential density within the Lamy community.

Galisteo Fire District

Galisteo

LEGAL: Section 35 T14N R09E

DESCRIPTIVE LOCATION: 12 miles south of Santa Fe off Hwy 41.

VEGETATION FUELS: piñon-juniper, grass, bosque fuels

POPULATION:

NUMBER OF LOTS: 684

CONSTRUCTION MATERIALS: varies

ROOF: varies

TERRAIN: flat and river bottom **SLOPE:**0-10% **ASPECT:** S-SW

ACCESS: Good access, paved and some unsurfaced roads

ROADS: Highway 41, County Road 42 (Camino Los Abuelos)

BRIDGES: One bridge, with weight limit, but can be avoided.

DRIVEWAYS: short, some turnarounds.

WATER AVAILABILITY: Some hydrants throughout community, gravity fed

CLOSEST FIRE DEPARTMENT: (in miles): Galisteo Volunteer Fire Department station is in town.

VALUES AT RISK: Residential structures, historic structures, churches, watershed values.

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 74- High



Figure D.47. Galisteo street view. Source Google Earth.



Figure D.48. Google Earth Imagery showing the road layout and residential density within Galisteo community.

Turquoise Trail Fire District

San Marcos and Turquoise Trail

LEGAL: Section 12 T14N R08E

DESCRIPTIVE LOCATION: South of Santa Fe off HWY 14

VEGETATION FUELS: piñon-juniper

POPULATION: 767

NUMBER OF LOTS: Turquoise Trail: 261, San Marcos: 133, Total: 394

CONSTRUCTION MATERIALS: varies

ROOF: varies

TERRAIN: rolling hills **SLOPE:**0-20% **ASPECT:** S

ACCESS: HWY 14 South to HWY 42 and head east

ROADS: HWY 42, Camino Los Abuelos, Don Jose Loop, Crazy Rabbit Drive, numerous side roads off of Turquoise Trail.

BRIDGES: a couple

DRIVEWAYS: varies with some that have turnaround or roundabouts

WATER AVAILABILITY: limited

CLOSEST FIRE DEPARTMENT: (in miles): San Marcos is 2 miles from Turquoise Trail Fire Station 2. Turquoise Trail Fire Stations 1 and 2 are within 5 miles of most areas of the Turquoise Trail.

VALUES AT RISK: Residential structures, commercial businesses, school, infrastructure

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$70,504,108.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 72- High



Figure D.49. Turquoise Trail station 1 serves San Marcos and areas off the Turquoise Trail.



Figure D.50. Google Earth Imagery showing the road layout and residential density in and around the San Marcos community.

Los Cerrillos

LEGAL: Section 17 T14N R08E

DESCRIPTIVE LOCATION: 23 miles south of Santa Fe off Hwy 14

VEGETATION FUELS: piñon-juniper, bosque fuels

POPULATION: 300

NUMBER OF LOTS: 445

CONSTRUCTION MATERIALS: Adobe and Frame

ROOF: varies

TERRAIN: flat and river bottom **SLOPE:**0-10% **ASPECT:** S-SW

ACCESS: Main Street off HWY14

ROADS: Main Street, HWY 14, Gravel Pit Road

BRIDGES: 3 bridges: 2 on Highway 41, south of the village and 1 on Via La Puente, one lane with weight limits

DRIVEWAYS: Narrow and unmarked

WATER AVAILABILITY: Rio Galisteo

CLOSEST FIRE DEPARTMENT: (in miles): 0 miles from Turquoise Trail Fire Station 3 (39 Avenida Vieja)

VALUES AT RISK: Residential structures, commercial and industrial businesses, historic structures, watershed values.

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$20,840,117.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 74- High



Figure D.45. Los Cerrillos residences.



Figure D.46. Google Earth Imagery showing the road layout and residential density within the Los Cerrillos community.

Madrid Fire District

Madrid

LEGAL: Ortiz Mine/Mesita de Juana Lop

DESCRIPTIVE LOCATION: South of Santa Fe on HWY 14

VEGETATION FUELS: piñon-juniper, grasses

POPULATION: 185

NUMBER OF LOTS: 604

CONSTRUCTION MATERIALS: varies

ROOF: varies

TERRAIN: rolling hills **SLOPE:**0-30% **ASPECT:** Varies

ACCESS: South from Santa Fe for xx miles on Hwy 14

ROADS: HWY 14

BRIDGES: none

DRIVEWAYS: most are narrow and rough with poor signage

WATER AVAILABILITY: limited

CLOSEST FIRE DEPARTMENT: (in miles): 0 miles to Madrid Fire Station 1

VALUES AT RISK: Residential structures, watershed values, infrastructure, commercial businesses, historic buildings

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$17,961,239.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 78- High



Figure D.51. Google Earth Imagery showing the road layout and residential density in and around the Madrid community.

Mailbox Road

LEGAL: Section 35 T13N R07E

DESCRIPTIVE LOCATION: Three miles South of Madrid off HWY 14

VEGETATION FUELS: piñon-juniper savanna and woodland mix

POPULATION: 101

NUMBER OF LOTS: 130

CONSTRUCTION MATERIALS: varies from large single-family homes to trailers

ROOF: varies

TERRAIN: Rolling hills, with steep areas **SLOPE:**5-50% **ASPECT:** West-South-West

ACCESS: The main road is right off Hwy 14 and is one way in one way out, although there maybe a 2-track that goes out another direction.

ROADS: Roads are non-surface and rough in spots. Side roads are narrow and rough with poor markings

BRIDGES: NA

DRIVEWAYS: Driveways are narrow and unmarked with limited access to turn around

WATER AVAILABILITY: Water is not available within the community

CLOSEST FIRE DEPARTMENT: (in miles): 5 miles to Madrid Fire Station

VALUES AT RISK: Residential structures, watershed values

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$6,157,362.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 94 – High



Figure D.52. Roof tops dot the landscape off Mailbox road south of Madrid.



Figure D.53. Google Earth Imagery showing the road layout and residential density within the Mail Box Road community.

Edgewood Fire District

San Pedro

LEGAL: Section 34 T12N R07E

DESCRIPTIVE LOCATION: 5 miles north of Cedar Grove on Hwy 344

VEGETATION FUELS: piñon-juniper (closed canopy), brush (oak), ponderosa stands on lower flats. Mixed defensible space.

POPULATION: 180

NUMBER OF LOTS: 310

CONSTRUCTION MATERIALS: Various

ROOF: Various

TERRAIN: Steep slopes to flatland **SLOPE:**0-60% **ASPECT:** S-SE

ACCESS: Poor where access it difficult for apparatus.

ROADS: Roads are unpaved, narrow, and very rough in a lot of areas surrounding South Mountain, poor signage, limited areas to turnaround.

BRIDGES: 3 small wood truss bridges on HWY 344

DRIVEWAYS: very narrow >8 feet and mostly unmarked, driveways that are marked are unreflective

WATER AVAILABILITY: very limited.

CLOSEST FIRE DEPARTMENT: (in miles): Station 3, less than one mile

VALUES AT RISK: Residential Structures, Watershed values, South Mountain

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$11,984,841.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 100 – High



Figure D.54. Road access in San Pedro is difficult due to the narrow unimproved roads with limited space to turn around.

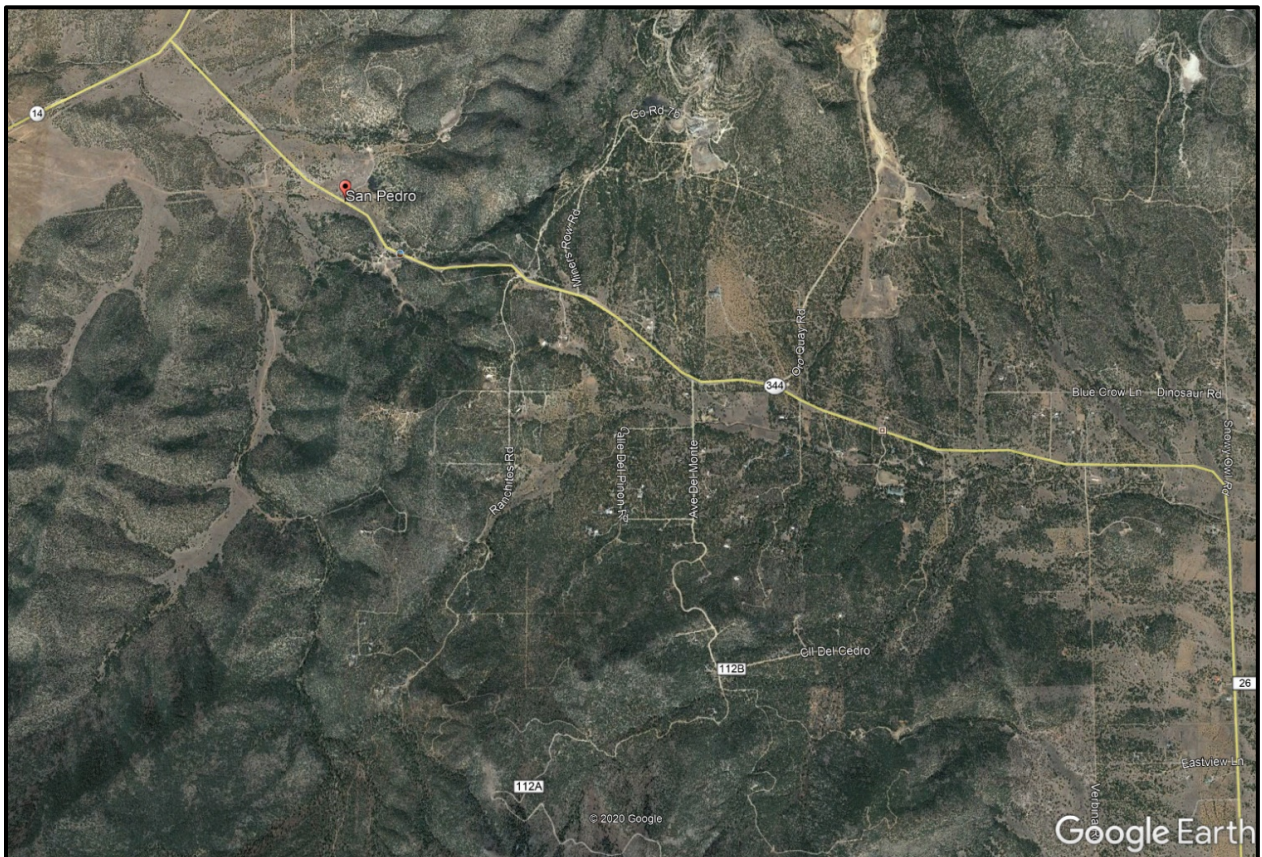


Figure D.55. Google Earth Imagery showing the road layout and residential density within the San Pedro community.

Cedar Grove

LEGAL: Section 22 T11N R07E

DESCRIPTIVE LOCATION: Located at the base of South Mountain. 8 miles north of Edgewood off HWY 344.

VEGETATION FUELS: piñon-juniper- closed canopy, brush (oak), open grassland. Defensible space is sporadic.

POPULATION: 395

NUMBER OF LOTS: 324

CONSTRUCTION MATERIALS: Varies, primarily mobile home/prefabricated/frame

ROOF: Varies

TERRAIN: Steep slopes to flatland **SLOPE:**0-60% **ASPECT:** S-SE

ACCESS: Poor to fair with some steep, winding and narrow roads with few turnarounds

ROADS: Main road HWY 344 is paved, but side roads are unpaved, narrow, and really rough, poor signage

BRIDGES: NA

DRIVEWAYS: mostly unmarked, most driveways that are marked are unreflective, varies from narrow and dirt to wide and paved.

WATER AVAILABILITY: Some hydrants

CLOSEST FIRE DEPARTMENT: (in miles): 0 miles

VALUES AT RISK: Residential structures, watershed values, aerodrome, South Mountain

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$40,469,342.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 100- High



Figure D.56. Cedar Grove is at the base of South Mountain in dense vegetation with limited defensible space

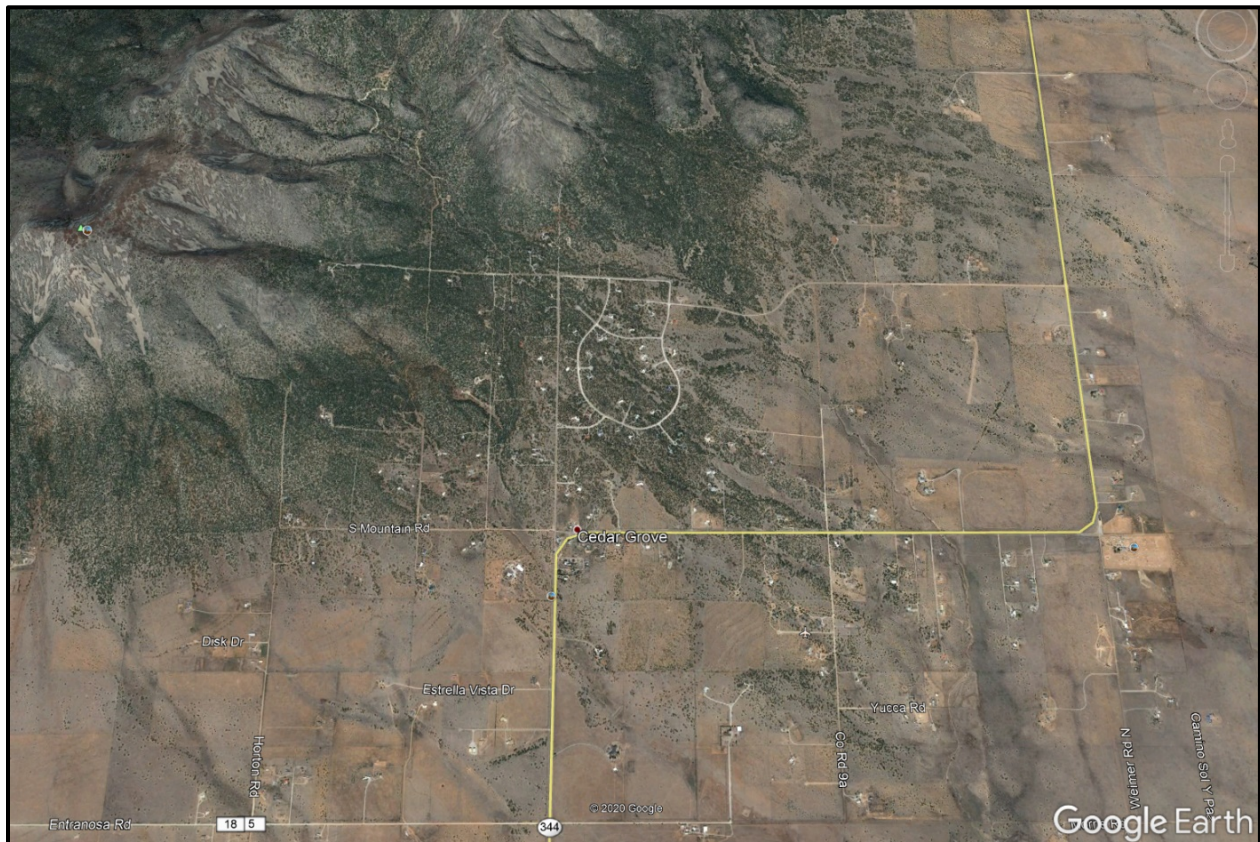


Figure D.57. Google Earth Imagery showing the road layout and residential density within the Cedar Grove community.

Bella Vista

LEGAL: Section 33 T10N R07E

DESCRIPTIVE LOCATION: South of Edgewood and I-40

VEGETATION FUELS: piñon-juniper

POPULATION: 487

NUMBER OF LOTS: 400

CONSTRUCTION MATERIALS: varies

ROOF: varies

TERRAIN: relatively flat with some small rolling hills **SLOPE:** 0-15% **ASPECT:** N-NE

ACCESS: Located off Edgewood 7.

ROADS: Numerous County paved roads

BRIDGES: None

DRIVEWAYS: Narrow with limited space to turnaround, most are non-surfaced, limited markings

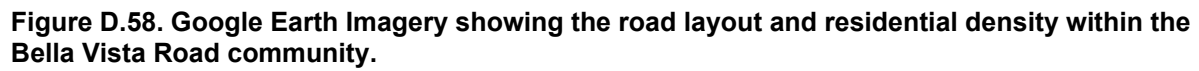
WATER AVAILABILITY: Pressurized hydrants are available

CLOSEST FIRE DEPARTMENT: (in miles): 3 miles from Edgewood District Station 4

VALUES AT RISK: Residential structures, churches, businesses

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$39,921,380.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 78- High



Edgewood, Thunder Mountain

LEGAL: Section 18 T10N R07E

DESCRIPTIVE LOCATION: 3 miles west of Edgewood

VEGETATION FUELS: piñon-juniper

POPULATION: 962

NUMBER OF LOTS: 99

CONSTRUCTION MATERIALS: mostly wood frame and stucco

ROOF: varies

TERRAIN: flat to steep slopes **SLOPE:** 0-40% **ASPECT:** All

ACCESS: Hwy 344 north from Edgewood to Dinkle Rd to Thunder Mountain Rd

ROADS: Thunder Mountain Rd, Snowflake Trail

BRIDGES: none

DRIVEWAYS: most off Thunder Mountain Rd, narrow and steep

WATER AVAILABILITY: Some pressurized hydrants in community

CLOSEST FIRE DEPARTMENT: (in miles): >1 mile from Edgewood Station 4

VALUES AT RISK: Residential Structures, livestock, watershed values

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$94,726,960.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 83- High



Figure D.59. Thunder Mountain subdivision near Edgewood, NM showing steep slopes, dense vegetation and limited defensible space.



Figure D.60. Google Earth Imagery showing the road layout and residential density within the Thunder Mountain Subdivision.

Stanley Fire District

There are no defined communities at risk within the Stanley Fire District, however there is a relatively large dispersed population with significant structure separation. Fuels tend to be light (grass-shrub). Access is good, but there are long response times to some homes.

Pueblo Communities

San Ildefonso Pueblo

LEGAL: Section 24 T19N R6E

DESCRIPTIVE LOCATION: 3.5 miles west of El Rancho, NM

VEGETATION FUELS: grassland and shrubland, riparian communities

POPULATION: 750

TERRAIN: flat to steep slopes **ASPECT:** all

ACCESS: Highway 84 north from Santa Fe to NM-502 west to Povi Kaa Drive

ROADS: Than Povi Po, Agoyo Po, Tunyo Po

BRIDGES: Tunyo Po, over Pojaque River

DRIVEWAYS: many off 84 & 84B, flat and accessible

WATER AVAILABILITY: very limited hydrants

CLOSEST FIRE DEPARTMENT: (in miles): 7.4 miles from Pojoaque Fire Department

VALUES AT RISK: residential and community structures, watershed values, historical values

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$68,124,560.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 53-Moderate



Figure D.61. San Ildefonso Pueblo, showing building material, vegetation, and steep slopes (background).

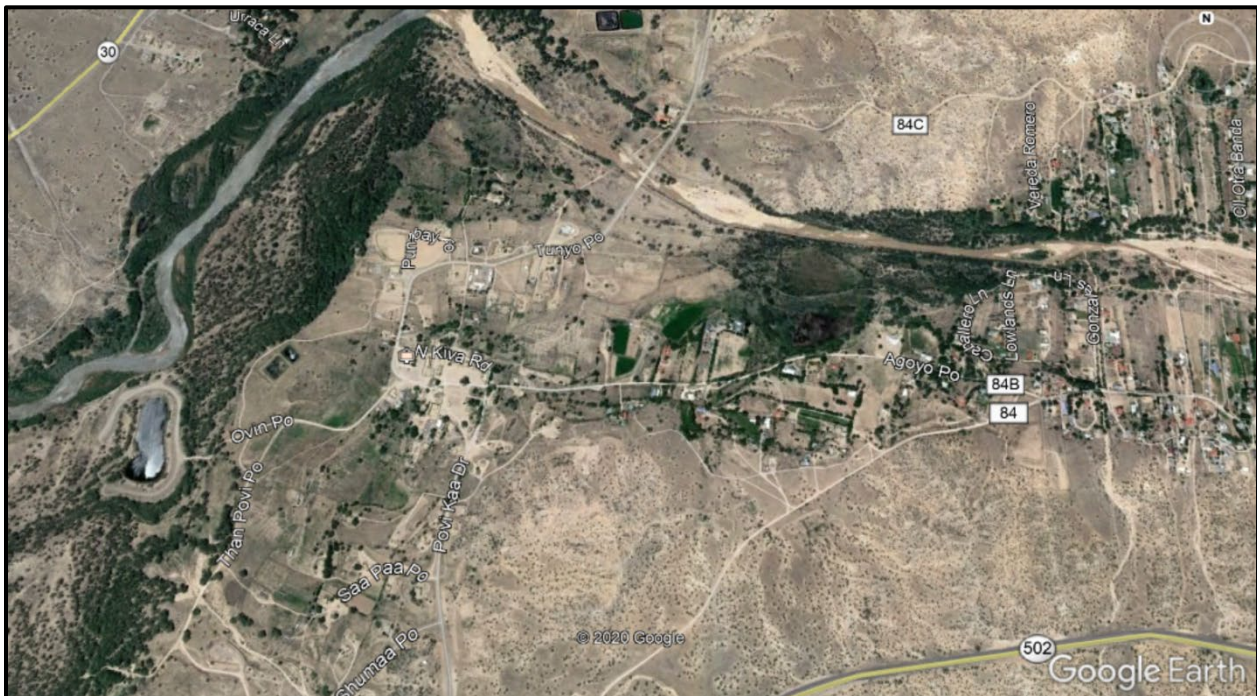


Figure D.62. Google Earth Imagery showing the road layout and residential density within the San Ildefonso Pueblo.

Pojoaque Pueblo

LEGAL: Section 5 T19N R9E

DESCRIPTIVE LOCATION: 3 miles west of Nambe, NM

VEGETATION FUELS: agricultural, riparian, conifer, shrubland

POPULATION: 1261 as of 2000 census

TERRAIN: flat to moderate slopes **ASPECT:** all

ACCESS: Highway 84 north from Santa Fe

ROADS: Highway 85, NM-503, Camino del Rincon, Oweenge Rd

BRIDGES: 502, over the Tesuque, Rio; 84 over the Tesuque, Rio; 285 over Pojoaque Creek

DRIVEWAYS: many off 503 and 84, flat and accessible

WATER AVAILABILITY: hydrants available

CLOSEST FIRE DEPARTMENT: (in miles): 1.5 miles from Pojoaque Fire Department

VALUES AT RISK: residential and community structures, watershed values, historical values

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$171,287,001.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 44-Moderate



Figure D.63. Pojoaque Pueblo, showing building material, vegetation, and moderate slopes (background).

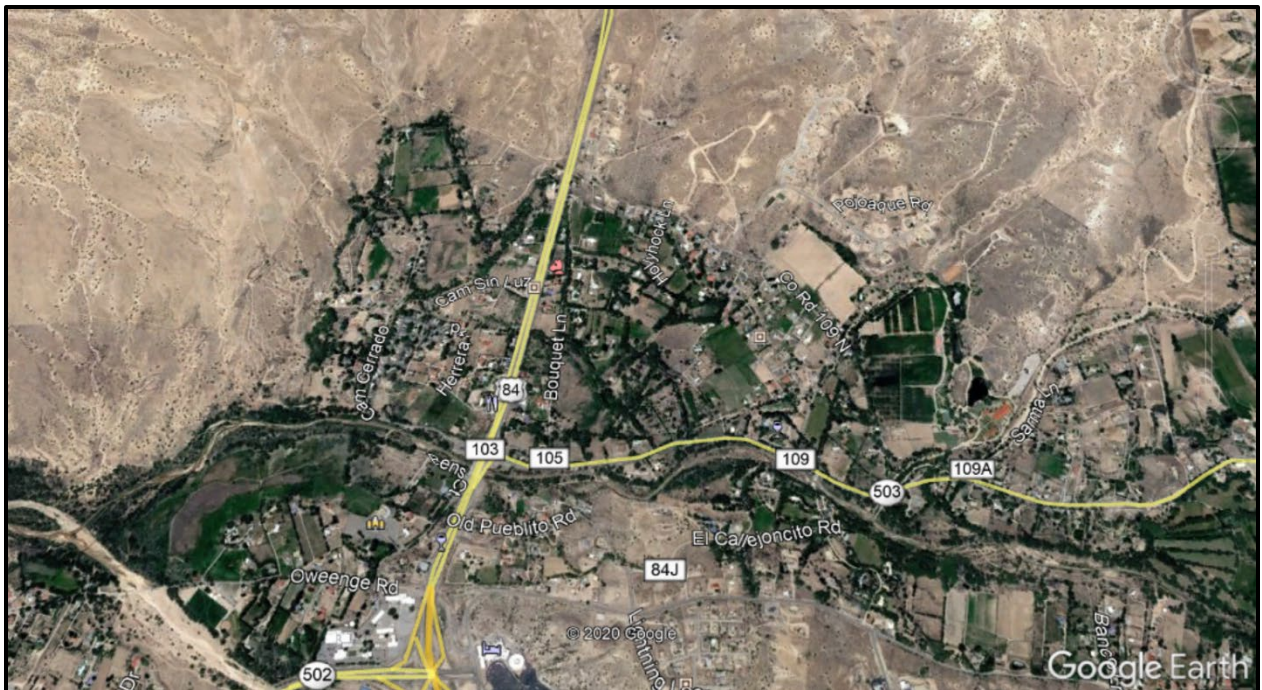


Figure D.64. Google Earth Imagery showing the road layout and residential density within the Pojoaque Pueblo.

Nambe Pueblo

LEGAL: Section 10 T19N R9E

DESCRIPTIVE LOCATION: 6 miles east of Pojoaque, NM

VEGETATION FUELS: grassland & shrubland, riparian communities

POPULATION: 1,818 (2010 census)

TERRAIN: flat to steep slopes **ASPECT:** all

ACCESS: Highway 84 north from Santa Fe to 503 east to Np 101 south

ROADS: 84F, Osaa Puu Poe, Poechunu Poe

BRIDGES: none

DRIVEWAYS: many off 503 and 84 F and G, flat and accessible

WATER AVAILABILITY: limited hydrants

CLOSEST FIRE DEPARTMENT: (in miles): 4.5 miles from Pojoaque Fire Department

VALUES AT RISK: residential and community structures, watershed values, historical values

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$94,691,636.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 51-Moderate



Figure D.65. Nambe Pueblo, showing building material, vegetation, and steep slopes (background).

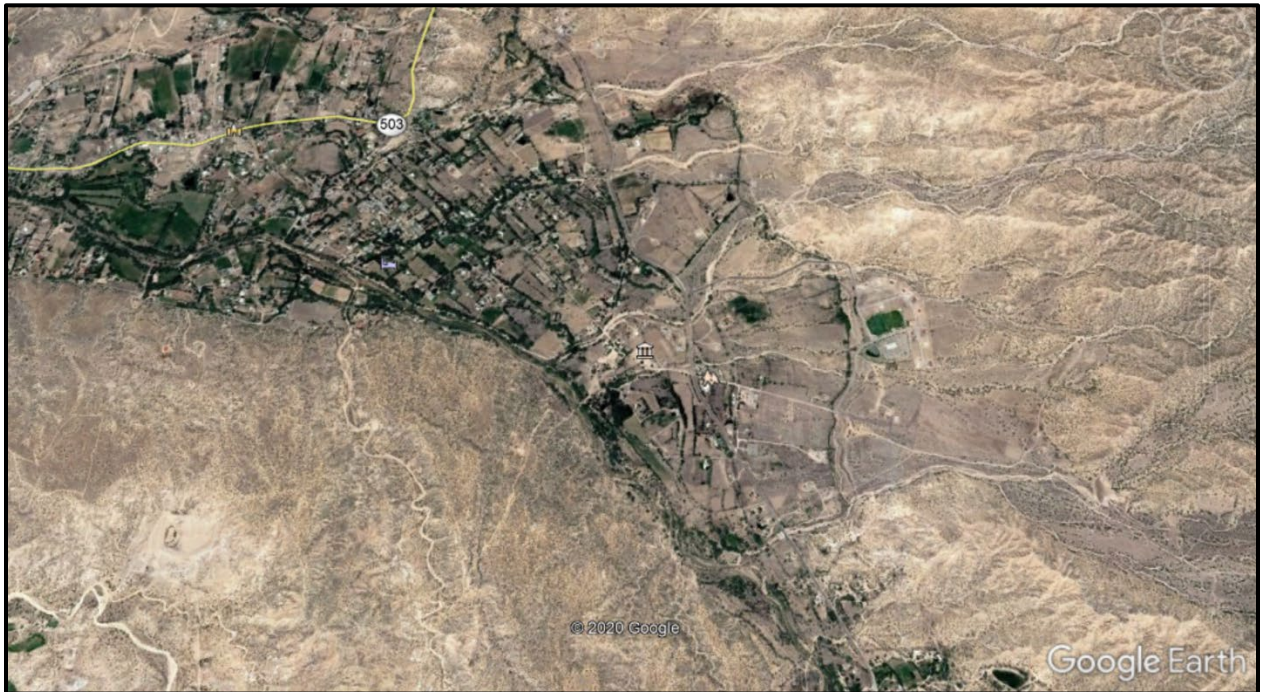


Figure D.66. Google Earth Imagery showing the road layout and residential density within the Nambe Pueblo.

Tesuque Pueblo

LEGAL: Section 8 T18N R9E

DESCRIPTIVE LOCATION: 4.4 miles north of Tesuque, NM

VEGETATION FUELS: grassland & shrubland, conifer

POPULATION: 909 (2000) census

TERRAIN: flat to moderate slopes **ASPECT:** all

ACCESS: Highway 84 north from Santa Fe to NP 806 west

ROADS: NP 806, NP 804, cemetery road, NP 800

BRIDGES: 1, according to 2018 HMP

DRIVEWAYS: many off NP 800 and 804, flat and accessible

WATER AVAILABILITY: limited number of hydrants

CLOSEST FIRE DEPARTMENT: (in miles): 0.5 miles from Tesuque Fire Department- Station 3

VALUES AT RISK: residential and community structures, watershed values, historical resources

COMMUNITY AND HAZARD EXPOSURE TOTALS (from 2018 HMP): \$28,608,603.00

CAR RATING- BASED ON THE NFPA 1144 PROTOCOL: 44-Moderate



Figure D.67. Google Earth Imagery showing the road layout and residential density within the Tesuque Pueblo.

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SCANS

APPENDIX E:

NFPA 1144 Form

SCA

Means of Access						
Ingress and Egress	Points					
Two or more roads in and out	0					
One road in and out	7					
Road Width						
>24 feet	0					
>20 feet, <24 feet	2					
<20 feet	4					
Road Conditions						
Surfaced road, grade <5%	0					
Surfaced road, grade >5%	2					
Nonsurfaced road, grade <5%	2					
Nonsurfaced road, grade >5%	5					
Other than all season	7					
Fire Access						
<300 feet with turnaround	0					
>300 feet with turnaround	2					
<300 feet with no turnaround	4					
>300 feet with no turnaround	5					
Street Signs						
Present—reflective	0					
Present—nonreflective	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 feet around structure	1					
>70 feet, <100 feet around structure	3					
>30 feet, <70 feet around structure	10					
<30 feet around structure	25					
Topography within 300 Feet of Structures						
Slope						
<9%	1					
10% to 20%	4					
21% to 30%	7					

Means of Access						
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 deck	5					
Combustible siding and deck	10					
Building Set-back						
>30 feet to slope	1					
<30 feet to slope	5					
Available Fire Protection						
Water Sources						
Hydrants 500 gpm, <1,000 feet apart	0					
Hydrants 250 gpm, <1,000 feet apart	1					
Nonpressurized, >250 gpm/2 hours	3					
Nonpressurized, <250 gpm/2 hours	5					
Water unavailable	10					
Organized Response						
Station <5 miles from structure	1					
Station >5 miles 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					

Means of Access						
Both aboveground	5					
Totals for Home or Subdivision						
Hazard Rating Scale	<40 Low	>40 Moderate	>70 High	>112 Extreme		

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WASH STATE

APPENDIX F:

Funding Sources

SCA

FUNDING RESOURCES

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

I. Federal Funding Information

Source: Pre-disaster 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 pre-disaster 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 pre-disaster 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 multi-hazard mitigation plans and to implement projects identified in those plans.

Source: Section 319 Base Grant to State Entities and Indian Tribes

Agency: 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.html>

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/>
- Pre-disaster Mitigation Program, <http://www.fema.gov/government/grant/pdm/index.shtml>
- Environmental Education Grants, http://www.epa.gov/enviroed/grants_contacts.html

Source: Firewise Communities**Agency:** Multiple**Website:** <http://www.firewise.org>

Description: Many different Firewise Communities activities are available to 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 several 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 that individuals and neighborhoods can undertake, the following often benefit from 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: GSA-Federal Excess Personal Property

Agency: USFS

Website: <https://gsaxcess.gov/>

Description: The Federal Excess Personal Property (FEPP) program refers to Forest Service-owned property that is on loan to State Foresters for the purpose of wildland and rural firefighting. Most of the property originally belonged to the Department of Defense (DoD). Once acquired by the Forest Service, it is loaned to State Cooperators for firefighting purposes. The property is then loaned to the State Forester, who may then place it with local departments to improve local fire programs. State Foresters and the USDA Forest Service have mutually participated in the FEPP program since 1956.

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: <https://www.nmcounties.org/services/programs/>

Description: This program targets communities, tribes, counties, and non-profits who service areas of wildfire risk in proximity to BLM lands. The Wildfire Risk Reduction Grant Program funds three categories of projects: Development or updates of Community Wildfire Protection Plans (CWPPs), outreach and education, and hazardous fuels reduction. The program has operated for 15 years with funding provided by the Bureau of Land Management.

Source: HB 266: Forest and Watershed Restoration Act (FAWRA)

Agency: New Mexico State Forestry

Website: <http://www.emnrd.state.nm.us/SFD/FAWRA.html>

Description: The Forest and Watershed Restoration Act (FAWRA) was created by House Bill 266 and signed into law by Governor Michelle Lujan Grisham on March 15, 2019. FAWRA allocates funding annually to New Mexico State Forestry for the purpose of restoring forests and watersheds in the state of New Mexico. A Forest and Watershed Advisory Board has been established to evaluate and recommend projects, and New Mexico State Forestry will administer, implement, and report on the projects. FAWRA funds can be used on public lands for on-the-ground restoration treatments; project planning; economic development programs to advance small diameter trees and woody biomass; and workforce development for wood utilization projects. Applicants should contact their local District Forester (Santa Fe County falls in the Bernalillo District. More information on funding is available: <http://www.emnrd.state.nm.us/SFD/documents/HB0266.pdf> and <http://www.emnrd.state.nm.us/SFD/FWHPlan/documents/HB266%20FAQ%20revised%202019.05.10.pdf>

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/>

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WASH STATE

APPENDIX G:

Homeowner Guide

SCA

SANTA FE COUNTY CWPP

HOMEOWNERS GUIDE

This guide has been developed to address site-specific information on wildfire for the Santa Fe County communities. 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 nonflammable 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 nonflammable 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.

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. It 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. Pruning and limbing trees along with the selective removal of trees and shrubs is recommended to create a minimum defensible space area of 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, nonflammable materials such as gravel are much better than wood chips or pine needles.

Vegetative debris such as dead grasses or leaves provide important erosion protection for soil but also may carry a surface fire. It is simply not feasible to remove all the vegetative debris from around your property. However, it is a good idea to remove any accumulations within the safety zone and extending out as far as possible. This is particularly important if leaves tend to build up alongside your house or

outbuildings. Removing dead vegetation 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 like 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. Residents should research and consider environmental impacts of chemicals.

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 in the planning area. 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 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 time frame 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 can 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 of your important household paperwork, such as birth certificates, titles, and so forth. Store them away from your home, such as in a safe deposit box. Important documents can also be protected in a designated firesafe 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 (EAS). 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 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, interior doors, and i your garage door. Disconnect automatic garage openers. Leave exterior doors unlocked. 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. Some roads 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 WUI 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. If it appears to be a large loss, consider whether you should hire a public adjuster that is licensed by the state department of insurance who will represent and advocate for you as the policyholder in appraising and negotiating the claimant's insurance claim to ensure you get the best outcome and recovery from your insurance company. Most public adjusters charge a small percentage of the settlement that is set by the state and primarily they appraise the damage, prepare an estimate and other claim documentation, read the policy of insurance to determine coverages, and negotiate with the insurance company's claims handler.

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 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 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 re-routing 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.

WASH STATE

APPENDIX H:

Community Outreach

SCA

PUBLIC OUTREACH

Table H.1 presents examples of the public outreach completed as part of the CWPP development. Due to the COVID-19 pandemic, public gatherings were not permitted. Therefore, online resources were used to provide information to the public and solicit feedback. Figures H.1 through H.4 show examples of online posts.

Table H.1. Public Outreach Resources

Resource Description	Location	URL	Figure Number	Date Published
Newspaper article	Santa Fe Reporter	Link not available	n/a	Week of September 21, 2020
Social media post	Next Door	Link	1	July 29, 2020
Social media post	Next Door	Link	n/a	August 21, 2020
Online news article	Santa Fe Today	Link	n/a	n/a
Website post	New Mexico Fire Information	Link	2	July 30, 2020
Social media post	Twitter: New Mexico Fire Information	Link	3	July 30, 2020
Social media post	Facebook: New Mexico Fire Information	Link	4	July 30, 2020
Social media post	Twitter: New Mexico State Forestry	Link	n/a	July 25, 2020
Social media post	Twitter: WUI Santa Fe Fire	Link	n/a	July 29, 2020
Social media post	Twitter: Southwest Fire Consortium	Link	n/a	August 25, 2020
Social media post	Twitter: Cibola National Forest & Grasslands	Link	n/a	July 30, 2020
ArcGIS story map	ArcGIS Online	Link	5-8	July 28, 2020
Podcast	The Richard Eeds Show	Link	n/a	August 20, 2020

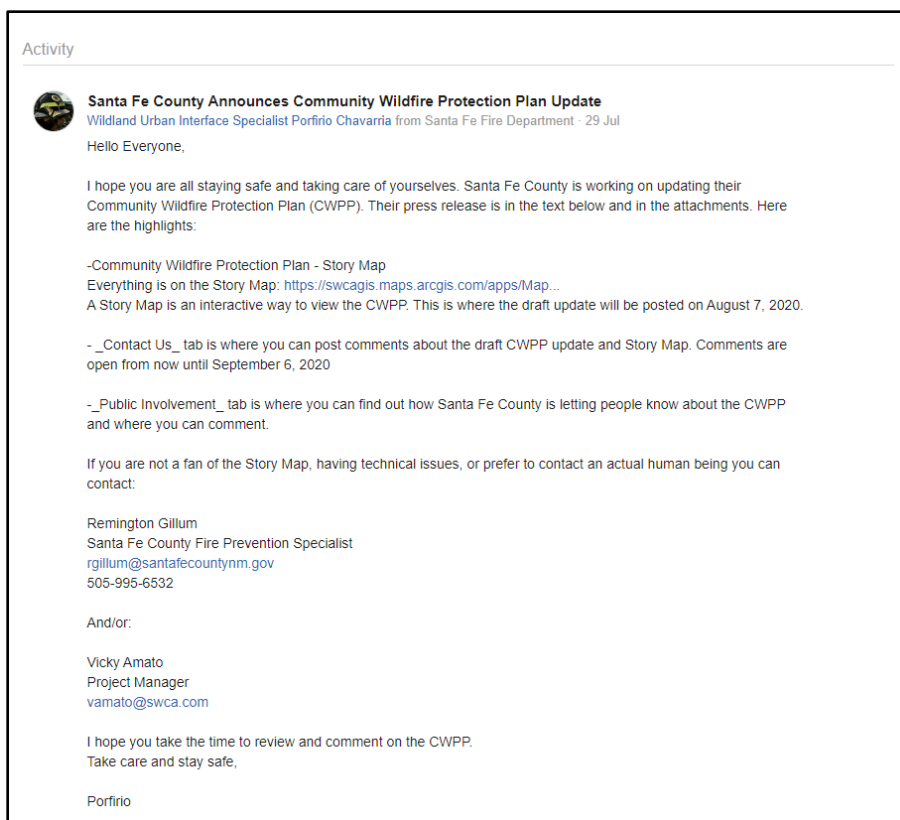


Figure H.1. Next Door post regarding CWPP from the Santa Fe County Fire Department.



Figure H.2. New Mexico Fire Information post regarding CWPP from the BLM.



Figure H.3. Twitter post from New Mexico Fire Information regarding CWPP.



Figure H.4. Facebook post from New Mexico Fire Information regarding CWPP.

The County developed the CWPP story map (online content, link in Table H.1) to accommodate engagement with the public during the COVID-19 pandemic. The story map provides opportunities for both information sharing and gathering between the public and the Core Team. The story map has several tabs, each demonstrating information from various chapters in the CWPP document. The introductory tab presents the purpose of the story map, project history, instructions for navigating the content, and the National Cohesive Wildland Fire Management Strategy framework (Figure H.5). Next, the public involvement tab invites viewers to view the Santa Fe County Fire Department press release (text included in the July 29, 2020, Next Door posting [see Table H.1]), listen to the radio interview podcast (see Table H.1), and view the informational flyer from the Santa Fe County Fire Department. The fire environment, values at risk, WUI hazard and risk assessment, mitigation strategies, and monitoring and evaluation strategies tabs present the bulk of the CWPP content (Figures H.6 and H.7). These tabs introduce the WUI concept, fire regimes and fire history in the County, information regarding County fire planning and response, County values at risk from wildfire, areas with high versus low risk, wildfire mitigation actions, and monitoring strategies for applied treatments.

The story map also links the viewer to the CWPP document and contact information for the Santa Fe County fire prevention specialist and the CWPP project manager. The figures below (H.5–H.7) demonstrate the spatial information that is conveyed through the story map. Each map is interactive, with several clickable layers providing information on numerous aspects of wildfire, including but not limited to communities in high-risk areas, vegetation and fuels, current mitigation projects, and fire behavior.

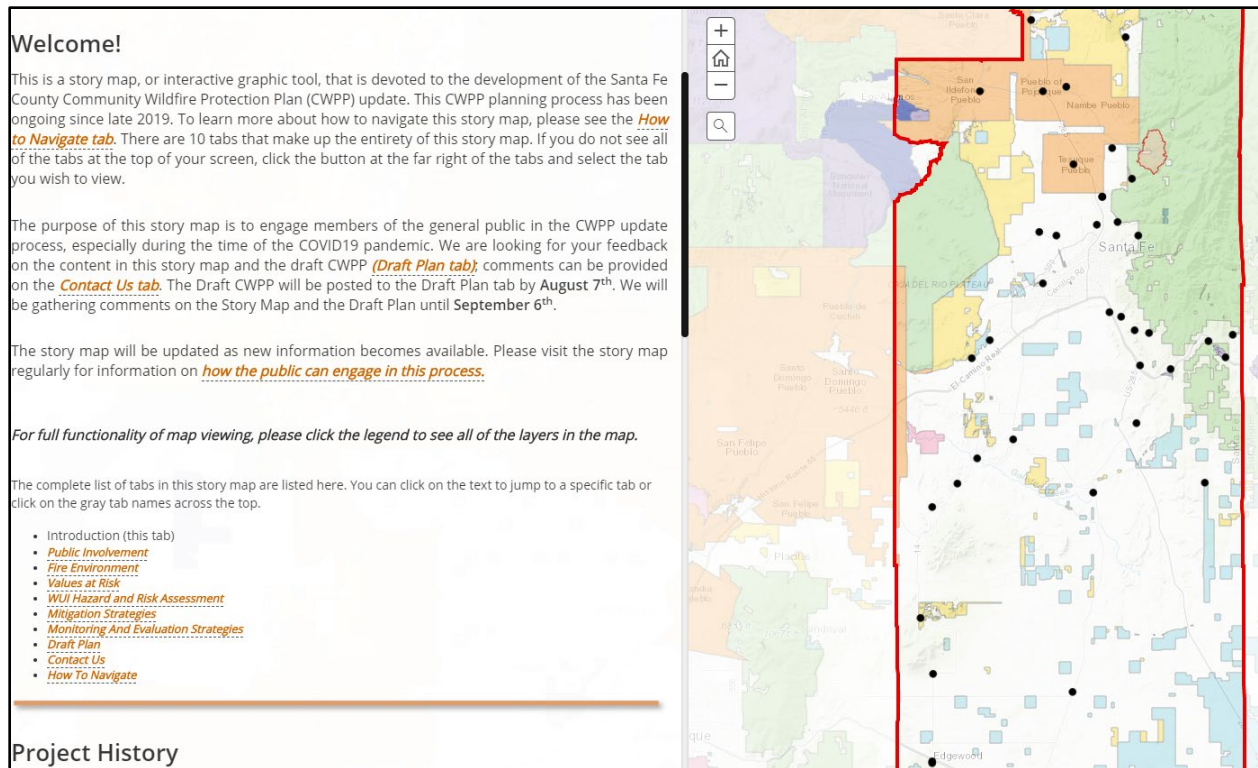


Figure H.5. CWPP story map introduction tab sample.

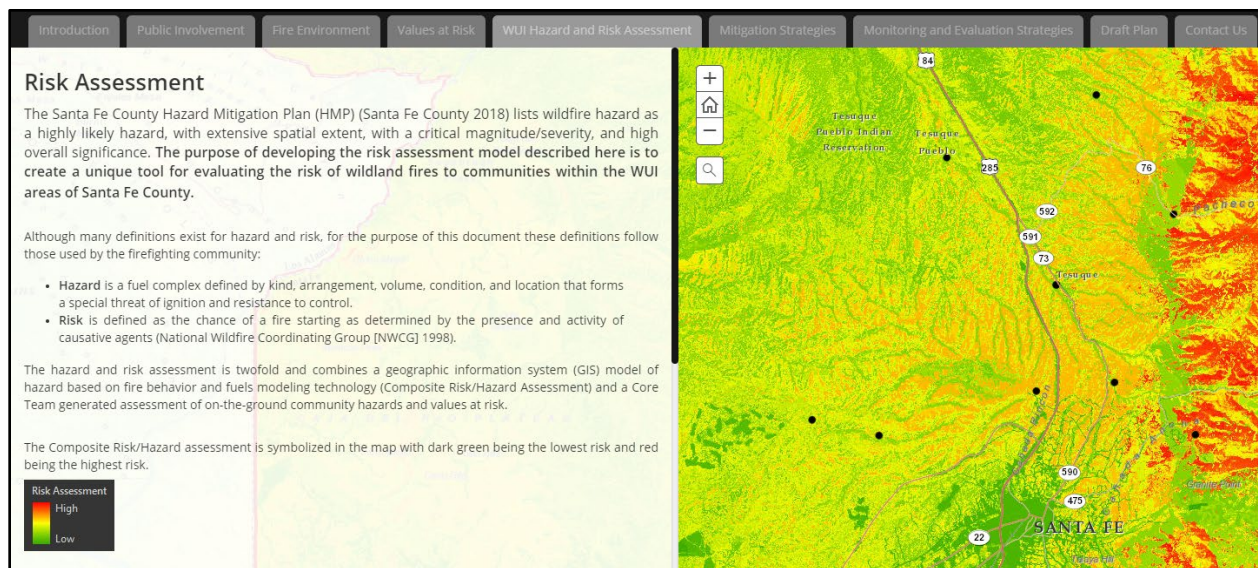


Figure H.6. CWPP story map WUI hazard and risk assessment tab sample.

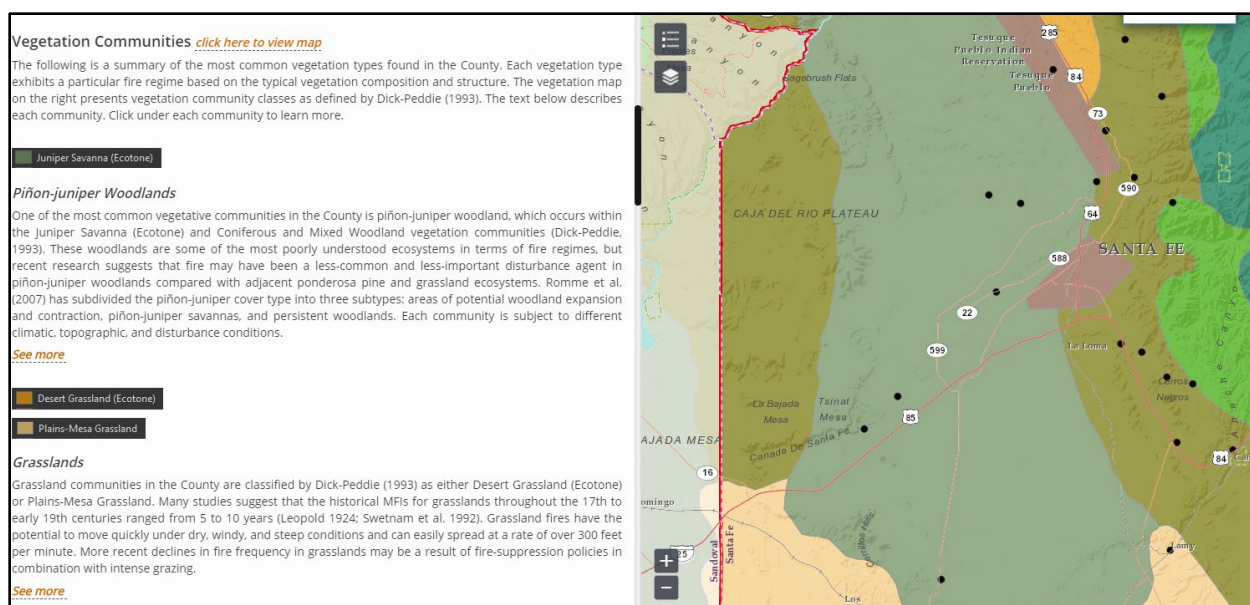


Figure H.7. Story map WUI hazard and risk assessment tab sample.

The story map tool allowed the project team to assess the number of views per day. Figure H.8 shows the average number of views per day and related graphical information. The number of views from July 17, 2020 (when the story map was originally posted for Core Team review) through September 15, 2020, was 978, and the average number of views per day was just over 16 (see Figure H.8).

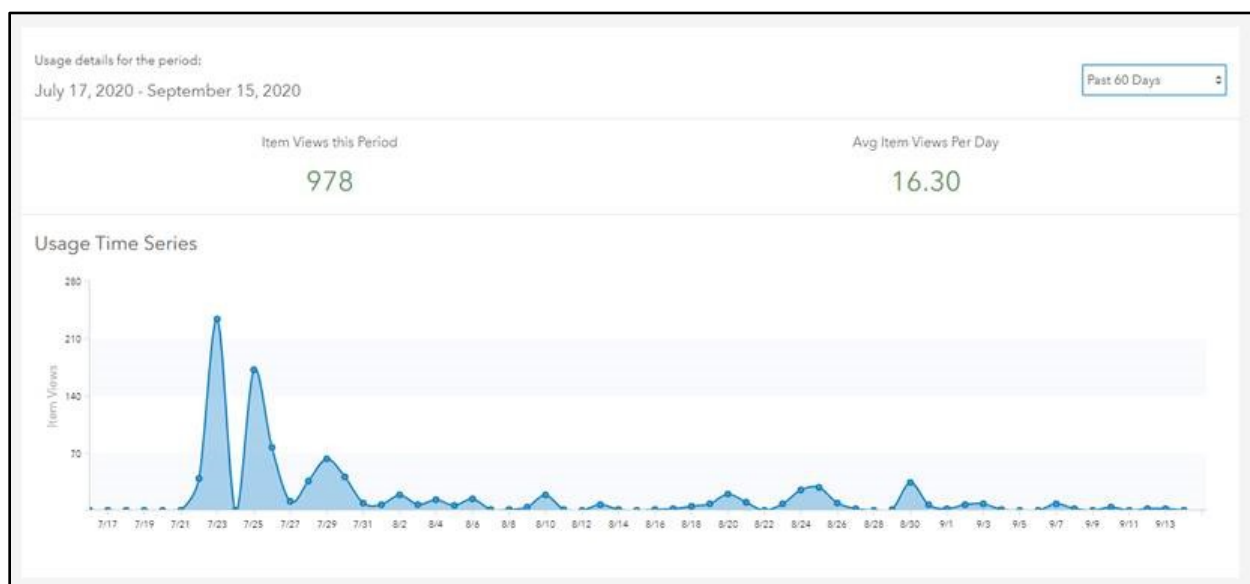


Figure H.8. Story map views from July 17 through September 13, 2020.

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Commissioner, District 1

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SANTA FE COUNTY

Anna T. Hamilton
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Katherine Miller
County Manager

The entities listed below participated in the development of and/or reviewed and are in support of the Santa Fe County Community Wildfire Protection Plan:

Signature

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Date

12-4-2020

Approved as to form:

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12/2/2020

Gregory S. Shaffer
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Date

Santa Fe County Finance Director 12/3/2020

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Signature

Todd Haines

Name (printed)

09/29/2020

Date

District Forester – Bernalillo District NMSF
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Santa Fe County Fire Department



The entities listed below participated in the development of and/or reviewed and are in support of the Santa Fe County Community Wildfire Protection Plan:



Signature

Erik Litzenberg

Name (printed)

12/8/2020

Date

Fire Chief, Santa Fe County

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