Updated Navajo and Apache County Sitgreaves Communities' Wildfire Protection Plan

June 2016

Apache County

Navajo County

City of Show Low

Town of Pinetop-Lakeside

Clay Springs-Pinedale Fire Department

Heber-Overgaard Fire District

Pinetop Fire Department

Timber Mesa Fire and Medical

Vernon Fire District

Apache-Sitgreaves National Forests

Arizona State Forestry Division

Bureau of Land Management

Aripine ◆ Clay Springs ◆ Heber-Overgaard ◆ Linden ◆ Pinedale ◆ Pinetop-Lakeside ◆ Show Low ◆ Vernon

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LIST OF ABBREVIATIONS

ACEM	Apache County Emergency Management
A-SNFs	Apache Sitgreaves National Forests
ASLD	Arizona State Land Department
ASFD	Arizona State Forestry Division
BA	basal area
BLM	Bureau of Land Management
CWPP	community wildfire protection plan
drc	diameter at root collar
FRCC	fire regime condition class
GIS	geographic information system
GPS	Global Positioning System
HFRA	Healthy Forests Restoration Act of 2003
IGA	intergovernmental agreement
IMS	Federal Wildland Fire Occurrence Internet Mapping Service
ISO	Insurance Services Office
NCEM	Navajo County Emergency Management
PPE	personal protective equipment
SR	state route
SWReGAP	Southwest Regional Gap Analysis Project
TES	Threatened, endangered, and sensitive species
USDA	US Department of Agriculture
USDI	US Department of the Interior
USFS	US Forest Service
WUI	wildland-urban interface

EXECUTIVE SUMMARY: SITGREAVES COMMUNITIES' WILDFIRE PROTECTION PLAN

The original Sitgreaves Communities' Wildfire Protection Plan (SCWPP) for the "at-risk" communities located within the Sitgreaves National Forest (SNF) managed within the US Department of Agriculture (USDA) Apache-Sitgreaves National Forests (A-SNFs) was developed in 2004 immediately after passage of the Healthy Forests Restoration Act of 2003 (HFRA) and in the aftermath of the Rodeo-Chediski Fire. The 2004 SCWPP analysis was developed to provide for wildfire protection planning for nine at-risk communities in Apache, Coconino and Navajo Counties. The 2004 SCWPP was one the earliest Community Wildfire Protection Plans (CWPP) constructed to be compliant with HFRA and approved by the Arizona State Forestry Division (ASFD), local fire departments, municipalities, and the A-SNFs.

Navajo and Apache Counties have agreed that the 2004 SCWPP should be reviewed, updated and revised where necessary, to document wildfire mitigation progress to date, re-analyzing wildfire risk concurrent with the National Forest Southwest Region Wildfire Risk Assessment, and by using fire behavior modeling tools and programs that were not available in 2004.

The Bureau of Indian Affairs Fort Apache Agency and the White Mountain Apache Tribe in 2013 revised and updated their Wildland Fire Management Plan which established WUI boundaries, wildland fuel mitigation treatments and fire protection measures for White Mountain communities adjacent to the Fort Apache Indian Reservation as well as for the communities of Hon-dah and McNary, negating the need for further review in the 2016 SCWPP planning revision process for Navajo and Apache County Communities. Coconino County has decided to not include the community of Forest Lakes in the 2016 revision of the SCWPP. Therefore the 2016 revision of the SCWPP will reflect Navajo and Apache County communities within the SCWPP analysis area.

The 2004 SCWPP was developed to assist local government, fire districts, and residents in the identification of lands—including federal lands—at risk from severe wildfire threat and to identify strategies for reducing fuels on wildlands while improving forest health, supporting local industry and economies, improving fire-fighting response capabilities, enhancing public and firefighter protection.

Navajo and Apache County believe a community wide approach to creating fire adapted communities is a new path forward, and a new way of thinking about wildland fire which reduces dependency on suppression. Such fire adapted communities (http://www.fireadapted.org/) are composed of informed and prepared citizens collaboratively planning and taking action to safely coexist with wildland fire through preparation that would assist in meeting the revised goals developed during the SCWPP planning process. Additionally, Apache and Navajo County support a regional approach to reducing and preparing for unwanted wildfire to at-risk communities. Navajo and Apache County have agreed to mutually re-establish the Sitgreaves Communities CWPP planning team for Apache and Navajo Counties and to identify and expand where necessary community wildfire protection and preparation on a regional level.

Within Navajo and Apache Counties the 2004 SCWPP was developed as a collaborative effort between the Pinetop, Timber Mesa Fire and Medical (formerly Show Low, Lakeside and Linden Fire Departments), Clay Springs-Pinedale, Vernon, and Heber-Overgaard Fire Departments, the City of Show Low, Town of Pinetop-Lakeside, Navajo County, Apache County, A-SNFs, and the ASFD. Navajo and Apache County have re-initiated the collaborative planning process for this update and revision by soliciting participation in the Core Planning Team (Core Team) from the original 2004 Navajo and Apache County collaborators. In response, a Core Team composed of representatives from NCEM, ACEM, ASFD, A-SNFs, local fire departments, communities and interested parties have been formed to guide and provide direction for the 2016 update and revision of the 2004 SCWPP.

Section I. Introduction

A primary objective of a CWPP is to help local governments, fire departments and districts, and residents identify at-risk public and private lands to better prepare those lands from severe wildfire threat. Additional functions of a CWPP are to improve fire prevention and suppression activities, as well as to identify funding needs and opportunities to reduce the risk of wildland fire and enhance public and firefighter safety. Identifying at-risk areas and improving fire protection capabilities helps the communities to prioritize high-risk projects and to expedite overall project planning. The 2004 SCWPP met all criteria of HFRA and was collaboratively developed by a coordinated and collaborative, performance-based framework of recommendations designed to meet its outlined goals. The Core Team is recommending additional goals to be considered for the 2016 SCWPP to reduce the risks to life and property from catastrophic wildland fire including the following goals:

- Improve fire prevention and suppression, emphasizing firefighter and public safety
- Reduce hazardous fuels, emphasizing public and private property protection
- Restore forest, rangeland, and riparian health
- Promote community involvement and provide for community protection
- Recommend measures to reduce structural ignitability in the WUI
- Encourage economic development in the communities from vegetative treatments
- Use the CWPP in conjunction with surrounding community and agency fire management plans
- Encourage high-risk communities to become Fire Adapted Communities
- Reduce potential economic loss to communities from unwanted wildland fire
- Work with elected officials to develop opportunities for enhanced funding through national, state and local sources for implementing the action recommendations of the Navajo and Apache County communities within the Sitgreaves Community CWPP
- Work with local, state and federal agencies to support the growth of forest industry and forest products to ensure infrastructure is in place to conduct landscape level forest restoration and community wildfire preparedness objectives

Action recommendations for at-risk areas within the 2016 SCWPP WUI boundaries have been reviewed and updated where needed as part of the planning process. Treatments for wildland vegetative fuels and additional wildland fire mitigation measures were recommended for implementation in specific time frames and with associated monitoring to determine and document measurable outcomes. Continued successful implementation of the 2016 SCWPP for Navajo and Apache County communities will require collaboration between fire departments and districts, governments, resource-management agencies, and private landowners. The cooperating agencies should work toward developing processes and systems that would allow recommended actions of the SCWPP to be compliant with applicable local, state, and federal environmental regulations within Navajo and Apache Counties

Section II. Community Assessment

Section II covers the methods used in community wildfire risk assessments; the identification of the WUI; and the identification of communities with high, moderate, and low wildland fire risk within the WUI. The 2004 SCWPP working group identified specific WUI boundaries that were determined by proximity to population centers and with respect to identified values at risk.

The 2004 and 2016 SCWPP was developed through quantitative analyses of wildland fire risk within Navajo and Apache Counties, designing mitigation measures and priority needs to implement mitigation measures, whether for wildland fire fuel manipulations, resource response, reduced structural ignitibility or public education and outreach.

During the 2016 review and revision of the SCWPP the Core Team has determined the community wildfire risk assessment would be composed of an assessment of:

1) *wildland fire threat* – the probably and intensity of an area burning

2) *wildfire effects* – the community values at risk from wildfire

3) *wildfire risk* - an analysis of where the potential for catastrophic wildland fire occurs adjacent to or within areas of high community values that may be effected by wildfire within Navajo and Apache County communities and lands within the WUIs identified by the Core Team.

This risk analysis is developed to closely tie to the future Arizona Wildfire Risk Assessment Portal (AZ WRAP) (https://azsf.az.gov/fire/prevention/az-wrap). The 2016 SCWPP incorporates the current fire regime condition class, wildfire fuel hazards, risk of ignition, local preparedness and protection capabilities, and at-risk community values. The Core Team has reviewed the Arizona State Forester's *Identifying Arizona's Wildland/Urban Interface Communities at Risk: A Guide for State and Federal Land Managers* (ASFD 2007) to allow the SCWPP to be compatible with and complementary to statewide CWPP planning efforts. The Core Team has included all risk factors required by the Arizona State Forester in the analysis and revision of this CWPP. The areas of concern for wildland fuel

hazards, risk of ignition and wildfire occurrence, local preparedness and protection capabilities, and loss of community values are evaluated to determine areas of highest wildfire risk.

These elements were all identified and combined using spatial analysis within a geographic information system (GIS). As a result of the GIS analysis, a WUI and sub-WUI boundary map and a wildfire risk rating map were created. Sub-WUIs were divided into treatment management areas, according to high, moderate, and low wildfire risk. The SCWPP analysis area consists of 2,631,366 acres of federal, state, and private lands, of which approximately 244,352 acres were classified as the WUI, slightly smaller than the 307,583 acres of WUI identified in the 2004 SCWPP. This reduction in acreage can be attributed to the community of Forest Lakes and lands associated with the Fort Apache Agency not being included as part of the 2016 analysis. Wildfire Risk levels across the 2016 SCWPP WUIs include 3,683 acres (2%) of high wildland fire risk, 146,206 acres (60%) of moderate risk, and 94,464 acres (39%) of low risk.

Section III. Community Mitigation Plan

Section III prioritizes the areas in need of wildland fuel mitigation and recommends the types and methods of treatment and management necessary to mitigate the potential for wildland fire in the WUI. Also presented in this section are the 2016 SCWPP recommendations for enhanced wildland fire protection capabilities; public education, information, and outreach; and support for businesses and industries centered on local wood products, woody biomass, and wildland vegetative fuel management.

As part of the community mitigation plan, the Core Teams identified the SCWPP administrators—composed of local fire chiefs, NCEM, ACEM, ASFD, A-SNFs, community members, concurring agencies, County and local planning and zoning departments and members of the Core Team —who will be mutually responsible for implementing and monitoring SCWPP action recommendations in coordination with the future-established countywide community CWPP Working Group. SCWPP administrators are responsible for ensuring implementation of the SCWPP, for preparing reports and work plans, and for developing community bulletins and public service announcements that inform residents of wildfire dangers and preventive measures. Additional tasks include assisting federal and state agencies and private landowners to identify appropriate funding sources to implement action recommendations of the SCWPP, as well as continued coordination with communities outside the analysis area. SCWPP administrators are also responsible for the monitoring and reporting of implementation actions that will allow for enhanced coordination of management programs and that will reduce inconsistencies among local, state, and federal agencies.

To prioritize treatments, the Core Teams identified 38 wildland treatment management units within 3 sub-WUI designations of the WUI. These treatment units were analyzed and categorized according to potential risk for wildfire. The Core Teams ranked then provided a recommendation for each unit's preferred treatment type and method. Preferred treatments were recommended for treatment management units identified as high, moderate and low risk. These treatments are designed to meet the fuel reduction and modification objectives of the SCWPP.

Section IV. Navajo and Apache County Sitgreaves Communities' CWPP 2016 Priorities: Action Recommendations and Implementation

To achieve the goals outlined in the CWPP, the Core Teams identified priority action recommendations, which are presented in Section IV. The first action recommendation was to identify priority treatment areas for fuel reduction projects. Treatment areas were identified within community WUIs to create survivable space through treatments within the home ignition zone, the use of strategically placed fuelbreaks, and the modification of hazardous wildland fuels. The objective of a fuels reduction project is to create an acceptable vegetation condition class for community and infrastructure protection as well as public and firefighter safety. Table 4.1 in Section IV lists the priority action recommendations for the reduction of hazardous fuels within the SCWPP area based on treatment areas identified in Section III. The second action recommendation identified by the Core Teams was to reduce structural ignitability. Reduction of structural ignitability is achieved through evaluation; maintenance; and, at times, upgrades to community response facilities, capabilities, and equipment. The third action recommendation identified was to promote community involvement through education, information, and outreach.

Section V. Monitoring Plan

The monitoring plan, outlined in Section V, describes how monitoring the implementation of the SCWPP will occur. The SCWPP administrators are responsible for implementation and monitoring. Implementation begins by securing grants and other funding necessary to execute the action items.

The SCWPP administrators will report successful grant awards and projects implemented as a result of those awards to the SCWPP signatories. The administrators will also update work plans based on projects completed in the previous years.

Acknowledgments

The following communities and agencies were involved in the collaborative process in preparation of and are assisting as appropriate in the revision and update of the SCWPP:

- Navajo County Office of Emergency Management
- Apache County Office of Emergency Management
- Municipal fire departments and local fire districts and fire chiefs from the following communities:
  - Pinetop Fire Department
  - Timber Mesa Fire and Medical
  - Clay Springs-Pinedale Fire Department
  - Heber-Overgaard Fire Department
  - Vernon Fire Department
- Arizona State Forestry Division
- US Department of the Interior, Bureau of Land Management
- US Forest Service, Apache-Sitgreaves National Forests

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I. INTRODUCTION

The 2004 *Community Wildfire Protection Plan for At-Risk Communities of the Sitgreaves National Forest in Apache and Navajo Counties* (SCWPP) was developed immediately after passage of the Healthy Forests Restoration Act of 2003 (HFRA) and in the aftermath of the Rodeo-Chediski Fire for the at-risk communities located within the Sitgreaves National Forest managed by the US Department of Agriculture (USDA) Apache-Sitgreaves National Forests (A-SNFs). The 2004 SCWPP analysis was developed to provide for wildfire protection planning for nine at-risk communities in Apache, Coconino and Navajo Counties (Figure 1.1). The local, state and federal agencies involved in the 2004 SCWPP recognized the value of this new legislation by providing incentives for communities to develop comprehensive wildfire protection plans in a collaborative, inclusive process. The 2004 SCWPP was one the earliest CWPPs constructed to be compliant with HFRA and approved by the Arizona State Forestry Division (ASFD), local fire departments, municipalities, and the A-SNFs. The 2004 SCWPP has been an exceptionally successful CWPP, including approval by three county governments, the ASFD, A-SNFs, two incorporated communities, eight local fire departments, the Bureau of Indian Affairs Fort Apache Agency, and the White Mountain Apache Tribe. During the first 5-years of the SCWPP work accomplishments included the following (Sitgreaves Community Wildfire Protection Plan Update 2009):

- 90,545 acres of land treated
- 5,238 acres of private property had been treated on 2,975 parcels
- 6,629 parcels have been assessed
- $1 million dollars in grant funds had been awarded for fire mitigation in the plan area in 2009
- Maintenance of previously treated areas and new treatments were addressed through a cooperative initiative between the City of Show Low, Homeowners Association Management Company, Arizona Division of Forestry, and the University of Arizona Cooperative Extension Background

Navajo and Apache Counties have agreed that the 2004 SCWPP should be reviewed, updated, and revised, where necessary, to document wildfire mitigation progress to date and to reanalyze wildfire risk by using the USFS Southwest Region Wildfire Risk Assessment and fire-behavior modeling tools and programs that were not available in 2004.

It is the intent of Navajo and Apache Counties and the SCWPP cooperators to continue the work toward achieving the goals of the 2004 SCWPP and to re-create the community and agency momentum established in 2004. The Bureau of Indian Affairs Fort Apache Agency and the White Mountain Apache Tribe in 2013 revised and updated their Wildland Fire Management Plan which established WUI boundaries, wildland fuel mitigation treatments, and fire protection measures for White Mountain communities adjacent to the Fort Apache Indian Reservation, as well as for the communities of Hon-dah and McNary, negating the need for further review in the 2016 SCWPP planning revision

process for Navajo and Apache County communities. Coconino County has decided to not include the community of Forest Lakes in the 2016 revision of the SCWPP. Therefore, the 2016 revision of the SCWPP will reflect Navajo and Apache County communities within the SCWPP analysis area (Figure 1.1)

The 2004 SCWPP was developed to assist local government, fire districts, and residents in the identification of lands—including federal lands—at risk from severe wildfire threat and to identify strategies for reducing fuels on wildlands while improving forest health, supporting local industry and economies, improving fire-fighting response capabilities, enhancing public and firefighter protection. Navajo and Apache County support the 2004 CWPP planning concepts and further believe that the protection of life and property from wildland fire involves a comprehensive approach from the home site to the entire community that abuts wildlands. They believe a community-wide approach to creating fire-adapted communities is a new path forward and a new way of thinking about wildland fire which reduces dependency on suppression. Such fire-adapted communities are composed of informed and prepared citizens collaboratively planning and taking action to safely coexist with wildland fire through preparation that would assist in meeting the revised goals developed during the SCWPP planning process. Additionally, Apache and Navajo Counties support a regional approach to reducing and preparing for unwanted wildfire to at-risk communities. Navajo and Apache Counties have agreed to mutually reestablish the SCWPP planning team for Apache and Navajo Counties and to identify and expand where necessary community wildfire protection and preparation on a regional level.

Navajo and Apache Counties fully support the tenants of the National Cohesive Strategy which establishes a national vision for wildland fire management, defines national goals, describes the wildland fire challenges, identifies opportunities to reduce wildfire risks, and establishes national priorities focused on achieving the national goals. The National Cohesive strategy identifies three primary factors as presenting the greatest challenges and opportunities in addressing wildland fire:

1. Restoring and maintaining resilient landscape
2. Creating fire-adapted communities
3. Responding to wildfires

In particular, Navajo and Apache Counties support the National Cohesive Strategy in providing general guidance for homes, communities, and values at-risk. The National Cohesive Strategy promotes community and homeowner involvement in planning and implementing actions to mitigate the risk posed by wildfire, stresses programs and activities that prevent human-caused ignitions, and emphasizes proactive wildfire risk mitigation actions. In order to provide Navajo and Apache County residents with the most up-to-date information on community wildfire fire protection, the counties have decided to review and revise, where necessary, the 2004 SCWPP for Navajo and Apache County communities. Therefore, the Navajo County Emergency Management (NCEM) and Apache County Emergency Management (ACEM) have recommended to the original 2004 SCWPP signatories for Navajo and Apache County communities that the existing SCWPP be updated and, where appropriate,

revised and resubmitted for approval and concurrence by local governments, fire departments, ASFD, and the A-SNFs.

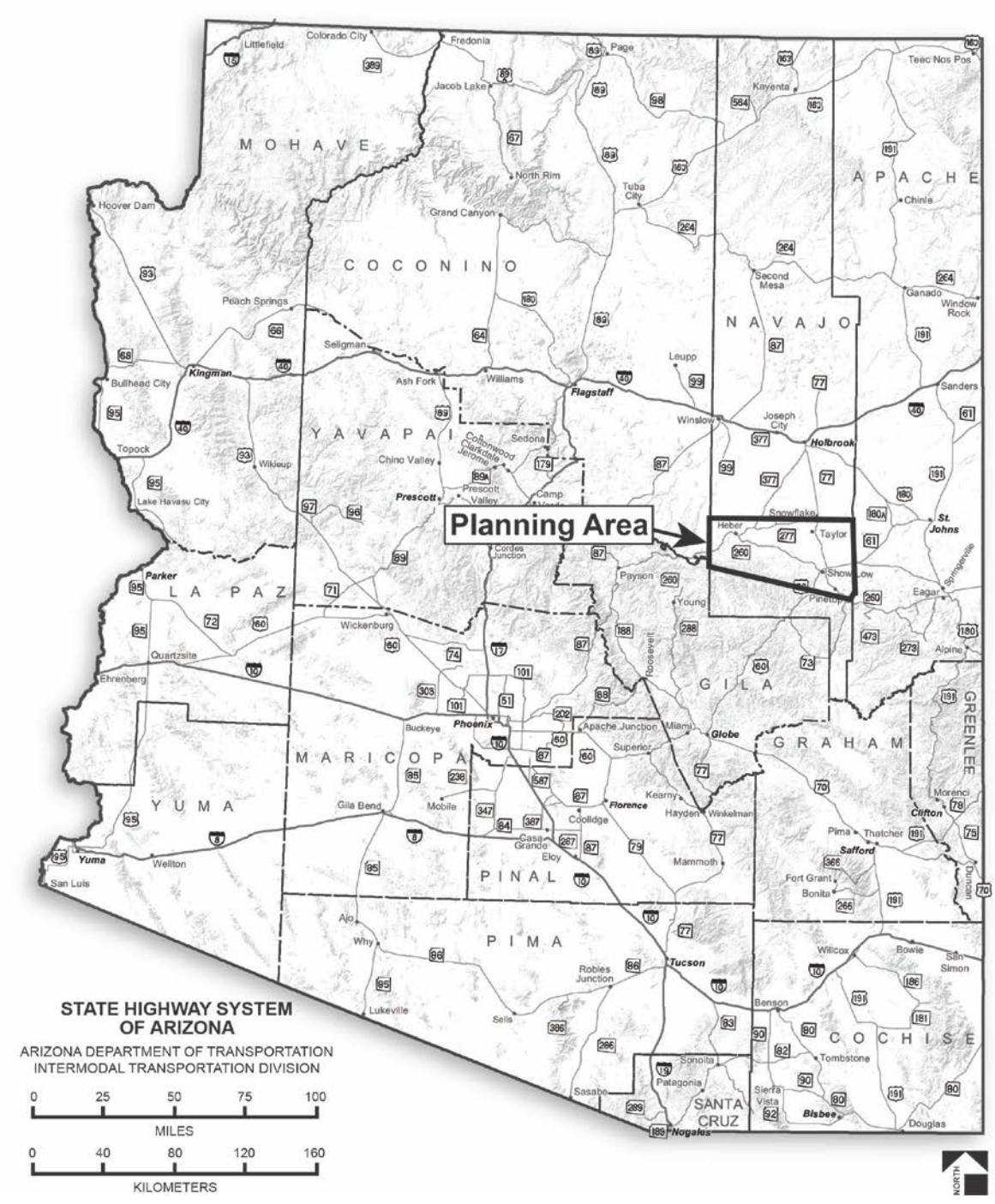

Figure 1.1. Location of 2016 SCWPP Analysis Area

A collaborative effort between the Pinetop, Timber Mesa Fire and Medical (formerly Show Low, Lakeside, and Linden Fire Departments), Clay Springs-Pinedale, Vernon, and Heber-Overgaard Fire Departments, the City of Show Low, Town of Pinetop-Lakeside, Navajo County, Apache County, A-SNFs, and the ASFD.

Navajo and Apache Counties have re-initiated the collaborative planning process for this update and revision by soliciting participation in the Core Planning Team (Core Team) from the original 2004 Navajo and Apache County collaborators. In response a Core Team composed of representatives from NCEM, ACEM, ASFD, A-SNFs, local fire departments, communities and interested parties has been formed to guide and provide direction for the 2016 update and revision of the 2004 SCWPP.

During analyses for the revision of the 2004 SCWPP, the Core Team recognized that in addition to guidance documents utilized during development of the 2004 SCWPP advancements in wildfire fire risk assessments, responses and public education have been made. The Core Team has therefore reviewed the following documents in consideration of updating and revising the SCWPP:

- *"Urban Wildland Interface Communities within the Vicinity of Federal Lands That Are at High Risk from Wildfire"* (US Department of Agriculture and US Department of the Interior [USDA and USDI] 2001a, 2001b)
- *Field Guidance: Identifying and Prioritizing Communities at Risk* (National Association of State Foresters 2003)
- *Arizona Wildland Urban Interface Assessment* (ASFD 2004)
- *Identifying Arizona's Wildland/Urban Interface Communities at Risk: A Guide for State and Federal Land Managers* (ASFD 2007)
- *Arizona-Identified Communities at Risk* (ASFD 2009a)
- *Statewide Strategy for Restoring Arizona's Forests* (Governor's Forest Health Councils 2007)
- *Arizona Forest Resource Assessment* (ASFD 2010a)
- *Arizona Forest Resource Strategy* (ASFD 2010b)
- *Forest Health Landscape-Scale Restoration Recommendations* (Western Governors' Association 2010)
- *A National Cohesive Wildland Fire Management Strategy-Phase II National Report* (WFLC 2012)
- *Landscape Conservation and Restoration Strategic Action Plan* (USFS 2011)
- *Preparing a Community Wildfire Protection Plan: A Handbook for Wildland-Urban Interface Communities* (Communities Committee et al. 2004)

- *Community Guide to Preparing and Implementing a Community Wildfire Protection Plan. A supplemental guide to Preparing a Community Wildfire Protection Plan: A Handbook for Wildland-Urban Interface Communities* (Communities Committee et al. 2008)
- *Guidance for Implementation of Federal Wildland Fire Management Policy* (USDA and USDI 2009)
- *Apache-Sitgreaves National Forest Plan* (USFS 1988)
- *Fire Adapted Communities (FAC) Toolkit* (International Association of Fire Chiefs, http://www.iafc.org/facToolkit)
- Ready, Set, Go! (RSG) Program (International Association of Fire Chiefs, http://www.wildlandfirersg.org/)
- *Wildland Urban Interface Wildfire Mitigation Desk Reference* (National Wildfire Coordinating Group PMS 051 August 2014)
- *US Forest Service Southwest Region Wildfire Risk Assessment Initial Fire Hazard Results* (USFS October 2015)
- *National Fire Protection Association Firewise Communities* (http://www.firewise.org)
- *Fire Adapted Communities* (http://www.fireadapted.org/)
- *Fire Adapted Communities Learning Network* (http://www.wildlandfirersg.org/)

In January 2001 the Departments of Interior and Agriculture published the "Urban Wildland Interface Communities within the Vicinity of Federal Lands That Are at High Risk from Wildfire" (USDA and USDI 2001b). Several Navajo and Apache County communities were included in the 2001 list of communities at-risk (Table 1.1). In 2004 the Arizona Interagency Coordination Group (AICG) prepared the Arizona Wildland Urban Interface Assessment, which included a list of Arizona communities at-risk for wildland fire. The 2004 communities list included a wildfire risk rating based on four main data layers composed of risk, topography, house/structure, and hazards. The rating ranged from0 (no risk) and 14 (extreme risk). Several SCWPP communities were also included in the 2004 list of at-risk communities and were rated as high or moderate risk for wildland fire (Table 1.1). The most recent communities' at-risk list published by the ASFD in 2009 also included several SCWPP Communities (ASFD 2009). The 2009 ASFD list of at-risk communities included a risk rating based on community type, predicted fire behavior, community culture, and wildfire response capabilities. The Core Team has decided to reanalyze wildland fire risk to SCWPP communities using current data and wildfire planning methodologies. Evaluating risk using current landscape data and analyses techniques is consistent with recent state and federal agencies' approaches to analyzing wildland fire risk to communities across Arizona. Additionally, Navajo and Apache Counties determined that it would be advantageous to local communities to simultaneously update and revise, where necessary, the Central Navajo County CWPP. Conducting concurrent wildfire risk analyses would allow for consistent fire behavior mapping and sharing of concepts for fuel mitigation, enhanced fire protection, and public outreach across

neighboring communities. Therefore, the Core Team for the SCWPP meets concurrently with the Core Team for the Central Navajo County CWPP.

Table 1.1. SCWPP At-Risk Communities Ratings

Community WUI	2001 Communities At-Risk List[1]	2004 WUI Risk Rating[2]	2004 SCWPP Risk Rating[3]	2009 ASFD Communities Risk Categories[4]	2016 WUI Risk Rating
Pinetop	Adjacent to USFS lands	13-High	See Pinetop/Lakeside	High	High
Pinetop/Lakeside	Adjacent to USFS lands	10-High	84% high-moderate acres	High	High
Show Low	Adjacent to USFS lands	12-High	84% high-moderate acres	High	Moderate
Heber	Adjacent to USFS lands	11-High	98% high-moderate acres	High	High
Overgaard	Adjacent to USFS lands	11-High	98% high-moderate acres	High	High
Vernon	NA	10-High	84% high-moderate acres	High	Moderate
Linden	Adjacent to USFS lands	9-Moderate	84% high-moderate acres	Moderate	Moderate
Pinedale	Adjacent to USFS lands	8-Moderate	84% high-moderate acres	Moderate	Moderate
Clay Springs	NA	NA	84% high-moderate acres	Not rated	High
Aripine	NA	NA	98% high-moderate acres	Not rated	Moderate

Note: USFS = US Forest Service; SCWPP = Sitgreaves Community Wildlife Protection Plan; ASFD = Arizona State Forestry Division; WUI = wildland-urban interface.

[1] USDA and USDI 2001b.

[2] 2004 Arizona Wildland Urban Interface Assessment.

[3] 2004 Sitgreaves Communities County Wildfire Protection Plan.

[4] 2009 ASFD Arizona – Identified Communities at-risk July 15, 2009).

The at-risk communities within Navajo and Apache Counties are adjacent to federal lands, including public lands administered by the A-SNFs, and are consistent with the Arizona State Forester's definition of an *intermix* or *interface community*:

The at-risk communities within the SCWPP are adjacent to federal lands, including public lands administered by the A-SNFs, and are consistent with the Arizona State Forester's definition of an *intermix, interface, or occluded community* (ASFD 2007):

> The Intermix Community exists where structures are scattered throughout a wildland area. There is no clear line of demarcation; wildland fuels are continuous outside of and within the developed area. The developed density in the intermix community, ranges from structures very close together to one structure per forty acres. Local fire departments and/or districts normally provide life and property fire protection and may also have wildland fire protection responsibilities.

> The Interface Community exists where structures directly abut wildland fuels. There is a clear line of demarcation between wildland fuels and residential, business, and public structures. Wildland fuels do not generally continue into the developed area. The development density for an interface community is usually three or more structures per acre, with shared municipal services. Fire protection is generally provided by a local fire department with the responsibility to protect the structure from both an interior fire and an advancing wildland fire. (ASFD 2007:1)
>
> Occluded communities generally exist in a situation, often within a city, where structures abut an island of wildland fuels (e.g. park or open space). There is a clear line of demarcation between structures and wildland fuels. The development density for an occluded community is usually similar to those found in the interface community, but the occluded area is usually less than one thousand acres in size. Fire protection is normally provided by local fire departments.

The ASFD has determined that significant risk from wildland fire varies based on a combination of factors, including the composition and density of vegetative fuels, extreme weather conditions, topography, density of structures, and response capability which determines the relative risk of unwanted wildland fire to a community. The ASFD has developed criteria that would assist the SCWPP Core Team in identifying the communities within the CWPP analysis area that are at significant risk from wildland fire. The application of these risk factors should allow for greater consistency in determining the need and priorities for project funding.

Risk Factor 1: Fire Behavior Potential

> Situation 1: In these communities, continuous fuels are in close proximity to structures. The composition of surrounding fuels is conducive to crown fires or high intensity surface fires. Likely conditions include steep slopes, predominantly south aspects, dense fuels, heavy duff, prevailing wind exposure and/or ladder fuels that reduce firefighting effectiveness. There is a history of large fire and/or high fire occurrence.
>
> Situation 2: In these communities, intermittent fuels are in proximity to structures. Likely conditions include moderate slopes and/or rolling terrain, broken moderate fuels, and some ladder fuels. The composition of surrounding fuels is conducive to torching, spotting and/or moderate intensity surface fires. These conditions may lead to moderate firefighting effectiveness. There is a history of some large fires and/or moderate fire occurrence.
>
> Situation 3: In these communities, fine and/or sparse fuels surround structures. There is infrequent wind exposure and flat terrain to gently rolling terrain. The composition of surrounding fuels is conducive to low intensity surface fires. Firefighting generally is highly effective. There is no large fire history and/or low fire occurrence.

Risk Factor 2: Risk to Social, Cultural and Community Resources

Situation 1: This situation most closely represents a community in an urban interface setting. The setting contains a high density of homes, businesses, and other facilities that continue across the interface. There is a lack of defensible space where personnel can safely work to provide protection. The community watershed for municipal water is at high risk of being burned to other watersheds within the geographic region. There is a high potential for economic loss to the community and likely loss of housing units and/or businesses. There are unique cultural, historical or natural heritage values at risk.

Situation 2: This situation represents an intermix or occluded setting, with scattered areas of high-density homes, summer homes, youth camps, or campgrounds that are less than a mile apart. Efforts to create defensible space or otherwise improve the fire-resistance of a landscape are intermittent. This situation would cover the presence of lands at risk that are described under state designations such as impaired watersheds or scenic byways. There is a risk of erosion or flooding in the community of vegetation burns.

Situation 3: This situation represents a generally occlude are characterized by dispersed single homes and other structures that are more than a mile apart. This situation may also include areas where efforts to create a more fire-resistant landscape have been implemented on a large scale throughout a community or surrounding watershed.

Risk Factor 3: Fire Protection Capability

Situation 1: In these communities, there are narrow dead end roads, steep grades, and/or one way access roads. There is no, or minimal, firefighting capacity, no fire hydrants, no surface water, no pressure water systems, no emergency response capability, and no evacuation plan in an area surrounded by a fire-conducive landscape.

Situation 2: In these communities, there are limited access routes, moderate grades, limited water supply, and limited firefighting capability in an area surrounded by scattered fire-conducive landscape.

Situation 3: In these communities, there are multiple entrances and exits that are well equipped for fire trucks, wide loop roads, fire hydrants, open water resources (pools, creeks, lakes), established emergency response resources, and evacuation plan in place in an area surrounded by a fireproof landscape.

A. Desired Future Condition and Wildfire Mitigation in the WUI

As described in the 2004 SCWPP, “As the SCWPP communities continue to expand into the adjacent wildlands, more citizens and property will become at-risk from wildland fire. The WUI is not static; it will

continue to grow. Therefore, for community wildfire protection planning and implementation to succeed, the rates of forest resource extraction and production need to reach a balance."

The Core Team recognizes that in addition to a community's at-risk listing status, the current condition of the wildland fuels within and adjacent to at-risk communities significantly contributes to the possibility of a catastrophic wildfire capable of damaging or destroying community values, such as houses, infrastructure, recreational sites, businesses, and wildfire habitats. Updating the SCWPP to enhance the protection of community values and to minimize the potential loss of property while ensuring public and firefighter safety during a catastrophic wildfire remains the overriding priority recommendation of the Core Team. Additionally, several local governments are property taxed based and the economic losses as a result of a catastrophic fire could affect governmental resilience post-fire.

The WUI is commonly described as "The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels" (NWCG 2012). The US Forest Service (USFS) defines *WUIs* as follows:

> . . . those areas of resident populations at imminent risk from wildfire, and human developments having special significance. These areas may include critical communications sites, municipal watersheds, high voltage transmission lines, observatories, church camps, scout camps, research facilities, and other structures that if destroyed by fire, would result in hardship to communities. These areas encompass not only the sites themselves, but also the continuous slopes and fuels that lead directly to the sites, regardless of the distance involved. (USFS 2010: Chap. 5140.5)

The Arizona State Forester defines a *structure* as follows:

> For the purposed of applying these categories and the subsequent criteria for evaluating risk to communities, a *structure* is understood to be either a residence or a business facility, including Federal, State and local government facilities. Structures do not include small improvements such as fences and wildfire watering devices. (ASFD 2007:1).

The 2004 SCWPP process of delineating WUI boundaries for at-risk communities involved collaboration among local, state, and federal government representatives; local fire departments; and interested individuals within the communities. The Core Team reviewed HFRA for the definition of a WUI: "areas adjacent to an evacuation route for an at-risk community that the Secretary determines, in cooperation with the at-risk community, requires hazardous fuel reduction to provide safer evacuation from the at-risk community" (HFRA Sec.101.1.16.B.iii.). After review of HFRA and discussion with federal, state, and local wildland fire and resource specialists, the Core Team determined that the WUI boundaries for at-risk communities in the CWPP analysis area have not significantly changed since 2004, with the exception of the community of Vernon within Apache County. As in 2004, the 2016 SCWPP WUI boundaries are composed of private lands within defined community boundaries with a surrounding buffer determined by the Core Team, private lands not within a defined community

boundary (described primarily as “occluded” communities) with a surrounding buffer determined by the Core Team, and significant federal lands included as A-SNFs interface communities (ASFD 2007). Due to the continued developed of private lands north of the 2004 Vernon community WUI, the Core Team has expanded the WUI boundary to State Route (SR) 61. The Core Team believes that the SCWPP community WUI boundaries are the minimum area needed to provide protection to each community at risk and their surrounding community values. The identified WUI for the 2016 Navajo and Apache County WUIs includes a total of 244,352 acres composed of a mix of private, county, state, and federal lands, which is an increase from the 243,220 WUI acres of these same communities analyzed in the 2004 SCWPP. The increased acreage is due to the WUI expansion in the community of Vernon. The WUI lands surrounding the Navajo and Apache County communities are, or could be, under extraordinary rainfall and drought years or in a condition conducive to large-scale wildland fire such that a wildfire could threaten human life and properties (Photo.1.1)

Photo 1.1. Wallow Fire,
Apache-Sitgreaves National Forests, June 2011

General elements used in creating the WUI boundaries for the SCWPP at-risk communities in Apache and Navajo Counties are consistent with definitions and guidance provided by the ASFD (ASFD 2007) and include the following:

- Vegetative fuel hazards, local topography, and modeled fire behavior
- Historical fire occurrence
- Community development characteristics
- Firefighting preparedness and response capabilities

- Infrastructure
- Recreational values
- Economic impacts on local economies from unwanted wildland fire

B. Desired Future Condition and Wildfire Mitigation in the WUI

The desired future conditions of Navajo and Apache County SCWPP lands have not significantly changed since 2004. The desired future condition of federal land is a return to Vegetation Condition Class I. Federal lands within this Condition Class can carry wildfire without significant loss to forest components. Once in this condition class, natural processes such as fire can be incorporated into long-term management practices to sustain forest health. The desired future condition of nonfederal lands within the WUI is to engage private landowners in order to gain compliance with current fire-safe standards recommended by local fire departments supported by local communities. In addition, encourage the creation of local or regional fire councils to assist in driving the fire-safe standards and community education models for reducing wildfire risk within the community

The desired future condition of federal lands includes improving public and firefighter safety from wildland fire, using wildland fire as a management tool to achieve resource objectives, managing hazardous wildland fuels within and adjacent to the WUI, providing adaptive wildland fire response and suppression, and returning public lands to fire-resilient ecosystems through reintroducing fire into fire-adapted ecosystems where practicable. Once this condition is achieved, natural processes such as fire can be incorporated into long-term management practices to sustain habitat health. Current federal fire guidelines state that “initial action on human-caused wildfire will be to suppress the fire at the lowest costs with the fewest negative consequences with respect to firefighter and public safety” (USDA and USDI 2009:7). However, “a wildland fire may be concurrently managed for one or more objectives and objectives can change as the fire spreads across the landscape. Objectives are affected by changes in fuels, weather, topography, varying social understanding and tolerance; and involvement of other government jurisdictions having different missions and objectives” (USDA and USDI 2009:7). The A-SNFs adheres to federal policy when managing all unplanned wildfire ignitions on public lands within the WUI. Federal policy for reducing wildfires on USFS lands is planned and administered locally through the A-SNFs’ Black Mesa and Lakeside Ranger Districts.

The desired future condition of private lands in the WUIs considered by the Core Team includes recommending that landowners either comply with the National Firewise Communities program (http://www.firewise.org/) or meet home-local or regional fire council recommendations for ignition-zone landscaping or fire-safe landscaping recommended by local fire departments and districts in compliance with local ordinances. Firewise is a national program that helps communities reduce wildfire risks and provides them with information about protecting themselves against catastrophic wildfires and mitigating losses from such fires. Within Arizona, the State Forester administers the Firewise certification program. Fire departments and districts and local governments in Navajo and Apache Counties would like to make this information available to their citizens and to encourage its application.

Residential and other structures that comply with Firewise standards significantly reduce fire-ignition risks in a community, as well as the potential for fires to spread to surrounding habitats. Additionally, structures that comply with Firewise recommendations are more likely to survive wildland fires that do spread into a community (Cohen 2008).

It is also recommended that local communities consider the concepts outlined by the International Association of Fire Chiefs' Fire Adapted Community program. A Fire Adapted Community acknowledges and takes responsibility for its wildfire risk and implements appropriate actions at all levels to address resident safety, homes, neighborhoods, businesses and infrastructure, forests, parks, open spaces, and other community assets (http://www.fireadapted.org/). The creation of local or regional fire councils help with the community engagement to carry forth the Fire Adapted Community efforts.

Photo 1.2. Conducting Prescribed Burns
Courtesy Pinetop, FD

C. Planning Process and Need for the Revision of the 2004 SCWPP

The Core Team is aware that wildland fuel accumulations primarily associated with the invasion of woody species, nonnative grasses, and decades of fire suppression, together with community growth in the WUI, have produced areas at high risk from catastrophic wildfire. The Core Team aspires to achieve restored, self-sustaining, biologically diverse habitats of mixed open space and developed areas that contribute to a quality of life demanded by local citizens. The Core Team recognizes that protection from, and preparation for, catastrophic wildland fire requires collaboration and implementation through all levels of government and through an informed and motivated public. The Core Team considered ecosystem restoration or maintenance of fire-resilient ecosystems through

reintroducing fire into fire-adapted ecosystems, community protection and preparation, and public and firefighter safety while revising the 2004 SCWPP.

Financial commitments required to reduce the risk of catastrophic wildfire can be expensive for municipal, county, state, and federal governments; for fire districts; and for the small rural communities surrounded by public lands (Ingalsbee 2010, 2014). Since approval and concurrence of the 2004 SCWPP, the A-SNFs, ASFD, Navajo and Apache Counties, and local communities have implemented wildland fuel mitigation projects within or near the SCWPP WUIs. Fire departments and districts have improved wildland fire suppression response and continue public education and outreach programs concerning wildland fire threat and preparation of home-ignition-safety zones. Local fire departments and districts have standing mutual-aid agreements to enhance initial and sustained wildland response**.** Additionally, fire departments and districts have taken proactive measures to encourage willing property owners to reduce fire risk on private property (HFRA, Sec. 103.d.2.B). The Core Team is proposing additional wildland fuel treatments and wildland fire suppression enhancements and has been proactive in pursuing funding for wildland fire public outreach programs and fire-suppression training and equipment and will continue these activities in working toward meeting the goals and objectives of the updated SCWPP for at-risk Navajo and Apache County communities.

The Core Team recognizes the strides made in community fire protection and forest health since adoption of the 2004 SCWPP. Therefore, the Core Team has essentially followed the same planning process in the revision and update of the 2004 SCWPP (Figure 1.2).

The Core Team also recognizes the advances in wildland fire risk analyses, strides in reducing wildland fuels, forest and rangeland restoration, and revised *Guidance for Implementation of Federal Wildland Fire Management Policy* (2009). Much of the success in reducing wildland fire behavior in and adjacent to the Sitgreaves communities is due to the A-SNFs implementation of the White Mountain Stewardship Project in 2004. The project began as an experiment in collaboration with multiple stakeholders to resolve decades-long forest health issues and to reduce the impact of wildfires on communities at risk, to improve wildfire habitat, and to restore forest health, while helping rural communities stimulate employment in the wood-products industry. In the first 5 years, 35,166 acres of forested lands were restored through the project (http://www.fs.fed.us/openspace/apache.html). After 10 years, the White Mountain Stewardship Project has completed vegetation treatments on over 75,000 acres. From January 2008 through mid-June 2015 the A-SNFs and the White Mountain Stewardship contractors completed 38,913 acres of forest treatments within the WUIs of the Sitgreaves communities. Recent research has confirmed that White Mountain Stewardship treatments effectively reduce potential fire behavior and appear to restore more natural structural characteristics (Chancellor et al. 2013).

In addition to aligning community wildland fire risk assessments with contemporary wildland fire programs and processes, the Core Team also recognizes the need to reevaluate where wildland fire risk has been reduced in the community WUIs and where additional protection measures are needed. Therefore, Navajo and Apache Counties and the Core Team are reviewing, updating, and where necessary revising the 2004 SCWPP.

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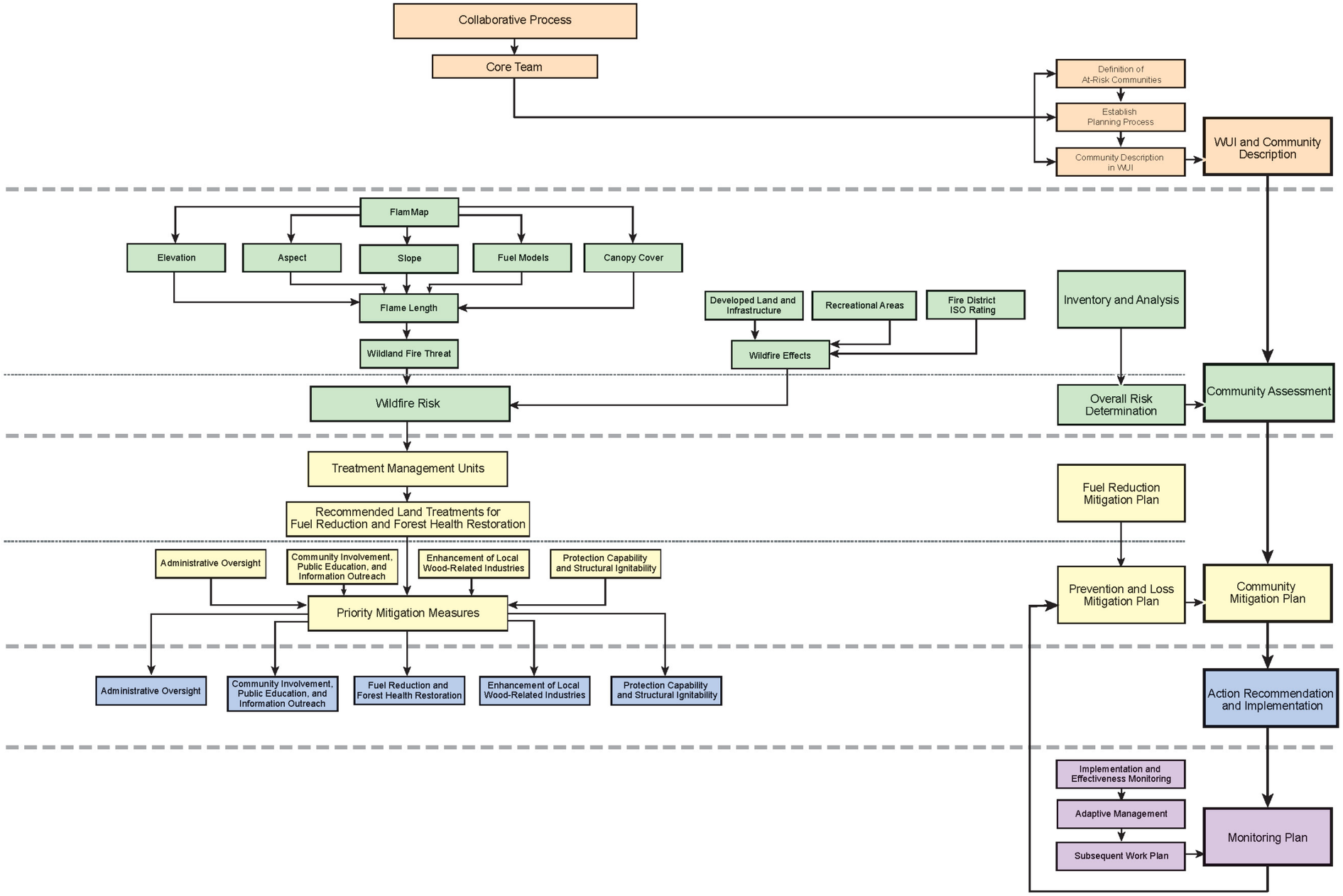

Figure 1.2. SCWPP Planning Process Chart

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D. Goals for the 2016 SCWPP in Apache and Navajo Counties

The goals established in the 2004 SCWPP consisted of the following six primary goals:

- Improve fire prevention and suppression
- Reduce hazardous forest fuels
- Restore forest health
- Promote community involvement
- Recommend measures to reduce structural ignitability within the SCWPP area
- Encourage economic development within the community

The 2004 SCWPP met all criteria of HFRA and was developed through a coordinated and collaborative performance-based framework of recommendations designed to meet its outlined goals. The Core Team is recommending additional goals to be considered for the revised SCWPP to reduce the risks to life and property from catastrophic wildland fire:

- Improve fire prevention and suppression, emphasizing firefighter and public safety
- Reduce hazardous fuels, emphasizing public and private property protection
- Restore forest, rangeland, and riparian health
- Promote community involvement and provide for community protection
- Recommend measures to reduce structural ignitability in the WUI
- Encourage economic development in the communities from vegetative treatments
- Use the CWPP in conjunction with surrounding community and agency fire management plans
- Encourage high-risk communities to become fire-adapted communities
- Creation of regional or local fire councils
- Reduce potential economic loss to communities from unwanted wildland fire
- Work with elected officials to develop opportunities for enhanced funding through national, state, and local sources for implementing the action recommendations of the SCWPP
- Work with local, state, and federal agencies to support the growth of forest industry and forest products to ensure infrastructure is in place to conduct landscape-level forest restoration and community wildfire preparedness objectives

Action recommendations for at-risk areas within the 2016 SCWPP WUI boundaries will be reviewed and updated where needed as part of this planning process. Treatments for wildland vegetative fuels and additional wildland fire mitigation measures may be recommended for implementation in specific time frames and with associated monitoring to determine and document measurable outcomes.

Continued successful implementation of the 2016 SCWPP for Navajo and Apache County communities will require collaboration between fire departments and districts, governments, resource-management agencies, and private landowners. The cooperating agencies should work toward developing processes and systems that would allow recommended actions of the SCWPP to be compliant with applicable local, state, and federal environmental regulations within Navajo and Apache Counties. The Core Team and collaborators encourage all agencies, groups, and individuals involved to develop any additional formal agreements necessary to assist in the SCWPP's timely implementation, monitoring, and reporting. The Core Team and CWPP planning process was reinitiated to meet collaborative requirements of HFRA and to report on achievements since adoption of the 2004 SCWPP; to determine current wildfire risk using up-to-date information and programs; to be supportive of and complementary to current local, state, and federal land management direction; and to represent the communities and their interests, with all parties being involved and supportive of the implementation of the 2016 SCWPP.

II. SCWPP COMMUNITY ASSESSMENT AND ANALYSIS

The community wildfire risk assessment analyzes the following

- *Wildland Fire Threat*—the probability and intensity of an area burning
- *Wildfire Effects*—the community values at risk from wildfire
- *Wildfire Risk*—an analysis of where the potential for catastrophic wildland fire occurs adjacent to or within areas of high community values that may be affected by wildfire within Navajo and Apache County communities within the WUIs identified by the Core Team

This risk analysis was developed to closely tie to the future Arizona Wildfire Risk Assessment Portal (AZ WRAP) (https://azsf.az.gov/fire/prevention/az-wrap). This risk analysis incorporates the current fire regime condition class, wildfire fuel hazards, risk of ignition, local preparedness and protection capabilities, and at-risk community values. The Core Team reviewed the Arizona State Forester's *Identifying Arizona's Wildland/Urban Interface Communities at Risk: A Guide for State and Federal Land Managers* (ASFD 2007) to ensure that the Navajo and Apache County CWPP are compatible with and complementary to statewide CWPP planning efforts. The Core Team included all risk factors required by the Arizona State Forester in the analysis of this CWPP. The areas of concern for wildland fuel hazards, risk of ignition and wildfire occurrence, local preparedness and protection capabilities, and loss of community values are evaluated to determine areas of highest wildfire risk.

The Navajo and Apache County CWPP analysis area includes at-risk communities within Navajo and Apache Counties comprising approximately 307,583 acres (Figure 2.1). During the review of the Navajo and Apache County Community WUIs, the Core Team identified 244,352 acres of land considered at risk of wildland fire to include in the revised community WUIs (Table 2.1; Figure 2.1).

Table 2.1. Land Management within 2016 Community WUIs

Ownership Type	Total Acres	% of Total*
Private	76,083	31
A-SNF	163,787	67
State Trust	3,949	2
Tribal	110	<1
Other	423	<1
Total	244,352	100

Note: A-SNF = Apache Sitgreaves National Forest; WUI = wildland-urban interface.

*Actual total may not add to 100% because of rounding.

Primary landownership in the Navajo and Apache County CWPP planning area is a mosaic of privately owned lands and USFS lands administered by the A-SNFs (Table 2.1). Of the federal lands within the WUI, A-SNFs manage 163,787 acres, or 67.0 percent, of lands within the WUI.

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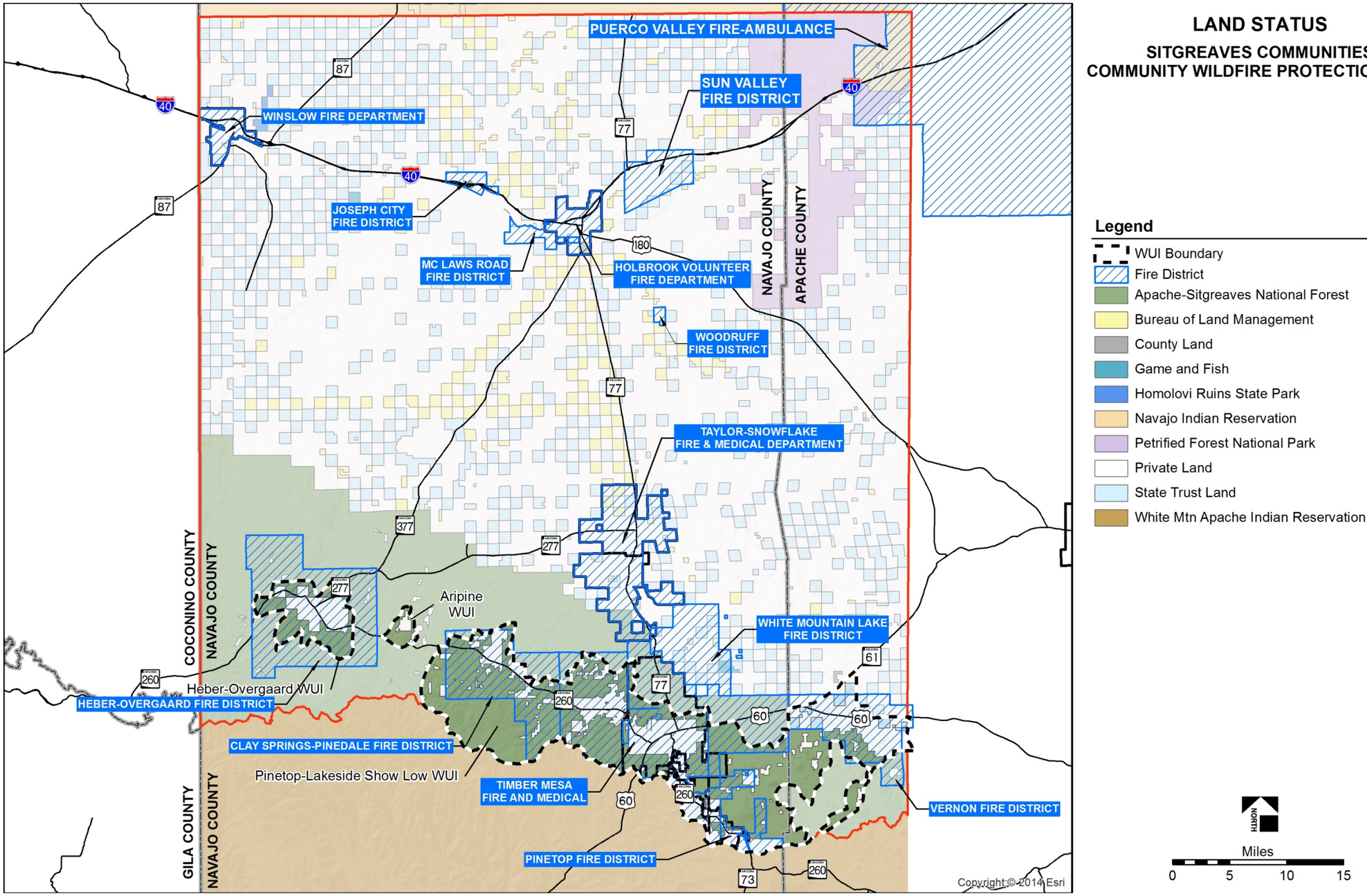

Figure 2.1. Navajo and Apache County SCWPP WUI Area

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Private land within the WUI composes 76,083 acres, or roughly 31 percent, of the WUI. Private lands are mostly clustered near communities, with some scattered private inholdings located throughout the WUI. The municipalities/unincorporated communities of Pinetop/Lakeside, Show Low, Linden, Clay Springs-Pinedale, Heber, and Vernon contain the majority of private land acreage within the WUI. Commercial structures are clustered along state and federal highways in community centers, and they are assumed to remain as the principal commercial corridors within the Navajo and Apache County at-risk communities.

State Trust lands were established in 1912 under the terms of the Arizona Enabling Act. With statehood, Arizona was granted ownership of four sections per township. ASLD manages State Trust lands to produce revenue for the Arizona State Trust beneficiaries, including the state's school system. Within the Navajo and Apache County CWPP WUIs, 3,949 acres (approximately 2 percent) of the WUI is composed of State Trust lands which are managed primarily for recreation, natural resource protection, and livestock grazing.

The diverse climate of Navajo and Apache Counties produces a varied landscape—from semiarid desert shrub to riparian corridors, and grasslands to oak and ponderosa pine and mixed conifer woodlands (LANDFIRE.gov 2015). Navajo and Apache County communities within the CWPP are in the Mexican Highland Section of the Basin and Range Province of the Intermontane Plateaus Major Land and Resource Area (MLRA) 39 (NRCS 2011). This MLRA is characterized by volcanic fields and gently dipping sedimentary rocks eroded into plateaus, valleys, and deep canyons. Elevation ranges from 4,000 to 7,000 feet in the southern half of the area to more than 7,500 feet, and this MLRA includes the highest point in eastern Arizona, Baldy Peak, at 11,403 feet (NRCS 2011).

Generally, more than half of the annual precipitation in the community WUIs occurs as snow fall during winter months due to Pacific frontal storms, a second rainy season occurs from July through September. The average annual precipitation varies from 16 inches per year in lower elevations to as much as 25 inches in higher elevations. The average annual air temperature is 30 to 45 degrees Fahrenheit (ºF) in January; with mean daily temperatures ranging from 70 to 85 ºF during July.

Cool-season vegetation growth normally begins in early spring and matures in early summer. Warm-season vegetation growth occurs after the summer rains and may remain green throughout the year in lower elevations (NRCS 2011). The potential plant community on lower elevations and gentler slopes is dominated by warm-season perennial grasses with a fair component of cool-season perennial grasses and small shrubs. This area supports alpine vegetation, conifer forests, chaparral, and grasses because of the broad elevation range. Spruce-fir woodland characterizes the area below timberline. Aspen grows on sites that have not been disturbed by past fires. The major part of the area is a vast ponderosa pine forest. Pinyon-juniper woodland normally occurs at an elevation below 6,800 feet. Below an elevation of about 6,000 feet shrub oak woodland and manzanita dominate.

A. Fire Regime and Condition Class

Before European settlement of North America, fire played a natural (historical) role in many of the Navajo and Apache County vegetated landscapes. Five historical fire regimes have been identified and are based on the average number of years between fires (fire frequency) combined with the severity (amount of overstory replacement) of fire on the dominant overstory vegetation (Fire Regime Condition Class [FRCC] Interagency Working Group 2005a, 2010) (Table 2.2).

Table 2.2. Fire Regime Information

	Frequency	Severity[a]
Regime I	0–35 years	Low
Regime II	0–35 years	High
Regime III	35–100 years	Low
Regime IV	35–100 years	High
Regime V	200+ years	High

Source: Schmidt et al. 2002.

[a]Low = less than 75% of the dominant overstory vegetation replaced. High = greater than 75% of the dominant overstory vegetation replaced (stand replacement).

The vegetation condition class (VCC) of wildland habitats describes the degree to which the current fire regime has been altered from its historical range, the risk of losing key ecosystem components, and the vegetative attribute changes from historical conditions. There are three VCCs, which are classified according to degree of departure from the historical fire regime: low departure (VCC 1), moderate departure (VCC 2), and high departure (VCC 3). VCC is calculated based on changes to vegetation composition, structural stage, and canopy closure using methods described in the *Interagency Fire Regime Condition Class Guidebook* (FRCC Interagency Working Group 2005b). LANDFIRE VCC is based on departure of current vegetation conditions from reference vegetation conditions only, whereas the Fire Regime Guidebook approach includes departure of current fire regimes from those of the reference period. Data obtained from LANDFIRE.gov (http://www.landfire.gov/NationalProductDescriptions10.php, accessed November 2015) simulates historical vegetation reference conditions using the Vegetation Dynamics Development Tool, which is a vegetation and disturbance dynamics model. A current vegetation condition is then derived from a classification of existing vegetation type, cover, and height and is current to the vegetative landcover that existed on the landscape in 2008.

The following descriptions of condition classes are provided by the Arizona State Forester (ASFD 2007:3):

> Condition Class 1:
>
> Fire regimes are within a historical range, and the risk of losing key ecosystem components is low. Vegetation attributes (species composition and structure) are intact and functioning within the historical range.
>
> Condition Class 2:
>
> Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components is moderate. Fire frequencies have departed from historical frequencies by one or more return intervals (either increased or decreased). Fire return interval is the time between fires in a defined area. These results in moderate changes to one or more of the following: fire size, intensity and severity, and landscape patterns. Vegetation attributes have been moderately altered from their historical range.
>
> Condition Class 3:
>
> Fire regimes have been significantly altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals. These results in dramatic changes to one or more of the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes have been significantly altered from their historical range.

The SCWPP WUI includes 6,165 acres of land classified as urban, water, and sparsely vegetated and barren landscapes (approximately 3.0 percent of WUI acres) and 528 acres of agricultural land (<1.0 percent of WUI acres). The WUI also includes 82,802 acres (approximately 34.0 percent of WUI acres) of VCC 1 lands; 101,823 acres (approximately 42.0 percent of WUI acres) of VCC 2 lands; and 52,026 acres (approximately 22 percent of WUI acres) of VCC 3 lands (http://www.landfire.gov/NationalProductDescriptions10.php, accessed November 2015). Therefore, approximately 64.0 percent of WUI acres are not considered to be within the natural range of variation of historical wildland fire regimes.

B. Wildfire Threat

The existing arrangement and flammability of vegetation associations largely determine wildland fire behavior. The Core Team and collaborators identified areas at risk from wildland fire by evaluating fire behavior models based on vegetative fuels and the arrangement of those fuels by slope and aspect as they occur on federal and nonfederal land in the WUI.

The arrangement of vegetative fuel, relative flammability, and potential of vegetation to support wildland fire varies throughout the WUI. Wildland fuel hazards depend on a specific composition, type, arrangement, or condition of vegetation such that if the fuel were ignited, an at-risk community or its

infrastructure would be threatened. The Core Team used the existing data through LANDFIRE.gov to determine the existing landcover and fire behavior models for the Navajo and Apache County WUIs. The LANDFIRE data sets use the 40 Scott and Burgan Fire Behavior Fuel Model (FBFM40) layer to represent distinct distributions of fuel loading found among surface fuel components (live and dead), size classes, and fuel types (LANDFIRE.gov accessed November 2015). These data sets allowed the Core Team to digitize vegetative landcover types and display the distribution and abundance of vegetation associations over the Navajo and Apache County WUIs (Figure 2.2). The Core Team used the FlamMap fire mapping and analysis system (Finney 2006; Stratton 2006) to describe potential fire behavior for constant environmental conditions (weather and fuel moisture) to produce an estimate of flame height as a surrogate prediction of fire intensity over the landscape (Figure 2.3).

Historically, fire played an important role in keeping woody species in check and light ground fuels low in fire-adapted vegetative communities. However, with the suppression of natural wildfires within the last century, fire return intervals have increased and have altered natural vegetated landscapes. The Core Team reviewed vegetation associations within the WUI that were identified and mapped using the LANDFIRE.gov Existing Vegetation Type (EVT) data layer which represents the species composition present at a given site up to 2008. (LANDFIRE.gov, accessed November 2015). Vegetation overlay descriptions from this source produce a consistent landcover depiction of Navajo and Apache Counties (Figure 2.2). These data sets provide the level of landscape description and vegetative land cover detail necessary for aligning wildland fuel flammability with existing vegetation. Each vegetation association consists of various fuel properties that produce differing wildfire behavior which is assigned to distinguishable fuel models.

The USFS Southwest Region is developing a Regional Wildfire Risk Assessment to quantify the probability of where fire is likely to occur, with what frequency and with what intensity (USFS Southern Region Wildfire Risk Assessment Initial Fire Hazard Results October 2015). The Core Team coordinated with the Southwest Region's ecologist to ensure consistency of fuel models across the CWPP landscape between those contained in the LANDFIRE.gov and those in the USFS Wildfire Risk Assessment. Amendments were made to LANDFIRE fire behavior models for consistency with those used by USFS. The revised fire behavior models were inserted into the FlamMap fire mapping and analysis system for predicting potential wildfire flame height within the community WUIs. The normalized vegetative data and associated range of assigned fuel models for predicting wildfire behavior for each vegetation association is shown in Table 2.3. The predicted flame length from the FlamMap fire map model was used to determine the high, moderate, or low wildland fire risk to communities from the existing vegetative land cover and wildland fuels. The relationship of surface-fire flame length to suppression actions is the basis for assigning wildland fire threat. Wildland fire with flame lengths less than 4 feet can generally be attacked at the head of the fire using hand tools. Fuel models with a predicted flame length of fewer than 4 feet are assigned low risk. Flame lengths from 4 to 8 feet are too intense for direct attack and equipment such as fire trucks; and aircraft may be needed for suppression and control. Fuel models with a predicted flame length of 4 to 10 feet are assigned moderate risk. Flame lengths over 10 feet present serious control problems, including crown fires with

fire spotting from fire brands, and major fire runs are possible. Fuel models with a predicted flame length of over 10 feet are assigned high risk (Heinsch and Andrews 2010). Table 2.5 lists the predicted flame height and associated wildfire risk rating.

However, since 2004 the A-SNFs, primarily through the White Mountain Stewardship Contract, have conducted wildland fuel mitigation and restoration treatments on over 75,000 acres of forest lands primarily proximate to community WUIs. The current LANDFIRE.gov vegetation and fire behavior models were developed from existing vegetation and physical attributes of the landscape that were in place in 2008. Therefore the Core Team has assumed that land treatments conducted by the A-SNFs prior to 2008 are accurately reflected in the LANDFIRE.gov data sets. However land treatments conducted after 2008 would not be reflected in fire behavior predictions based on current LANDFIRE.gov data sets. The Core Team has defaulted areas within the WUIs where fuel mitigation and restoration treatments occurred during and after 2008 to a low influencing factor for wildfire threat (Figure 2.3). Areas where fuel mitigation and restoration treatments were conducted prior to 2008 are assigned fire behavior models as modified by the USFS Regional Wildfire Risk Assessment and included in the FlamMap fire map model. Vegetative land cover in areas where fuel mitigation and restoration treatments were conducted prior to 2008 was assumed to be accurately presented in LANDFIRE.gov data.

The Arizona State Forester has established the following guidelines for evaluating wildfire threat (ASFD 2007:1):

> **Evaluate Risk to Communities:** Not all structures and/or communities that reside in an "interface" area are at significant risk from wildland fire. It is a combination of factors, including the composition and density of vegetative fuels, extreme weather conditions, topography, density of structures, and response capability that determines the relative risk to an interface community. The criteria listed below are intended to assist interagency teams at the state level in identifying the communities within their jurisdiction that are at significant risk from wildland fire. The application of these risk factors should allow for greater nationwide consistency in determining the need and priorities for Federal projects and funding.

The Core Team reviewed the fire behavior potential in the WUI and determined that the risk classification is consistent with Situations 1, 2, and 3 as described by the Arizona State Forester (ASFD 2007:1–2):

> Risk Factor 1: Fire Behavior Potential
>
> Situation 1: In these communities, continuous fuels are in close proximity to structures. The composition of surrounding fuels is conducive to crown fires or high intensity surface fires. Likely conditions include steep slopes, predominantly south aspects, dense fuels,

heavy duff, prevailing wind exposure and/or ladder fuels that reduce fire fighting effectiveness. There is a history of large fire and/or high fire occurrence.

Situation 2: In these communities, intermittent fuels are in proximity to structures. Likely conditions include moderate slopes and/or rolling terrain, broken moderate fuels, and some ladder fuels. The composition of surrounding fuels is conducive to torching, spotting, and/or moderate intensity surface fires. These conditions may lead to moderate fire fighting effectiveness. There is a history of some large fires and/or moderate fire occurrence.

Situation 3: In these communities, fine and/or sparse fuels surround structures. There is infrequent wind exposure and flat terrain to gently rolling terrain. The composition of surrounding fuels is conducive to low intensity surface fires. Fire fighting generally is highly effective. There is no large fire history and/or low fire occurrence.

The Navajo and Apache County community WUIs includes 4 major vegetative fuel types composed of 18 ecological system (not including agricultural lands), 4 mostly nonvegetated associations, and 2 open-space residential developed land covers (LANDFIRE.gov accessed November 2015). Each vegetative community is assigned to specific fuel models that predict the rate of spread, flame length, and fire intensity levels possible for each vegetation association during an average fire season under average weather conditions (Table 2.4). Assigning a fuel model to each vegetation association within each community WUI will help predict wildfire behavior and thus proper suppression response (for detailed fuel model descriptions, see Anderson 1982; Scott and Burgan 2005).

The average historical fire return interval is highly variable among vegetation associations across the WUI. Habitat-replacement wildfires or wildfires resulting in a major loss of habitat components, in conjunction with drought, may increase fire frequency and intensity in woodland and forest habitats because of lower live fuel moisture in heavy wildland fuels (FRCC Interagency Working Group 2005a). Wet years that create abundant fine fuels such as grass and brush followed by drought years have in the past led to years with many large fires over fairly wide areas (Swetnam and Baisan 1996). Climate change may compound this and make fire behavior more intense and fire seasons longer (Stephens et al. 2013; Karl 2009; McDonald 2009).

Wildfire behavior as predicted by fuel models are influenced by topographic features such as slope and aspect. Slope affects both the rate of spread and flame length, becoming greater as slope increases because the flame is tilted over the unburned fuel allowing it to ignite more quickly (Rothermel 1983). Aspect affects fire behavior by the amount of solar radiation creating the driest fuel moistures on slopes that face the afternoon sun, which would be the south and southwest aspects in the northern hemisphere. Additionally, during the summer months wind direction is primarily from the south-southeast during pre-monsoonal months. A southerly aspect will increase fire behavior by producing a greater effective wind speed if it is blowing up a slope rather than down it because the wind and slope are in alignment (Scott 2012) The Core Team recognizes the influencing factor of slope and aspect on wildfire behavior and included these influencing factors in determining wildfire risk (Table 2.3).

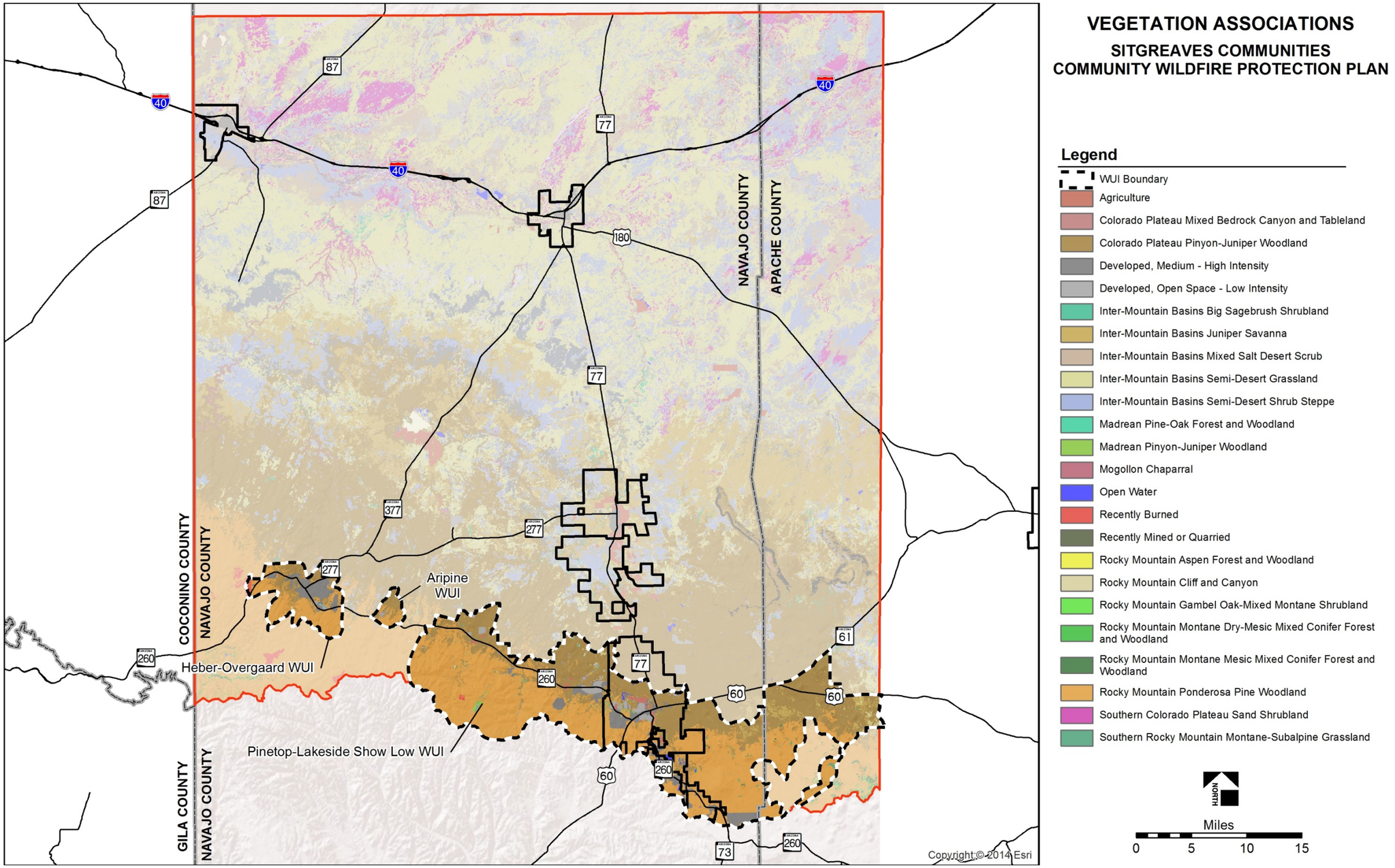

Figure 2.2. Navajo and Apache County SCWPP Vegetation Associations

Table 2.3. Navajo and Apache County CWPP Vegetation Associations

Fuel Type	Vegetation Association	Aripine WUI Acres (%)[a, b]	Heber-Overgaard WUI Acres (%)[a, b]	Pinetop-Lakeside-Show Low WUI Acres (%)[b]	Total Acres (%)[b]
Shrublands	*Coleogyne ramosissima* Shrubland Alliance	<1 (<1)	36 (<1)	481 (<1)	517 (<1)
	Inter-Mountain Basins Big Sagebrush Shrubland	59 (2)	43 (<1)	3,352 (2)	3,454 (1)
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	380 (9)	868 (4)	3,464 (2)	4,712 (2)
	Inter-Mountain Basins Sparsely Vegetated Systems II	1 (<1)	72 (<1)	58 (<1)	132 (<1)
	Sonoran Paloverde-Mixed Cacti Desert Scrub	NA	NA	3 (<1)	3 (<1)
	Western Cool Temperate Developed Ruderal Shrubland	NA	2 (<1)	498 (<1)	500 (<1)
	Western Cool Temperate Urban Shrubland	2 (<1)	261 (1)	1,705 (<1)	1,968 (<1)
	Quercus gambelii Shrubland Alliance	146 (4)	899 (4)	2,755 (1)	3,800 (2)
	Introduced Riparian Shrubland	175 (4)	324 (1)	2,383 (1)	2,882 (1)
Grasslands	Apacherian-Chihuahuan Semi-Desert Grassland	27 (<1)	82 (<1)	1,921 (1)	2,030 (<1)
	Inter-Mountain Basins Semi-Desert Grassland	298 (7)	387 (2)	7,626 (4)	8,310 (3)
	Southern Rocky Mountain Montane-Subalpine Grassland	280 (7)	950 (4)	16,932 (8)	18,162 (7)
Woodlands	Colorado Plateau Pinyon-Juniper Woodland	946 (24)	7,874 (33)	52,245 (24)	61,065 (25)
	Inter-Mountain Basins Montane Riparian Forest and Woodland	103 (3)	557 (2)	7,119 (3)	7,780 (3)
	Madrean Pinyon-Juniper Woodland	215 (5)	1,642 (7)	3,206 (2)	5,063 (2)
Timberlands	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	NA	NA	4 (<1)	4 (<1)
	Southern Rocky Mountain Ponderosa Pine Woodland	1347 (34)	8,758 (36)	101,074 (47)	111,180 (46)
	Western Cool Temperate Urban Evergreen Forest	3 (<1)	219 (1)	30 (<1)	3,302 (1)
Nonvegetated Lands	Barren	NA	4 (<1)	38 (<1)	43 (<1)
	Developed-Low Intensity	<1 (<1)	45 (<1)	1,270 (1)	1,324 (<1)
	Developed-Medium Intensity	NA	16 (<1)	822 (<1)	838 (<1)
	Developed-Roads	22 (<1)	1,095 (5)	4,370 (2)	5,487 (2)
	Open Water	NA	NA	1,250 (1)	1,250 (1)
	Quarries-Strip Mines-Gravel Pits	NA	3 (<1)	114 (<1)	117 (<1)
	Total	4,006 (100)	24,179 (100)	216,167 (100)	244,352 (100)

Source: LANDFIRE (November 2015).

[a] NA = not applicable.

[b] Actual percentages may not add to 100% because of rounding.

Table 2.4. Fuel models, Fuel Descriptions, and Fire Behavior Models

Fuel Model	Fuel Description	Wildfire Risk Rating[a]	Anderson Fuel Model	Fire-Danger Rating Model[b]	Flame Length (ft)	Flame Length (ft) Low Dead Fuel Moisture	Fire Intensity Level from Fire Behavior Fuel Model[c]	Rate of Spread ft/hr (ch/hr)—Low Dead Fuel Moisture[d]	Acre (%)[e]
Shrub (SH)—Shrubs cover at least 50 percent of the site; grass sparse to nonexistent (Shrub)		**L**	**4-6**	**L and T**	**1–5**				
SH1	Low shrub fuel load, fuelbed depth about 1 foot; some grass may be present. Spread rate very low; flame length very low.					0.2–0.7	SH1, 1	SH1, 7–132 (0– 2)	3,820 (2)
SH2	Moderate fuel load (higher than SH1), depth about 1 foot, no grass fuel present. Spread rate low; flame length low.					1.5–>10.0	SH2, 1–3	SH2, 0-1188 (0–18)	1,649 (<1)
SH5	Heavy shrub load, depth 4 to 6 feet. Spread rate very high; flame length very high.					4.0–>25.0	SH5, 2–6	SH5, 0–16500 (0–250)	745 (<1)
SH7	Very heavy shrub load, depth 4 to 6 feet. Spread rate lower than SH5, but flame length similar. Spread rate high; flame length very high.					4.0–>25.0	SH7, 2–6	SH 7, 0–11889 (0–180)	1,558 (<1)
Grasslands (GR)—Nearly pure grass and/or forb type		**M**	**1-2**	**F and T**	**1-8**				
GR1	Grass is short, patchy, and possibly heavily grazed. Spread rate moderate; flame length low.					0.5–1.7	GR1, 1	GR1, 0–990 (0–15)	12,599 (5)
GR2	Moderately coarse continuous grass, average depth about 1 foot. Spread rate high; flame length moderate.					1.0–8.0	GR2, 4	GR2, 0–7920 (0–120)	89,405 (37)
Grass-Shrub (GS)—Mixture of grass and shrub, up to about 50 percent shrub coverage (Grass-Shrub)		**M**	**1-3**	**A (B) and T**	**1–8**				
GS1	Shrubs are about 1 foot high, low grass load. Spread rate moderate flame length low.					1.0–6.0	GS1, 1–3	GS1, 0–3960 (0–60)	14,116 (6)
GS2	Shrubs are 1 to 3 feet high, moderate grass load. Spread rate high; flame length moderate					1.5–>10.0	GS2, 2–5	GS2, 0–>6600 (0–100)	165 (<1)
Timber_Understory (TU)—Grass or shrubs mixed with litter from forest canopy (Timber-Understory)		**M**	**10**	**F and T**	**1-16**				
TU1	Fuelbed is low load of grass and/or shrub with litter. Spread rate low; flame length low					1.0–4.0	TU1, 1–3	TU1, 0–990 (0–15)	4,665 (2)
TU2	Fuelbed is moderate litter load with shrub component. Spread rate; moderate; flame length low.					1.0–8.0	TU2, 1–5	TU2, 0–5,280 (0–80)	10 (<1)
TU5	Fuelbed is high load conifer litter with shrub understory. Spread rate moderate; flame length moderate.					2.0–13.0	TU5, 2–6	TU5, 0–2,772 (0–42)	3 (<1)

Continued

Table 2.4. Fuel models, Fuel Descriptions, and Fire Behavior Models

Fuel Model	Fuel Description	Wildfire Risk Rating[a]	Anderson Fuel Model	Fire-Danger Rating Model[b]	Flame Length (ft)	Flame Length (ft) Low Dead Fuel Moisture	Fire Intensity Level from Fire Behavior Fuel Model[c]	Rate of Spread ft/hr (ch/hr)— Low Dead Fuel Moisture[d]	Acre (%)[e]
Timber Litter (TL)—Dead and down woody fuel (litter) beneath a forest canopy (Timber Litter)		**H**	**8**	**B and T**	**4-25**				
TL1	Light to moderate load, fuels 1 to 2 inches deep. Spread rate very low; flame length very low.					0.0–0.5	TL1, 1	TL1, 0–66 (0–1)	67 (<1)
TL2	Low load, compact. Spread rate very low; flame length very low.					0.3–1.0	TL2, 1	TL2, 0–132 (0–2)	532 (<1)
TL3	Moderate load conifer litter. Spread rate very low; flame length low.					0.4–1.3	TL3, 1	TL3, 0–198 (0–3)	55,255 (23)
TL4	Moderate load, includes small diameter downed logs. Spread rate low; flame length low.					1.5–2.0	TL4,1-3	TL4, 0–396 (0-6)	813 (<1)
TL5	High load conifer litter; light slash or mortality fuel. Spread rate low; flame length low.					4.0–4.5	TL5. 1-3	TL5, 0- 1452 (0-22)	1,332 (<1)
TL6	Moderate load, less compact. Spread rate moderate; flame length low.					1.0–7.0	TL6, 1-4	TL6, 2–1650 (2–25)	309 (<1)
TL8	moderate load and compactness may include small amount of herbaceous load. Spread rate moderate; flame length low.					1.0–8.0	TL8, 1–5	TL1, 0–66 (0–1)	48,473 (20)
Non-burnable (NB)—Insufficient wildland fuel to carry wildland fire under any condition (Nonburnable)									
NB1	Urban or suburban development; insufficient wildland fuel to carry wildland fire.								7,242 (3)
NB3	Agricultural field, maintained in non-burnable condition.								4 (<1)
NB8	Open water.								1,246 (<1)
NB9	Bare ground.								343 (<1)
								Total	244,352 (100)

National Fire Danger Rating System (USFS 1983; Burgan 1988).

[a] L = low; M = moderate; H = high; NA = not applicable.

[b] National Fire Danger Rating System .

[c] Fire behavior fuel models are designed for wildland vegetation and do not accurately predict fire behavior when structures are involved. Fire intensity level (FIL) is an expression of fireline intensity based on flame length (in feet): FIL1 = 0–2 ft; FIL2 = 2.1–4 ft; FIL3 = 4.1–6 ft; FIL4 = 6.1–8 ft; FIL5 = 8.1–12 ft; FIL6 > 12 ft

[d] Flame Length predicted by FlamMap (LANDFIRE.gov)

[e] Actual percentages may not add to 100% because of rounding.

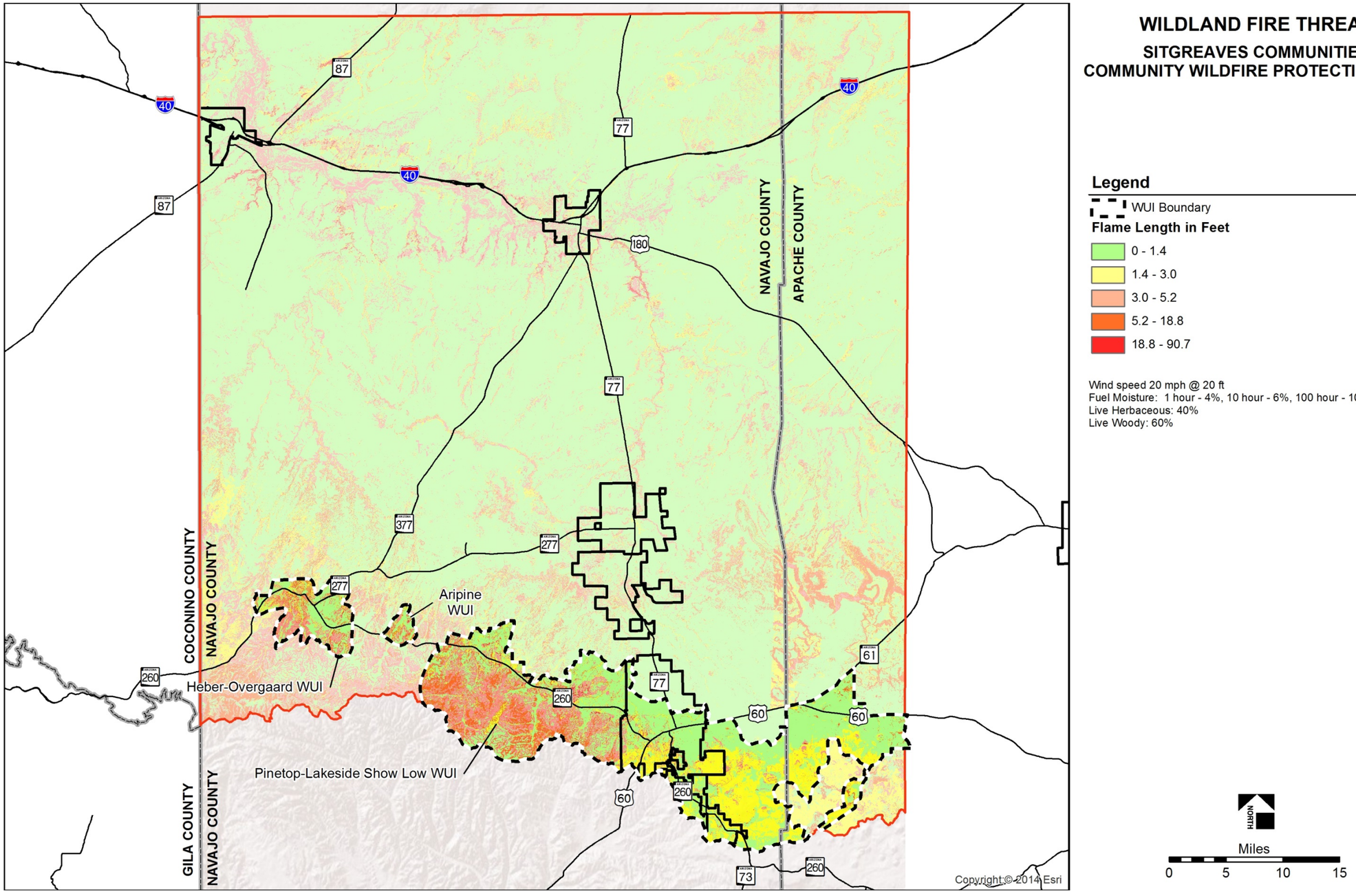

Figure 2.3. Navajo and Apache County SCWPP Wildland Fire Threat

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Table 2.5. Wildland Fire Threat

Component	Influence
Vegetation type and density	
• Predicted Flame length greater than 10+ feet	High
• Predicted Flame length of 2.5 to 10 feet	Moderate
• Predicted Flame length of less than 2.5 feet	Low

Source: Logan Simpson.

C. Conditions of Ignition and Past Fire Occurrence

Past regional wildfire events are important for determining the potential occurrence of unwanted wildland fire in any area of the WUI. Because of the combination of recurring dry conditions and a regional history of fires, there will be wildland fire ignitions within the WUI that must be suppressed. The fire history of the planning area, including recent large wildfires that have occurred within or adjacent to the WUI, has been included in this analysis to determine the most likely areas for either natural or human-caused wildland fire ignition (Figure 2.4).

Table 2.6 details the high, moderate, and low positive-influence values assigned to wildland fire ignitions. These include concentrated areas of lightning strikes and human-caused ignitions with high wildfire threat influencing areas having the greatest number of fire starts per square mile. Wildland fire ignition data were obtained from the Federal Wildland Fire Occurrence Internet Mapping Service web site and database (http://wildfire.cr.usgs.gov/firehistory/), and from the Arizona State Forester's Office (ASFD 2015). Data sets were combined with redundant ignitions counted as a single ignition. The largest wildfire boundary from all data sets for each mapped wildfire was used to depict fire boundaries. The data sets used in the Internet Mapping Service web site are based on official fire occurrence data collected from five federal and state agencies that have been merged into one fire-history point layer. According to these data, over 1,030 wildfire ignitions have been reported within the WUI from 1990 through 2014.

Table 2.6. Ignition History and Wildfire Occurrence

Wildfire Occurrence	Value
0-4 fire ignitions/square mile	Low
4–8 fire starts/square mile	Moderate
>8 fire starts/ square mile	High

A growing body of evidence shows that the climate has changed substantially since 1900, that this change is accelerating, and that even greater change is likely to occur in the next 100 years (USDA 2012); such climate change will alter natural ecosystems and affect their ability to provide goods and services (USDA 2012). Additionally, post-wildfire conditions and fire management activities can create ideal opportunities for invasions by nonnative plants that undermine the benefits of fire management

actions (Brooks and Lusk 2008; Brooks 2008). The Core Team determined that the majority of wildfire ignitions within the WUIs have occurred within the Mogollon Rim crest and adjacent to SR 260 and lands adjacent to the communities of Pinetop-Lakeside. Many of these wildland fire ignitions have occurred adjacent to roadways within woodland and timber vegetation associations that threaten the at-risk communities of Navajo and Apache Counties with the potential for catastrophic wildland fire.

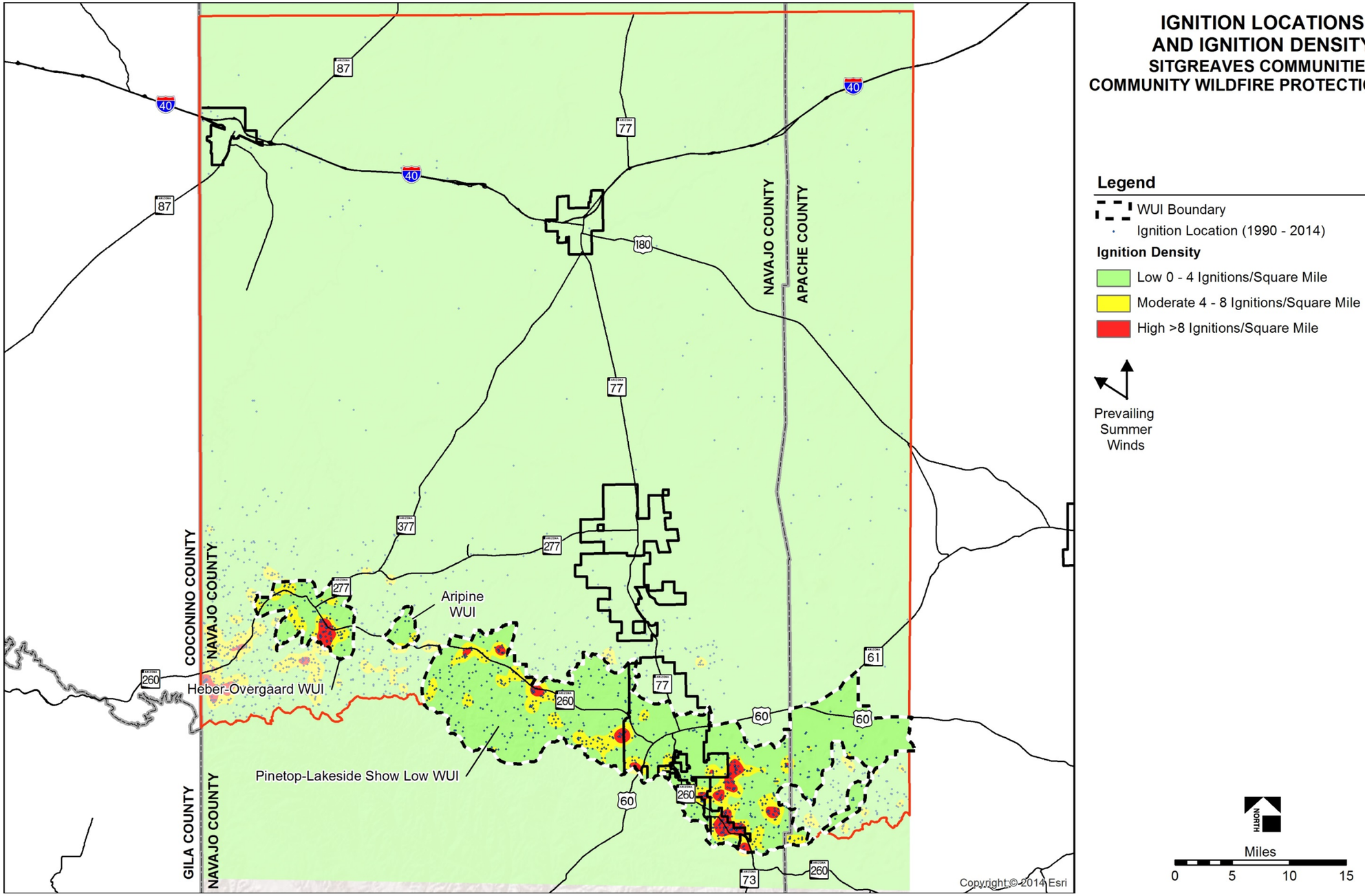

Figure 2.4. Navajo and Apache County SCWPP WUI Ignition History

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D. Wildfire Effects

Valued at-risk community resources include private and community structures, communication facilities, local recreation areas, cultural and historic areas, sensitive wildlife habitat, watersheds, and natural resources. As agreed to by the Core Team, developed land and other infrastructures within the area of highest flammability were given the highest risk of wildland fire. In accordance with the risk to "Social, Cultural and Community Resources" identified by the Arizona State Forester (ASFD 2007:2), the Core Team has determined that the Navajo and Apache County WUI does include areas consistent with Risk Factor 2, Situations 1, 2, and 3, as follows:

> Risk Factor 2: Risk to Social, Cultural and Community Resources
>
> Situation 1: This situation most closely represents a community in an urban interface setting. The setting contains a high density of homes, businesses, and other facilities that continue across the interface. There is a lack of survivable space where personnel can safely work to provide protection. The community watershed for municipal water is at high risk of being burned to other watersheds within the geographic region. There is a high potential for economic loss to the community and likely loss of housing units and/or businesses. There are unique cultural, historical or natural heritage values at risk.
>
> Situation 2: This situation represents an intermix or occluded setting, with scattered areas of high-density homes, summer homes, youth camps, or campgrounds that are less than a mile apart. Efforts to create survivable space or otherwise improve the fire-resistance of a landscape are intermittent. This situation would cover the presence of lands at risk that are described under state designations such as impaired watersheds or scenic byways. There is a risk of erosion or flooding in the community of vegetation burns.
>
> Situation 3: This situation represents a generally occluded setting characterized by dispersed single homes and other structures that are more than a mile apart. This situation may also include areas where efforts to create a more fire-resistant landscape have been implemented on a large scale throughout a community or surrounding watershed.

1. Housing, Businesses, Essential Infrastructure, and Evacuation Routes

The Core Team identified high-risk wildlife-effects areas—including the major community cores and portions of major highways and roadways within each community WUI. Residential community development is occurring throughout the WUI in a mix of high-density, single-family, and multi-acre parcels. The Core Team reviewed the most current structure data for each land parcel within each community WUI (Navajo County Assessor's Office and Apache County Assessor's Office 2015) to determine structure distribution and density within private lands to determine areas of low, moderate, and high structural density (Figure 2.7). This data was then portioned into wildlife-effects categories according to the density of structures and presence of natural or developed landcover types. This

includes areas of highly developed lands that lack significant open space or natural land covers, moderately developed private lands where an intermingling of public and private lands occur and where the major portion of the landscape is composed of natural landcover types, and lightly developed or undeveloped lands where the majority of land cover is composed of natural land cover. Areas of highest development and areas lacking development are considered at low risk for wildfire or having low effect from wildfire; areas of moderate development where the majority of land cover is composed of natural land cover are considered at high risk or high effect from wildfire; and areas of light development are considered areas at moderate risk for wildfire or having moderate effects from wildfire.

2. Recreation Areas/Wildlife Habitat

Recreational features within and adjacent to the WUI—including camping and recreation areas associated with designated camping and recreation areas in the A-SNFs and major USFS trailheads—are located throughout Navajo and Apache Counties. These recreational areas provide camping and scenic vistas of deep canyons, distant mountain ranges, colorful fall foliage, and a mosaic of vegetation.

The WUI also includes known and potential habitat areas for several threatened, endangered, and sensitive (TES) plants and animals. The land management agencies use conservation strategies to mitigate risk to these species by implementing programs that meet goals and objectives of natural-resource management. Wildland fuel and vegetative restoration treatments within TES species' habitat may require additional site-specific analysis because of the extraordinary circumstances created by the presence of TES species or their habitats. Before any vegetation treatment by the federal and state agencies, a biological assessment and evaluation would normally be conducted by the appropriate agency to determine the extent of impacts the proposed treatments will have on TES species and habitats. The Core Team reviewed Section 102.a.5.B of HFRA and understands that site-specific evaluations of individual recommended projects will determine whether TES species and habitats would benefit from wildland fire mitigation treatments that would reduce wildland fuels, and thereby lessen the threat of catastrophic wildland fire, while protecting the natural-resource and recreational values local residents and visitors associate with the communities.

3. Local Preparedness and Protection Capability

For many years, the Insurance Services Office (ISO) has conducted assessments and rated communities on the basis of available fire protection. The rating process grades each community's fire protection on a scale from 1 to 10 (1 is ideal and 10 is poor) based on the ISO's Fire Suppression Rating Schedule. Five factors make up the ISO fire rating: water supply—the most important factor—accounts for 40 percent of the total rating, while type and availability of equipment, personnel, ongoing training, and the community's alarm and paging system account for the remaining 60 percent of the rating. The Core Team reviewed ISO ratings for the fire protection services within each community WUI or, in many cases, the lack of any fire protection services. ISO ratings will vary within fire departments and districts depending on housing densities and the distance of structures that are isolated (usually 5 miles) from a fire station and water sources available for firefighting. The Core Team determined that

many areas within the WUI include areas of high ISO ratings. The Core Team also recognized that some fire departments within Apache and Navajo County WUIs must rely on private water companies, which can affect ISO by not meeting fire flow requirements, inconsistencies in water delivery systems and not meeting the American Water Works Standards American Water Works Association, http://www.awwa.org/). The Core Team also recognized that housing densities and ISO ratings tend to reflect compounding-influences factors. Where housing density is high, ISO ratings are low—both essentially representing the same influence of risk to structures, infrastructures, subdivisions, and communities. Therefore, the Core Team determined that housing density would be the overriding influence factor for structures, infrastructures, subdivisions, and community values.

The wildland and structural fire response within the WUI is provided by local fire departments and districts. The A-SNFs, ASFD, and local fire departments and districts provide support for initial wildland fire attack for areas within and adjacent to the Navajo and Apache County community WUIs. Structural protection for the USFS "involves the use of standard wildland fire suppression tactics and control methods; including the use of standard equipment, fire control lines, and the extinguishing of spot fires near or on the structure when safe and practical" (USFS 2009:1). Initial-attack response from local fire departments and districts can occur under the authority of mutual-aid agreements between individual departments or under the intergovernmental agreements that individual fire departments and districts have with the Arizona State Forester.

Land use in the community WUIs consists primarily of residences, livestock production, farming, timber harvest, community businesses, and community-based services and facilities. Surrounding areas are dominated by A-SNFs and private properties. Land uses within or close to the WUI include fuelwood cutting and recreational activities (for example, hiking, hunting, fishing, bird watching, nature study, photography, and off-road-vehicle use). Section II.E of this CWPP provides more detailed community assessments.

The Core Team recognizes not only the occurrence of high-use recreation areas throughout Navajo and Apache Counties but also the significance and special risk these areas pose as potential ignition sources and complications in safe evacuations from wildland fire. Many of these areas have limited access for evacuation and responding firefighting resources. Outdoor recreation and tourism is a major industry in Navajo and Apache Counties, and the loss of or inability of the public to access recreational areas could create significant effects to local economies. Due to high public use, limited access and communications, and economic value of recreational areas, risk to community values is increased within and adjacent to high-use recreational areas. Several A-SNFs recreation areas include USFS structures. As defined by the ASFD (2007:1), "a *structure* is understood to be either a residence or a business facility, including Federal, State and local government facilities."

However, the Core Team realizes that resident populations within the Navajo and Apache County WUIs will determine the extent of initial attack; sustained responses; structural protection; and public safety protection, including potential evacuation of a community. Therefore, the Core Team used the most

current structure density estimates for each WUI to provide the influence factor for the community values risk assessment.

Table 2.7 identifies the different influence-factor weightings given to these wildfire-effects components; these components were also mapped and are depicted in Figure 2.5.

Table 2.7. Wildfire Effects

Component	Value
0.4 or greater structures/acre	High
0.1 - 0.4 structures/acre	Moderate
0 -0.1 structures/acre	Low

Source: Logan Simpson.

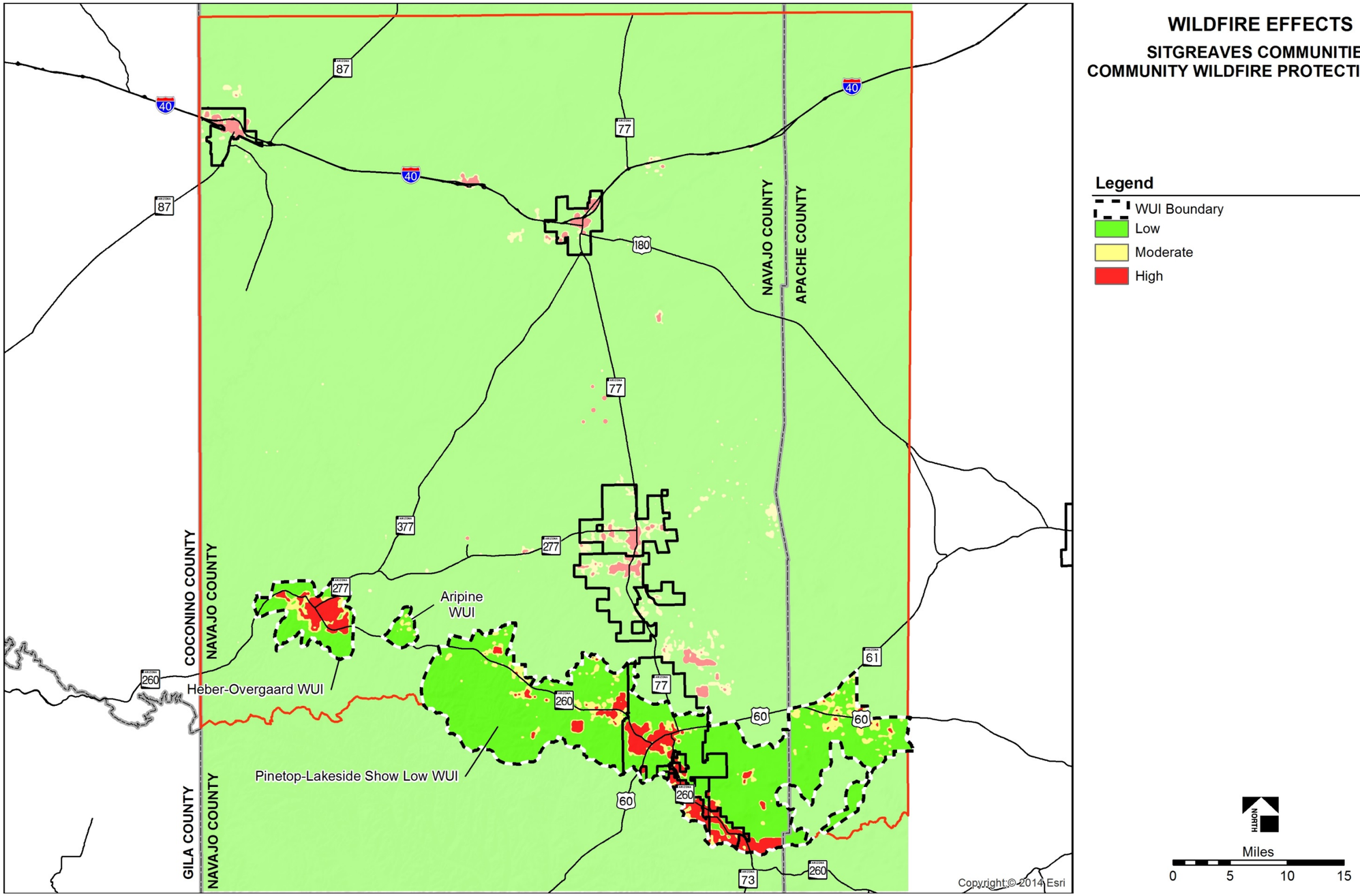

Figure 2.5. Navajo and Apache County SCWPP Wildfire Effects

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E. Summary of Community Assessment and Cumulative Risk Analysis

The major concerns identified by the Core Team during the development of the Navajo and Apache County CWPP include (1) delayed response time by available mutual-aid fire departments; (2) obtainment of additional firefighting equipment and training; (3) insufficient dispatch and communication capabilities on initial response units; and (4) structures, subdivisions, and communities that do not have fire protection because they are not within the jurisdiction of a fire department or district and (5) inadequate firefighting water supplies. Additionally, many residences in the identified WUIs were not designed with adequate general or emergency vehicle access. Private structures without adequate access and readily available water supplies increase the risk of greater habitat and structural losses from large wildland fires. The Core Team recommends that the A-SNFs continue to conduct wildland fuel treatments in high-value community areas. Recommendations to landowners for wildfire risk mitigation are included in Section III of this CWPP. Additional recommendations for remote private lands include identifying properties by placing names or addresses on identification placards, road signs, and wells or surface-water sources that could be used to replenish water supplies for fire response equipment—both ground-based drafting and aerial bucketing.

The 10-year White Mountain Stewardship Project initiated in 2004 had conducted forest restoration and thinning on over 75,000 acres mostly within or adjacent to community WUIs at the completion of the contract in 2014. Fuels treatments were conducted on 38,913 acres within the SCWPP WUIs from January 2008 through mid-June 2015. The Core Team recommends that the A-SNFs continue to conduct wildland fuel treatments in high wildfire effects community's areas through stewardship contracting which may become available through the Four Forest Restoration Initiative and other Forest Service means. The Core Team also supports fuel management and restoration actions by the ASFD, local fire departments and municipalities within and adjacent to the community WUIs. Recommendations to landowners for wildfire risk mitigation are included in Section III of this CWPP. Additional recommendations for remote private lands include identifying properties by placing names or addresses on identification placards, road signs, and wells or surface-water sources that could be used to replenish water supplies for fire response equipment—both ground-based drafting and aerial bucketing.

The communities within each WUI are described below in more detail. The community descriptions include data on population and housing units, major transportation routes, and major vegetation associations and a summary of where in the WUI the highest risk of wildland fire occurs. Population and housing data was obtained from the US Census Bureau 2010 data unless noted otherwise.

1. Community WUI Descriptions and Risk Rating

Pinetop-Lakeside Show Low WUI

The Pinetop/Lakeside Show Low WUI subarea is by far the most populated area within the planning area. It covers 78,884 acres and includes the communities of Pinetop/Lakeside, Show Low, Linden, Clay Springs, Pinedale, Vernon, and the major roads connecting them. Current Navajo and Apache

County parcel data estimates that 31,930 structures are included within the WUI. Fifty-nine percent of this WUI is rated at moderate or high wildfire risk.

Pinetop/Lakeside

Located in the eastern portion of the Sitgreaves National Forest, this community is the second largest populated area within the SCWPP and includes the Town of Pinetop-Lakeside, southeast of Show Low, in Navajo County. To delineate a WUI around this community, the Core Team identified the threat of wildfire from the vast forestlands located to the south and west. This can be seen in the extensive WUI buffer that crosses several miles into the FAIR. This area, south of Pinetop-Lakeside, has several canyons that run north-south, potential expressways for wildfires to reach the populated areas of the community. The WUI north of the community is delineated by a buffer around private property and by the transition area from ponderosa pine to pinyon/juniper vegetation.

The majority of land in the town is privately owned, with a few public parcels scattered through the community. The majority of lands surrounding the community are federally owned. Current trends in commercial and residential development are outlined in the 2001 *Pinetop/Lakeside and Navajo County Regional Plan*, which has identified growth areas within the WUI. Planning for these growth areas includes infill in existing neighborhoods, specifically within the downtown area. Projected growth is also identified along major transportation corridors, in commercial and industrial districts, and in master-planned developments. Recreation/open space and low-density residential are the primary land uses in these rural communities; however, there are planned higher-density residential and commercial developments located generally near the town center.

Pinetop/Lakeside was estimated to have a year-round population of 3,600 in 2004. The population has increased to an estimated population of 4,297 living in 3,567 housing units in 2014, with an estimated 2,160 residents and 3,946 housing units within the Pinetop Country Club Census Designated Place (CDP). (American FactFinder, accessed November 2015) The communities of Pinetop-Lakeside experience a dramatic influx of seasonal population growth associated with the recreational opportunities located in the region. The greater community population of Pinetop-Lakeside can grow to an estimated 30,000 during the summer months. Town commercial districts are centered along the SR 260 corridor. Existing and continuing development of paved roads, utilities, communication centers, schools, hospitals, and public buildings adds to the community's infrastructure. Properties within the town have an ISO rating of 4.

Show Low

Also located in Navajo County, in the eastern portion of the A-SNFs, the Show Low community is the largest populated area in the WUI. The Core Team considered the threat of wildfire from the forestlands located to the south and west in delineating the southern WUI. This WUI subarea extends several miles south of the city center, into the Fort Apache Indian Reservation. This southern area has several canyons that run north-south, providing direct wildfire access to the city of Show Low. To the north, the

WUI is delineated by a 1-mile buffer from private property and also has a characteristic change in vegetation type from ponderosa pine to pinyon/juniper.

The bulk of landownership in Show Low is private. The majority of lands surrounding the community are federally owned. Current trends in commercial and residential development are outlined in the 1999 *City of Show Low General Plan*, which identified growth areas within the WUI. Components of these growth areas include infill in existing neighborhoods, specifically within the downtown area. Projected growth is also identified along major transportations corridors, in commercial and industrial districts, and in master-planned developments. Recreation/open space and low-density residential are the primary land uses within this rural community; however, there are higher-density residential and commercial developments located and planned generally near the downtown area.

The City of Show Low was estimated to have a year-round population of 9,000 in 2004. The population has increased to an estimated population of 10,754 living in 7,544 housing units in 2014 (American FactFinder, accessed November 2015) Show Low also experiences a dramatic seasonal population influx associated with the region's recreational opportunities. The city's several commercial districts provide the regional economic development base. Existing and continuing development of paved roads, utilities, communication centers, schools, hospitals, and public buildings adds to the community's infrastructure. Fire protection services for Show Low is provided by the Timber Mesa Fire Department Properties in the city have an ISO rating of 4, and is among the lowest of the surrounding communities.

Linden

Located northeast of Show Low and in the central portion of the A-SNFs in Navajo County, this WUI subarea reflects the potential threat of severe wildfire approaching from the south. This is made notable by the extensive buffer that crosses into burned areas from the Rodeo-Chediski Fire, which defines the WUI to the southwest. In the north, a buffer extends the WUI 0.5 mile from private property.

The majority of land ownership in this unincorporated community is private, with federally owned lands surrounding. Current trends in commercial and residential development are less pronounced than in Show Low. Projected growth is identified along major transportation corridors. Linden was estimated to have a year-round population of 1,200 residents in 2004. The population has increased to an estimated population of 2,605 residents living in 1,397 housing units within the Linden CDP in 2014 (American FactFinder, accessed November 2015). The community experiences a dramatic seasonal population influx associated with the region's recreational opportunities. Existing and continuing development of paved roads, utilities, communication centers, schools, and public buildings adds to the community's infrastructure. Fire protection services for Linden are provided by the Timber Mesa Fire Department.

Clay Springs and Pinedale

Located in a rural area of Navajo County and in the central portion of the A-SNFs, the WUI surrounding Clay Springs and Pinedale is delineated by SR 260, with the potential wildfire threat being from the south. Previously burned areas influenced Pinedale's delineation of its southern WUI boundary. To the

north, the WUI is delineated by a 1-mile buffer from private property and also by a characteristic change in vegetation type from ponderosa pine to pinyon/juniper.

The majority of land ownership in Clay Springs is private, with federally owned lands surrounding. The estimated year-round population of Clay Springs was estimated at 550 residents with Pinedale's estimated year-round population estimated to be 550 in 2004. In 2014 the population of Clay Springs is estimated to be 679 residents living in 126 housing units and Pinedale to be composed of 560 residents living in 322 housing units (American FactFinder, accessed November 2015). Both communities experience an increase in population in the summer months. The volunteer Clay Springs-Pinedale Fire District provides protection for over 1,500 people, and the communities' properties have an ISO rating of 8. The fire district includes three additional subdivisions, two of which (Victory Heights and Ricochet Ranch) have only single-access points. The fire district also provides fire protection to two summer recreational vehicle parks that also have only single-access points (Oddfellows and FSR 139A). The Rodeo-Chediski Fire left an unburned area in its mosaic pattern that forms a general bearing of more than 30 degrees, running from the A-SNFs to a series of residences approximately 0.5 mile to the west of Pinedale.

Vernon

Located in the most eastern portion of the SCWPP, in Apache County, the Vernon WUI subarea reflects the potential threat from wildfires from the south. To the north, the WUI was expanded in the 2016 SCWPP and is now delineated to the north by SR 61. The Vernon WUI is characterized by a change in vegetation type from ponderosa pine to pinyon/juniper. Projected growth is identified along major transportation corridors. The year-round population is estimated to be 122 residents living in 42 housing units within the Vernon CDP. Vernon also experiences a dramatic seasonal population influx associated with the region's recreational opportunities. Consisting of over a dozen subdivisions, the Vernon area is continuing to develop roads and utilities. During the revised SCWPP analysis, the Vernon WUI was expanded north from US Highway 60 to SR 61, increasing the WUI by over 1,100 acres. Fire protection services for the Vernon community are provided by the Vernon Fire Department.

Heber-Overgaard

The WUI around this community encompasses the private lands of Heber-Overgaard, in Navajo County. A 3-mile buffer was delineated to the south and southwest of the communities for protection from wildfires coming from southern forestlands. A 0.5-mile buffer was delineated around the community's west, north, and east edges, which also experience a change from ponderosa pine to pinyon/juniper vegetation.

The majority of landownership within this unincorporated community is private, with a surrounding influence of federally owned lands. This community has increasing commercial and residential development. Projected growth is identified along major transportation corridors and the community center. The population of Heber-Overgaard was estimated to be 2,722 residents in 2014. The 2014 populations is estimated to be 3,006 residents living in 3,635 housing units. Heber-Overgaard

experiences a dramatic seasonal population influx associated with the region's recreational opportunities. Existing and continuing development of paved roads, utilities, communication centers, schools, and public buildings adds to the community's infrastructure. The Heber-Overgaard Fire District provides protection for over 4,000 people and their properties. Heber-Overgaard properties have fire insurance ratings ranging from 7 to 9. Current Navajo County parcel data estimates that 8,293 structures are included within the WUI.

Aripine WUI

Located east of Heber-Overgaard, in Navajo County, this is the most isolated community within the SCWPP. The WUI around Aripine is delineated by a 0.5-mile buffer to the north, east, and west and extends south to SR 260. This small community has a population of 70, which increases during the summer months. Current Navajo County parcel data estimates that 103 structures are included within the WUI.

F. Wildfire Risk Analysis

The wildfire risk analysis synthesizes the risk associated with fuel hazards, wildfire ignitions, wildfire occurrence, and community values. These components were analyzed spatially, and an overall cumulative risk for the WUI was calculated. Figures 2.6a and 2.6b and Table 2.8 display the results of wildfire risk, identifying the areas and relative percentages of WUI areas of high, moderate, and low risk.

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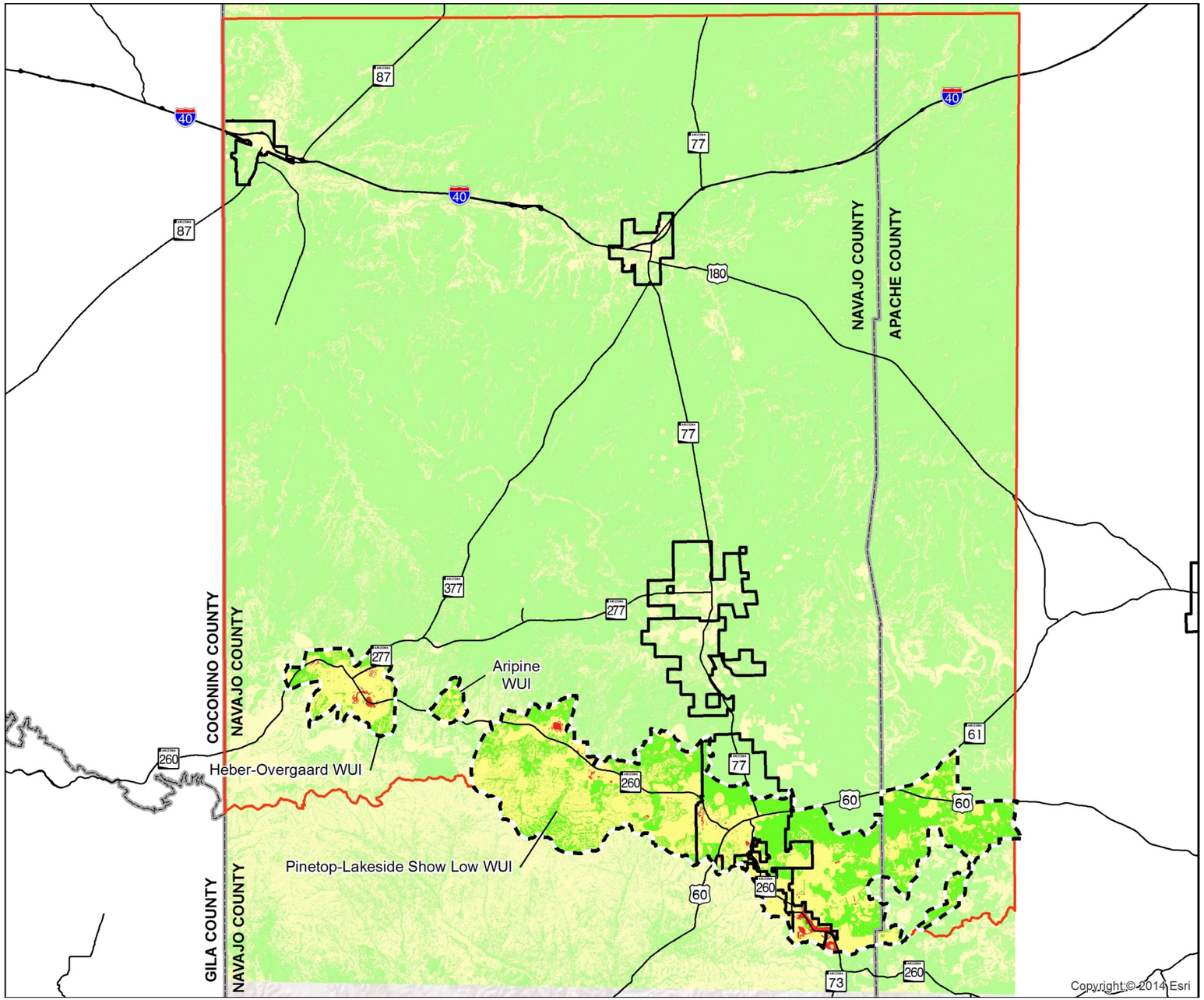

Figure 2.6a. Navajo and Apache County SCWPP Wildfire Risk Analysis

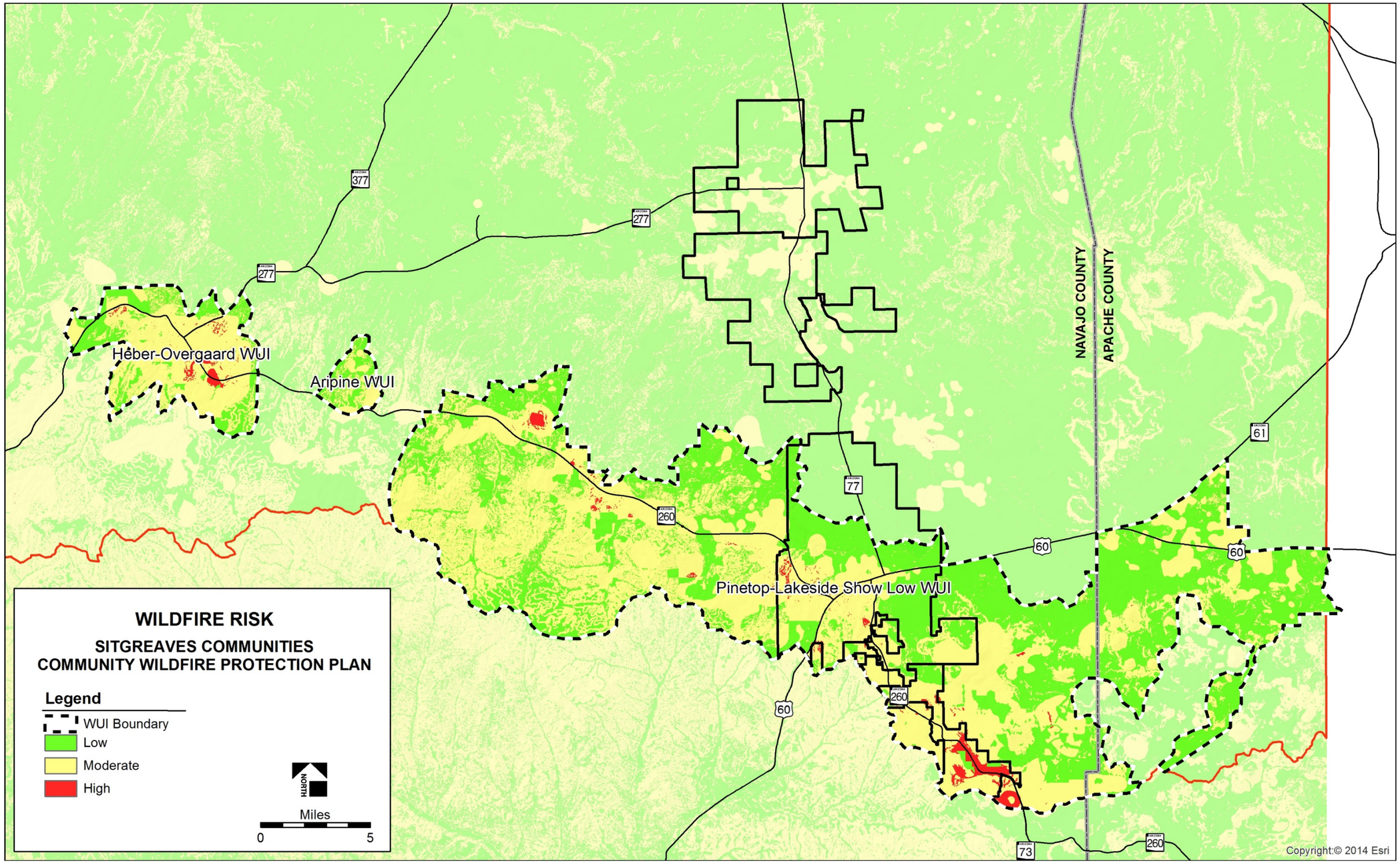

Figure 2.6b. Navajo and Apache County SCWPP Wildfire Risk Analysis—Detail View

Table 2.8. Wildfire Risk Assessment by Percentage and Acreage of the WUI Area

Navajo and Apache County Community WUI	High Risk		Moderate Risk		Low Risk		Total Acres
	(%)	Acres	(%)	Acres	(%)	Acres	
Pinetop-Lakeside Show Low WUI	1	3,025	58	125,671	41	87,471	216,167
Heber-Overgaard WUI	3	658	77	18,507	21	5,015	24,179
Airpine WUI	0	0	51	2,028	49	1,978	4,006
Total		3,683		146,206		94,464	244,352

Source: Logan Simpson.

Note: WUI = wildland-urban interface.

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III. COMMUNITY MITIGATION PLAN

This section outlines revised priorities for wildland fuels treatments, as well as the recommended methods of treatment and management strategies for mitigating the potential spread of catastrophic wildland fire in the Sitgreaves Communities CWPP for Navajo and Apaches County communities. The Sitgreaves Communities and the A-SNFs have conducted wildland fuel mitigation and forest restoration projects within and adjacent to community WUIs subsequent to approval of the 2004 Sitgreaves Communities CWPP. The Core Team reviewed these treated areas and determined current priority areas for future fuels mitigation and restoration treatments that are included in this revised Sitgreaves Communities CWPP. This section also presents revised recommendations for enhanced wildland fire protection capabilities and public education, information, and outreach to further community preparation for wildland fire within and adjacent to the communities.

A. Fuel Reduction Priorities

After determining areas currently at greatest risk for wildland fire (Section II of this CWPP), the Core Team reviewed and amended as necessary the 2004 Community Mitigation Plan (2004 Sitgreaves CWPP p 39) wildland fuel treatment recommendations for 46 site specific areas. The 2004 SCWPP was comprised of 307,711 acres of mixed private, state and federal ownership including the communities of Aripine, Clay Springs, Pinedale, Forest Lakes, Heber-Overgaard, Linden, Pinetop-Lakeside, Show Low, Vernon and McNary Hon Dah. The Fort Apache Agency and White Mountain Apache Tribe revised the Fort Apache Agency Fire Management Plan in 2014. The Revised Fort Apache Fie Management Plan includes WUI designations for the Tribal communities as well as WUI treatment areas designated for enhanced community wildfire protection for Pinetop\Lakeside, Show Low ad rim communities in Navajo and Apache Counties. Therefore, the 2016 Revised SCWPP does not include a reanalysis of the Fort Apache Indian Reservation communities. Additionally, Coconino County has elected to not include the community of Forest Lakes within the 2016 SCWPP revision. Therefore the revised SCWPP does not include a re-analysis of the Forest Lakes community.

Subsequent to the issuance of the White Mountain Stewardship Contract and efforts of local communities after approval of the 2004 SCWPP, there were 90,545 acres of land treated for fuel mitigation, including 5,238 acres of land on 2,975 private land parcels (2009 Sitgreaves Communities Wildfire Protection Plan Update 2009). The A-SNFs through the White Mountain Stewardship contract and A-SNFs actions have resulted in approximately 38,913 acres of wildland fuel reduction and restoration treatments in or proximate to community WUIs from 2008 to the first half of June 2015. The wildfire threat analysis conducted by the Core Team is based on fire behavior models, vegetative landcover and the FlamMap fire mapping and analysis system utilizing the LANDFIRE.gov data base. The LANDFIRE.gov data is expected to accurately display the existing land conditions present in 2008 therefore land treatments conducted prior to 2008 should be accurately reflected in the FlamMap fire mapping analysis. The Core Team reviewed the wildland fuel mitigation treatments within and adjacent to community WUIs that have occurred after 2008, which would not be accurately reflected in the FlamMap fire mapping analysis. The Core Team has defaulted these treatment areas to a low

influencing factor of fire threat since accurate fire behavior models for these areas have not been established. The Core Team then revised the 2004 SCWPP proposed action recommendations to prevent wildfire spread from public lands onto private land and, conversely, to reduce the risk of fires spreading from private land onto public lands by reducing wildland fuels and creating survivable space within fire-adapted communities. A “survivable space” is the area around a structure where the vegetation has been managed to reduce fire intensity as a wildfire nears and to reduce the chance of fire from reaching and burning the structure. A primary goal of the 2016 SCWPP is for proposed treatments to be continuous across property boundaries, allowing for the most effective protection from wildfires and to complement those fuel mitigation and forest restoration treatment conducted after approval of the 2004 Sitgreaves Communities CWPP.

Hazardous fuels reduction recommendations on federal and private lands vary by implementing single fuel breaks to broader land treatment applications for wildland fuel reduction and forest restoration within or adjacent to the WUI. Additional fuel breaks or hazardous fuels reduction projects since those implemented beginning in 2004 are recommended and conform to the types of treatment recommendations developed by the 2004 Core Team. The current recommendations for fuel mitigation and restoration treatments are complementary to previous actions and conform to current land management plans. The Core Team recognizes the responsibility of private landowners in creating and maintaining survivable wildland fire space on their lands and in fire-adapted communities to enhance protection of values within their properties and communities. The Core Team supports and encourages private landowners to become involved with fire councils, wildland fire protection and the creation of survivable space in fire-adapted communities. The NCEM, ACEM, ASFD, A-SNFs, municipalities, local fire departments and districts, and the Core Team’s participating resource specialists developed wildland fuel reduction recommendations designed to restore wildland fire to its natural role appropriate for the landscape and to provide for community preparedness. The 2016SCWPP recommendations for fuel reduction treatments should enhance public and firefighter safety, enhance community value protection, promote restoration of native vegetation, and support wildlife habitat needs. In this plan, *fuel break* means a strip of land where vegetation has been modified so that fires burning into it can be more readily controlled.

These revised wildland vegetative fuel and fuelbreak recommended treatments are intended to promote the 2016 SCWPP goals of enhancing firefighter and public safety, reducing hazardous wildland fuels on public and private lands, improving fire prevention and suppression, restoring riparian, forest and rangeland health, involving the community, and expediting project implementation. To prioritize wildland fuel mitigation projects, the Core Team analyzed wildland fire threat through analyzing fire behavior, fuel hazards, and fire history. The Core Team analyzed fire effects through determination of proximity of community values and structure density to high wildfire threat. Fire threat and fire effects were combined to produce the wildland fire risk assessment that is compiled in a single community base map depicting areas of low, moderate, and high wildland fire risk (see Figures 2.6a and 2.6b). The 2004 SCWPP identified and categorized a total of 46 site specific treatment management units (TMUs) within nine community WUIs, with an overall risk value determined for each treatment management unit (see

Logan Simpson 2004: Table 4.1, page 76). The Core Team reviewed the 2004 TMUs and has revised these in accordance with the current risk assessment and areas of previous fuel reduction treatments. The 2016 SCWPP Core Team identified specific TMUs based on wildfire risk across all landownerships. The Core Team identified 38 TMUs (Figure 3.1; Table 3.2) based upon similar risk values and fuel reduction treatments necessary to move toward meeting fire-adapted community goals identified by the Core Team. Additionally, the Core Team developed a series of fuel reduction and restoration recommendations that enhance agency and community wildfire preparedness goals (Table 3.1).

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Table 3.1. Fuel Modification and Treatment Plans

Treatment No.	1 Developed Parcels <2 Acres				2 Undeveloped private parcels or single-structure parcels >2 acres		3 Grassland Fuelbreaks		4 Oak/Pinyon/Juniper and Shrublands within the WUI	
Treatment Category	**Zone 1 (0–10 feet from structures)**	**Zone 2 (10–30 feet from structures)**	**Zone 3 (30–100 feet from structures)**	**Zone 4 (100–600 feet around home)**	**Slopes <20%**	**Streambeds, Channels, and Slopes ≥20%**	**Slopes <20%**	**Slopes ≥20%**	**Landscape Treatment outside Fuelbreaks**	**Fuelbreaks**
Vegetation	Remove ladder fuels by pruning the lower third of trees or shrubs up to a maximum of 10 feet to reduce flammable vegetation. Remove and destroy insect-infested, diseased, and dead trees and shrubs. Grasses and forbs may be cut with a mower to a 4-inch stubble. Remove dead plant material from ground; prune tree limbs overhanging roofs; remove branches within 10 feet of chimneys; remove flammable debris from gutters and roof surfaces.	Remove ladder fuels by pruning the lower third of trees or shrubs up to a maximum of 10 feet; remove and destroy insect-infested, diseased, and dead trees. Create separation between trees, tree crowns, and other plants according to fuel type, density, slope, and other topographical features. Reduce continuity of fuels by creating a clear space around brush or planting groups. Grasses and forbs may be cut with a mower to a 4-inch stubble. All snags and vegetation that may grow into overhead electrical lines, other ground fuels, ladder fuels, dead trees, and thinning from live trees must be removed. Control soil erosion from small waterflow channels by using rock or noncombustible velocity-reducing structures.	Remove ladder fuels by pruning the lower third of trees or shrubs up to a maximum of 10 feet; remove and destroy insect-infested, diseased, and dead trees. Maximum density of trees measuring 60 basal area [a]. *f*or an average density of 60 trees/acre. Grasses and forbs may be cut with a mower to a 4-inch stubble.	For natural areas, thin selectively and remove highly flammable vegetation. Carefully space trees; choose Firewise plants (see online list: http://www.firewise.org/usa/fw_plantlists.htm).	Remove ladder fuels by pruning the lower third of trees or shrubs up to a maximum of 8 feet; remove and destroy insect-infested, diseased, and dead trees. Maximum density of trees should reflect fire resiliency status appropriate for the fire-adapted vegetation community See the Fuel Modification Plan (this section) developed to promote riparian health, to prevent spread of fire to adjacent property, and to create survivable space with considerations for wildlife and groundwater protection. Single structure or structures on parcels exceeding 2 acres should include Treatment 1 in proximity to structures and Treatment 2 for remaining acres.	Remove dead, diseased, and dying trees. Fell dead trees away from stream channels with defined bed and banks. Areas should be hand-thinned and hand-piled; inaccessible areas may be treated with periodic prescribed fire. Develop a fuel modification plan (this section) for treatments.	Grassland types may be mechanically treated, including mowing, baling, chopping, or mastication, to reduce or remove vegetation or may be grazed to a suitable stubble height. Ensure that treatment of vegetation within a designed fuelbreak of >1 chain (66 feet) in width and length is necessary to enhance protection of federal, state, or private land values. Fuel reduction treatments within grassland vegetation types may include multiple-entry burns to maintain stand structure and reduce fine fuels. Trees and shrubs should be thinned to a variable distance to reflect fire resiliency status appropriate for the fire-adapted vegetation community. Mechanical/chemical or grazing treatment may be used to maintain fuelbreaks on private lands. See the Fuel Modification Plan (this section) developed to prevent spread of fire to adjacent property and to create defensible space with considerations for wildlife and groundwater protection.	Same as for slopes <20%. Fuel treatments may require hand-thinning and hand-piling or grazing in steep slopes. Prescribed fire may be used to reduce high fire potential (see Treatment 5). Designated fuelbreaks may be increased to more than 2 chains in steep slopes where herbaceous (fine fuels) and subshrub species fuel loads increase to pretreatment levels within 3 years. See the Fuel Modification Plan (this section) developed to promote forest health, to prevent spread of fire to adjacent property, and to create defensible space with considerations for wildlife and groundwater protection.	Spacing may be variable to promote (1) wildlife habitat while breaking horizontal fuel loading, which allows for patches of closely spaced trees for adequate cover, and (2) other habitat components while incorporating openings to increase herbaceous forage production, to maximize edge effect, and to promote fire-resilient stands. Mechanical thinning, mastication, and prescribed fire (see Treatment 5) can be used to reduce fuels by removing dead standing oaks and junipers to move stands toward potential natural vegetation groups as described in the *FRCC Interagency Handbook* (FRCC Interagency Working Group 2005b) or grazed to like conditions. All trees >10 inches diameter should be targeted as “leave trees” unless treatment is necessary to reflect fire resiliency status appropriate for the fire-adapted vegetation community	Woodland and shrub trees should be thinned to reflect fire resiliency status appropriate for the fire-adapted vegetation community, or prescribed fire should be applied to achieve like conditions. Shrub and tree trunks should be severed <6 inches from the ground. Mechanical treatments, such as crushing, chipping, mastication, and prescribed fire, may be used to create open stands to minimize crown-fire potential and to produce fuel conditions conducive to suppression action. Remove ladder fuels by pruning the lower third of trees or shrubs up to a maximum of 10 feet; Herbaceous and subshrub understory may be mechanically treated, including mowing, chopping, and masticating, or may be grazed to limit fine-fuel loading while protecting soil integrity. Herbicide application may be used to prevent resprouting/regrowth of trees, and broad-scale invasions of woody species.
Slash	Remove or reduce natural flammable material 2–4 feet above the ground around improvements. Remove vegetation that may grow into overhead electrical lines, ladder fuels, and dead trees; thinning from live trees must be removed (chipped, etc.). Remove all leaf litter to a depth of 1 inch.	Remove all leaf litter to a depth of 1 inch.	Same as Zones 1 and 2.	Slash may be burned, piled and burned, or chipped and removed. Slash from grassland treatments may be burned, removed, masticated, turned, or grazed for like treatment.	All slash, snags, and vegetation that may grow into overhead electrical lines; other ground fuels; ladder fuels; dead trees; and thinning from live trees must be removed, mechanically treated (chipped, etc.), or piled and burned along with existing fuels.	Clean dead and down debris in channels where debris may be mobilized in floods and thus create downstream jams. Some slash and debris can be scattered and retained in small, ephemeral streambeds in which slash can help retain runoff and sediment and provide headcut stabilization.	Slash from grassland treatments may be burned, removed, masticated, or turned (disked).	Same as for slopes <20%; however, slash may be hand-piled and ignited with prescribed fire as the primary slash reduction treatment.	Slash may be burned, piled and burned, or chipped and removed. Slash from grassland treatments may be burned, removed, masticated, or turned.	Slash may be burned, piled and burned, or chipped and removed. Slash from grassland treatments may be burned, removed, masticated, or turned.

Continued

Table 3.1. Fuel Modification and Treatment Plans

Treatment No.	5 Prescribed Fire	6 Riparian Areas (federal, nonfederal, and private lands)		7 Forest Types (federal and nonfederal lands)	
Treatment category	**Federal, State, or Private Lands**	**Federal or State Lands**	**Fuelbreaks on Private Lands**	**Thinning**	**Shaded Fuelbreaks**
Vegetation	Prescribed fire should be used as a tool to accomplish specific resource management objectives in accordance with standards and guidelines from ASLD, ASFD, A-SNFs, or all of the above. Prescribed fire on federal land is authorized if part of an approved prescribed-fire plan. As additional areas within the WUI are identified, prescribed fire may be used as a treatment tool provided that a prescribed fire plan has been approved and that all conditions set forth have been met. Prescribed fire can occur at low, moderate, and/or high intensity depending on the vegetation type and treatment objectives.	Riparian treatments should be limited in scope. The majority of riparian areas that fall within the WUI boundary will be avoided unless deemed a fuel hazard. Clearing or cutting of any material by mechanized equipment adjacent to any stream on federal land may be prohibited to prevent the risk of accelerating erosion. Treatments may include some overstory removal of deciduous riparian trees and shrubs in areas where encroachment has increased heavy woody fuels (emphasizing removal and control of saltcedar and other invasive trees). Treatments will emphasize nonnative species. Snags may be retained in accordance with agency guidelines. Presettlement trees, including snags, will be targeted for retention.	Private land treatment should use hand tools, chain saws, or mowers. Dead vegetation and slash should be removed. Ladder fuels, including limbs and branches, should be removed up to a maximum of 8 feet aboveground. All mechanized equipment must meet state and local fire-department/district standards. Perform treatments October–March annually. Chemical treatment of annuals may be best when annuals are green.	Lands may be thinned from below to reduce understory vegetation. Residual stocking levels for sites of predominantly ponderosa pine, or mixed conifer overstory would be reduced to reflect fire resiliency status appropriate for the fire-adapted vegetation community. All trees larger than agency diameter limits stated would not be cut even if the desired stocking level is not being met. In those cases, all tress smaller may be cut, but with some vegetation retained to provide a mosaic pattern.	Shaded fuelbreaks would only be planned around residential areas. A shaded fuelbreak is a type of fuelbreak within forested lands in which a band of larger mature trees (that are more fire resistant) are left in place with a relatively open understory. Enough mature trees are left to provide shade to keep the understory from redeveloping. The fuelbreak is designed to significantly slow the speed of a wildfire, All dead standing trees, of any size, would be removed. A shaded fuelbreak width of approximately 330 feet is necessary to reduce fire crowning.
Slash	Slash, piles of small-diameter dead trees or tree limbs (jackpots), and down logs may be burned as appropriate in consideration of local conditions and distance from private property. Pile or prescribed fire can be used to remove fuel from private land as designated. Snags and down woody material may be retained in areas where fire resilience is not compromised.	After removal of heavy woody fuels, fine fuels may be maintained by cool-season low-intensity prescribed fire that moves slowly downslope or into prevailing winds to midslope. Large down woody material and snags (≥12 inches) may be retained in riparian areas.	Fuel treatments and woody material removal should occur on existing roads. Cool-season low-intensity prescribed fire may be used for maintenance of fine fuels. Pile burning or burning stands of small diameter trees (jackpot burning) should not occur in ephemeral, intermittent, or perennial stream channels.	Slash may be lopped and scattered to a thickness of no more than 2 feet deep, then treated later as part of a broadcast burn. Slash may also be piled by hand or machine, and later burned.	Slash would be piled and burned.

Note: ASFD = Arizona State Forestry Division; ASLD = Arizona State Land Department; A-SNFs = Apache-Sitgreaves National Forests.

[a] Basal area is the common term used to describe the average amount of an area (usually an acre) occupied by tree stems.

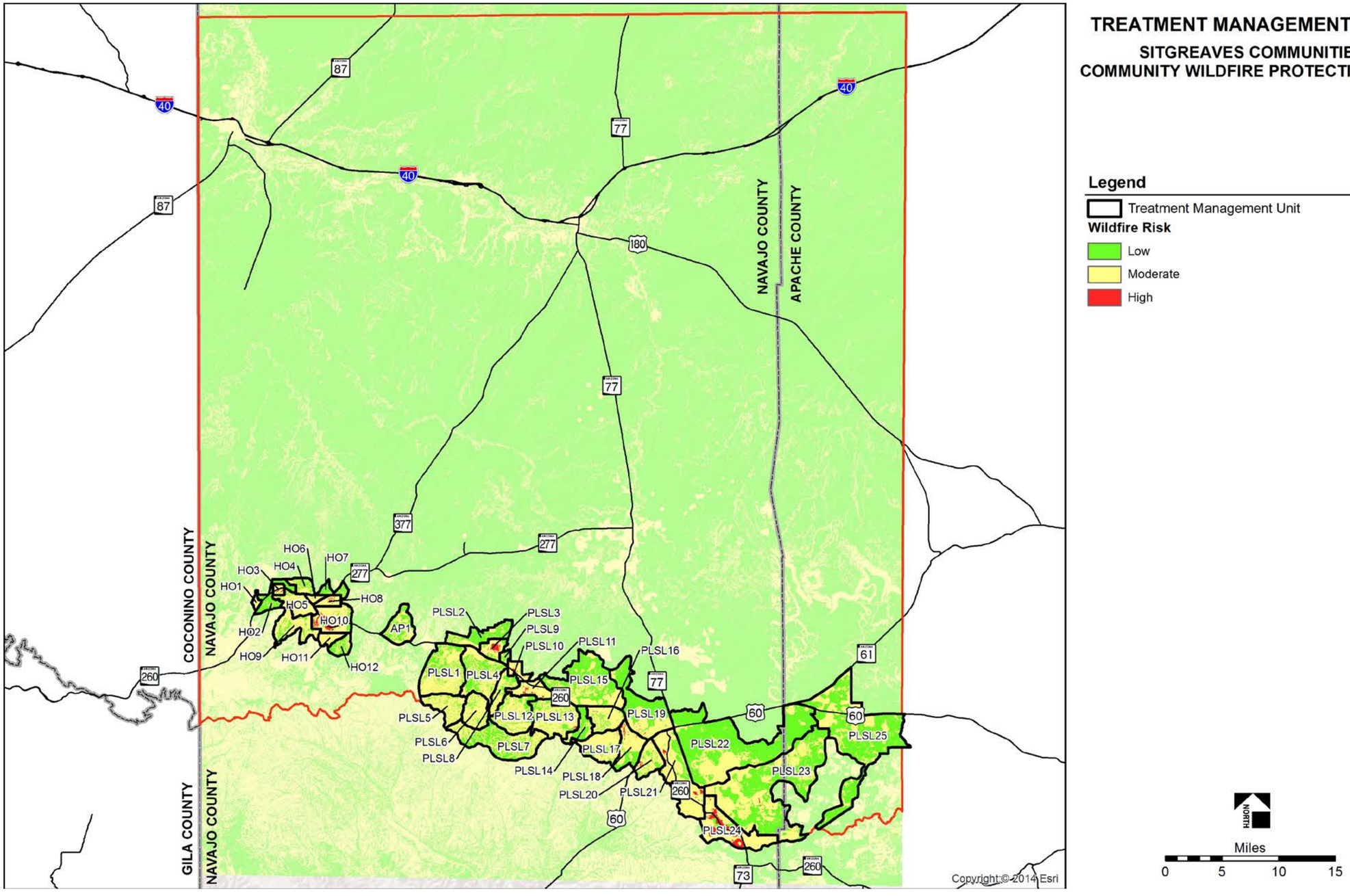

Figure 3.1. Sitgreaves Communities' CWPP Treatment Management Units

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The Core Team has assigned recommended fuel reduction treatments for each TMU (Table 3.2). The management units listed in Table 3.2 does not always coincide with fire department or district boundaries. Some management units are not located within a fire department or district and therefore have no structural fire protection. For example, the Heber-Overgaard WUI is larger than the fire district boundary.

Table 3.2. Identified Treatment Management Units

Treatment Management Unit	Map ID	Risk Value	Fuel Model	Recommended Treatment[a]	Total Acres	Federal Acres	State Trust Acres	Nonfederal/ Other Acres
Heber-Overaard	HO1	M	GR1,GR2,GS1,NB1,NB3, NB9,SH7,TL3,TL8,TU1	1,2,3,4,5,7	419	419	-	-
	HO2	M	GR1, GR2,GS1,NB1,SH1, SH2,SH7,TL1,TL3,TL5,TL8, TU1	1,2,3,4,5,7	2,514	2,490	-	24
	HO3	M	GR1,GR2,GS1,NB1,NB9, SH1,TL1,TL3,TL8,TU1	1,2,3,4,5,7	621	5	-	61
	HO4	M	GR1,GR2,GS1,NB1,NB9, SH1,SH7,TL3,TL8,TU1	1,2,3,4,5,7	1,647	1,078	-	569
	HO5	M	GR1,GR2,GS1,NB1,NB9, SH1,SH2,SH7,TL1,TL3, TL4,TL5,TL8,TU1,	1,2,3,4,5,7	3,233	870	-	2,364
	HO6	M	GR1,GR2,GS1,NB1,NB9, SH1,SH7,TL3,TL8,	1,2,3,4,5,7	615	11	-	604
	HO7	L	GR1,GR2,GS1,NB1,SH7, TL3,TL8,TU1	1,2,3,4,5,7	1,335	1,324	-	11
	HO8	M	GR1,GR2,GS1,NB1,NB9, SH1,SH7,TL3,TL8,TU1	1,2,3,4,5,7	1,183	9	-	1,174
	HO9	M	GR1,GR2,GS1,NB1,SH1, SH2,SH7,TL1,TL3,TL4, TL5,TL6,TL8,TU1	1,2,3,4,5,6,7	4,673	4,154	-	519
	HO10	M	GR1,GR2,GS1,NB1,NB9, SH1,SH2,SH7,TL2,TL3, TL4,TL8,TU1	1,2,3,4,5,6,7	4,936	1,498	-	3,438
	HO11	M	GR1,GR2,GS1,NB1,NB9, SH1,SH2,SH7,TL2,TL3, TL4,TL8,TU1	1,2,3,4,5,7	1,303	1,303	-	-
	HO12	L	GR1,GR2,GS1,NB1,SH2, TL3,TL4,TL8,TU1	1,2,3,4,5,7	1,699	1,669	-	-
Aripine	AP1	M	GR1,GR2,GS1,NB1, NB9 SH1,SH2,SH7,TL3, TL4, TL8,TU1	1,2,3,4,5,6,7	4,006	2.893	-	1,113

Continued

Table 3.2. Identified Treatment Management Units

Treatment Management Unit	Map ID	Risk Value	Fuel Model	Recommended Treatment[a]	Total Acres	Federal Acres	State Trust Acres	Nonfederal/ Other Acres
Pinetop-Lakeside Show Low	PLSL1	M	GR1,GR2,GS1,NB1,NB8, NB9,SH2,SH7,TL3,TL4, TL8,TU1,	1,2,3,4,5,6,7	9,638	8,647	-	991
	PLSL2	M	GR1,GR2,GS1,NB1,NB8, NB9,SH1,SH2,SH5,SH7, TL3,TL4,TL8,TU1	1,2,3,4,5,6,7	4,457	2,912	-	1,545
	PLSL3	H	GR1,GR2,GS1,NB1,NB8, NB9,SH1,SH2,SH5,SH7, TL3,TL8,TU1	1,2,3,4,5,6,7	2,132	440	-	1,692
	PLSL4	M	GR1,GR2,GS1,NB1,NB8, NB9,SH1,SH2,SH5,SH7, TL3,TL4,TL5,TL8,TU1	1,2,3,4,5,6,7	7,775	6,627	-	1,149
	PLSL5	M	GR1,GR2,GS1,SH2,SH7, TL3,TL4,TL8,TU1	1,2,3,4,5,7	4.294	4,293	-	1
	PLSL6	M	GR1,GR2,GS1,NB9,SH2, SH7,TL3,TL4,TL8,TU1	1,2,3,4,5,7	3,949	3,949	-	-
	PLSL7	M	GR1,GR2,GS1,NB9,SH2, TL3,TL4,TL8,TU1	1,2,3,4,5,7	10,606	10,465	-	141
	PLSL8	M	GR1,GR2,GS1,NB1,SH2, SH7,TL3,TL4,TL8,TU1	1,2,3,4,5,7	2,941	2,897	-	44
	PLSL9	M	GR1,GR2,GS1,NB1,SH1, SH2,SH5,SH7,TL3,TL8, TU1	1,2,3,4,5,6,7	627	377	-	251
	PLSL10	M	GR1,GR2,GS1,NB1,NB9, SH1,SH2,SH7,TL3,TL5, TL8,TU1	1,2,3,4,5,6,7	1,399	162	-	1,236
	PLSL11	M	GR1,GR2,GS1,NB1,NB9, SH1,SH2,SH7,TL3,TL4, TL5,TL8,TU1	1,2,3,4,5,6,7	2,933	1,757	-	1,176
	PLSL12	M	GR1,GR2,GS1,NB9,SH2, SH7,TL3,TL4,TL8,TU1	1,2,3,4,5,6,7	6,363	6,281	-	83
	PLSL13	M	GR1,GR2,GS1,NB1,NB9, SH2,SH7,TL3,TL4,TL8,TU1	1,2,3,4,5,6,7	7,904	6,344	-	1,559
	PLSL14	L	GR1,GR2,GS1,NB1,SH1, SH2,SH7,TL3,TL4,TL8,TU1	1,2,3,4,5,7	2,612	1,634	-	979
	PLSL15	M	GR1,GR2,GS1,NB1,NB8, NB9,SH1,SH2,SH5,SH7, TL3,TL4,TL5,TL8,TU1	1,2,3,4,5,6,7	13,656	8,277	-	5,380

Continued

Table 3.2. Identified Treatment Management Units

Treatment Management Unit	Map ID	Risk Value	Fuel Model	Recommended Treatment[a]	Total Acres	Federal Acres	State Trust Acres	Nonfederal/ Other Acres
	PLSL16	M	GR1,GR2,GS1,NB1,NB9, SH1,SH2,SH7,TL3,TL4, TL8,TU1	1,2,3,4,5,7	3,972	2,159	-	1,813
	PLSL17	M	GR1,GR2,GS1,NB1,SH2, SH7,TL3,TL4,TL5,TL6,TL8, TU1	1,2,3,4,5,7	5,280	5,276	-	4
	PLSL18	M	GR1,GR2,GS1,NB1,SH1, SH2,SH7,TL1,TL2,TL3, TL4,TL5,TL6,TL8,TU1	1,2,3,4,5,7	4,458	2,400	-	2,058
	PLSL19	L	GR1,GR2,GS1,NB1,NB3, NB8,NB9,SH1,SH2,SH5, SH7,TL1,TL2,TL3,TL5,TL8, TU1	1,2,3,4,5,7	10,565	6,444	-	4,121
	PLSL20	M	GR1,GR2,GS1,NB1,NB9, SH1,SH7,TL2,TL3,TL5, TL6,TL8,TU1	1,2,3,4,5,7	3,468	2,692	-	776
	PLSL21	H	GR1,GR2,GS1,NB1,NB3, NB8,NB9,SH1,SH2,SH5, SH7,TL1,TL2,TL3,TL5,TL8, TU1	1,2,3,4,5,7	11,022	2,000	-	9,022
	PLSL22	L	GR1,GR2,GS1,GS2,NB1, NB3,NB8,NB9,SH1,SH2, SH5,SH7,TL3,TL5,TL8, TU1,TU2	1,2,3,4,5,7	29,522	21,893	1,478	6,151
	PLSL23	H	GR1,GR2,GS1,NB1,NB8, NB9,SH1,SH2,SH5,SH7, TL1,TL2,TL3,TL5,TL6,TL8, TU1,TU2,TU5	1,2,3,4,5,7	31,722	28,398	2	3,322
	PLSL24	H	GR1,GR2,GS1,NB1,NB8, NB9,SH1,TL1,TL2,TL3, TL5,TL6,TL8,TU1	1,2,3,4,5,7	8,552	1,732	-	6,821
	PLSL25	L	GR1,GR2,GS1,GS2,NB1, NB3,NB8,NB9,SH1,SH2, SH5,SH7,TL2,TL3,TL5, TL6,TL8,TU1,TU5	1,2,3,4,5,7	26,318	7,977	2,469	15,873
				Total Acres	244,352	163,787	3,949	76,616

Note: L = low; M = moderate; H = high

[a] See Table 3.1 for recommended treatments.

Treatment of wildland fuels within the WUI is expected to generate considerable slash and vegetative waste material. Private individual use of wood products from fuel reduction treatments within the WUI is primarily for fuelwood. Commercial use of the woody material from fuel reduction treatments has been generated through the A-SNFs' 2004 White Mountain Stewardship Project whose goals were to reduce the impact of wildfires to communities at risk, to improve wildlife habitat, and to restore forest health, while helping rural communities stimulate employment in the wood-products industry.

Recent costs of fuels mitigation treatment on USFS lands within the WUI are estimated to be $100.00 per acre for mowing and $200.00 per acre for mastication. Recent costs of fuels mitigation treatment on A-SNFs lands consistent with the White Mountain Stewardship contract costs for thinning within the WUI include $525.00 per acre and $250.00 to $350.00 per acre for forest treatments conducted by the A-SNFs. If wildland fuel modification prescriptions require follow-up pile burning or herbicide application after vegetation treatment, the total cost per acre could include $50.00-$100.00 for burning and $400.00 for foliar herbicide application (A-SNFs, pers. comm. 2015).

Private land treatments in the WUI typically occur on small land parcels near power lines, structures, and other obstacles. In many cases, cut trees and slash cannot be piled and burned on small private land parcels, or it is not the preferred slash treatment by the owner of a small residential lot or by the local fire departments. Therefore, the Core Team recommends that slash from wildland fuel reduction treatments on small residential parcels be removed, whole or chipped, and transported to a disposal site. The Core Team does not oppose alternative vegetative treatments, such as an experimental grazing program using primary grazers within the WUI to achieve wildland fuel mitigation objectives adjacent to state or federal lands. The Core Team also recommends that fuelbreaks constructed on public and private lands to restrict wildland fire movement be maintained on a rotating 2- or 3-year interval, or as deemed necessary, to ensure the integrity of the fuelbreak through removal of fine and light vegetative fuels.

The Core Team recommends that when available, wildland fuel modification projects be contracted to ASFD through the Department of Corrections (DOC) Fire and Fuels Management Crews to ensure that treatments are conducted in a timely fashion and at a reasonable cost. The estimates of daily costs, which include a 20-person labor crew and a chipper for a 100-mile roundtrip to the project site by an ASFD crew carrier as of December 2015 are as follows:

- 10-hour day—$1,400.00
- 12-hour day—$1,580.00

Cost estimates for treatments in the WUI are based on the estimates provided by the ASFD for the Fire and Fuels Crew costs for both federal and nonfederal land treatments (Table 3.3). The ASFD Fire and Fuels Crew does not remove hazard trees or provide "climbers" for pruning or segmented tree removal that is sometimes required on private lands. The Core Team does support and encourage local business development that will complement wildland fuel mitigation needs within federal and nonfederal

lands of the WUI. Vegetative fuel mitigation costs for this CWPP are estimated to be $350.00 per acre, which is comparable to the estimated cost of the ASFD Fire and Fuels Crew and estimated fuel mitigation costs on adjacent federal lands. However, the availability of federal, state, and local funding for mitigation of wildland fire risk, enhanced response, and public education will drive the ability of the Core Team to meet the goals of the revised Central Navajo County CWPP.

Table 3.3. Acres of Wildland Fuels Mitigation Treatment Conducted by ASFD Fire and Fuels Crew during a 10-Hour On-Site Workday

Vegetation Association	Average Acres per Day Treated
Ponderosa pine/mixed conifer	0.5 to 1 acre per day
Pinyon/juniper	1 to 2 acres per day
Mesquite woodland	3 to 4 acres per day
Oak woodland	3 to 4 acres per day
Riparian	1 to 2 acres per day (depending on fuel loading)
Grassland	2 to 4 acres per day (depending on grass type and fuel loading)

The Core Team recommends that private landowners who wish to adopt fuel modification plans other than those described in Table 3.1 have the plan prepared or certified by a professional forester, by a certified arborist, by other qualified individuals, or in conjunction with recommendations from local fire departments or fire districts that reference Firewise or fire-safe guidelines. Fuel modification plans for federal and state lands within 0.5 mile of private lands may be prepared for wildlife and watershed benefits—including the retention of large snags or vegetative patches of high wildlife value in areas more than 600 feet from private lands in which fire resiliency is not impaired and will not compromise public or firefighter safety. A fuel modification plan should identify the actions necessary to promote rangeland, wildlife, or watershed health and to help prevent the spread of fire to adjacent properties by establishing and maintaining survivable space. The action identified by the fuel modification plan should be completed before development of the property or identified during project initiation on federal and state lands.

Alternate Federal, State, or Private Land Wildland Fuel Modification Plan

A fuel modification plan for federal and state lands should follow agency procedures, standards, and guidelines. Fuel modification treatment plans for private land parcels described in the 2004 Sitgreaves Communities CWPP should at least include the following information:

- A copy of the site plan
- Methods and timetables for controlling, changing, or modifying fuels on the properties in a timely and effective manner
- Elements for removal of slash, snags, and vegetation that may grow into overhead electrical lines; removal of other ground fuels, ladder fuels, and diseased, dying, and dead trees; and thinning of live trees

- Methods and timetables for controlling and eliminating diseased or insect-infested vegetation
- A plan for the ongoing maintenance of the proposed fuel reduction and control measures for disease and insect infestations
- A proposed vegetation management plan for groupings of parcels under multiple ownership that has been accepted by all individual owners (subject to compliance with this section)

HFRA was designed to expedite administrative procedures for conducting hazardous wildland fuel reduction and restoration projects on federal lands. Regardless of priority treatments selected for federal lands, an environmental assessment must be conducted for fuel reduction projects. Although HFRA creates a streamlined and improved process for reviewing fuel reduction and restoration treatments, it still requires that appropriate environmental assessments be conducted and that collaboration is maintained (USDA and USDI 2004).

The recommended treatments within the 2016 SCWPP have been developed to be consistent with state, and federal land-management action alternatives and are intended to comply with and facilitate efficient planning and decision making concerning fuels mitigation treatments or restoration of public and private lands in order to reduce risks to communities caused by severe fires and to restore fire-adapted ecosystems (USFS 2000).

B. Prevention and Loss Mitigation

The SCWPP Core Team prepared the updated Sitgreaves Communities CWPP to be used as a resource to help coordinate long-term interagency mitigation of potential catastrophic wildfire events in at-risk communities within Navajo and Apache Counties. The SCWPP Core Team established specific revised goals for wildland fire prevention and loss mitigation as follows:

- Improve fire prevention and suppression for firefighter and public safety and to protect private property
- Promote community collaboration, involvement, and education
- Creation of regional or local fire councils
- Recommend measures to reduce structural ignitability in the Sitgreaves Community WUIs
- Preserve the aesthetics within forest and rangelands which include plant and wildlife values
- Identify funding needs and opportunities
- Expedite project planning through partnerships with ASFD, A-SNFs, and private and public entities in managing wildfire risk within the WUI
- Reduce economic impacts to local communities as a result of unwanted wildland fire
- Ensure a viable and sustainable forest industry necessary to conduct fuel mitigation recommendations, enhance local economies, and traditional community values

The 2016 SCWPP should be reviewed annually and updated every 5 years, or as needed. Successful implementation of this SCWPP will require collaboration among numerous government entities and community interests.

The Core Team and collaborators revised the "Prevention and Loss Mitigation" section of the 2004 Sitgreaves Communities CWPP and propose the following revised action recommendations to meet the goals of the 2016 SCWPP.

1. Administer and Implement the SCWPP

The Core Team recommends establishing a Sitgreaves Communities CWPP Working Group composed of local fire chiefs, NCEM, ACEM, ASFD, A-SNFs, community members, concurring agencies, County and local planning and zoning departments and members of the Core Team to support individual agency implementation of the recommendations for fuel modification, public outreach, protection capability, and structural ignitability within the Sitgreaves Communities CWPP WUI, including fuel hazards removal on private lands within the WUI.

2. Improve Protection Capability and Reduction in Structural Ignitability

The 2016 Sitgreaves Communities CWPP Core Team considers the risks of wildland fire igniting and spreading throughout the WUI a serious threat. The Core Team and collaborators concur that actions to reduce risk and promote effective responses to wildland fires should be undertaken. The following are revised recommendations prepared by the Core Team to enhance wildfire protection capabilities for at-risk communities within the Sitgreaves Communities CWPP in Navajo and Apache Counties:

- Obtain a medium-size water tender for use by local fire departments and districts.
- Strategically locate additional water-storage tanks, wells, or other water sources for tender filling throughout the fire departments and districts.
- Maintain helicopter landing sites; and update mapping capabilities of local fire departments and districts.
- Establish and promote a countywide public emergency mass notification system.
- Encourage fire departments and districts to participate in annual multiagency wildfire safety training before the fire season.
- Encourage subdivisions and communities that are not within a fire department or district to take actions necessary to be annexed by an existing fire district to provide viable fire protection services.
- Acquire GIS and GPS (Global Positioning System) software and laptops to update mapping capabilities of local fire departments and districts.

- Provide enhanced and coordinated firefighting training and equipment, such as personal protective equipment (PPE) and second-generation fire shelters, for newly certified wildland firefighters and volunteer firefighters.
- Develop and maintain mutual-aid agreements with neighboring fire departments or districts for wildland and structural fire response support and other emergency response.
- Develop a pre-suppression plan with Navajo and Apache County fire departments and A-SNFs along the community WUI boundaries.
- Develop additional wildland fire preplans for all high-hazard locations across Navajo and Apache County where they have not been adopted.
- Meet annually before the fire season to coordinate early suppression deployment and to determine training and equipment needs.

3. Promote Community Involvement and Improved Public Education, Information, and Outreach

Navajo and Apache County and the Core Team should continue developing and implementing public outreach programs to help create an informed citizenry. The goal is to have residents support concepts of fire-adapted communities, survivable space and naturally functioning wildland systems through restoration management and rapid response to wildland fire. The SCWPP is intended to be a long-term strategic plan containing prescriptive recommendations to assist in hazardous fuels management to enhance community preparedness. A grassroots collaborative structure of individual citizens, supported by local governments as full partners, would provide the most effective long-term means to achieve these goals and to maintain community momentum. The components of such a structure include the following recommendations:

- Assist in implementing a Firewise Communities/USA Recognition program in communities where the program is supported by the local fire departments and districts. The Firewise Communities approach emphasizes community and individual responsibility for safer home construction and design, landscaping, and maintenance. The Core Team will also help identify high-priority communities that would most benefit from a Firewise Communities program.
- Expand the use of current public information tools for fire-safe residential treatments as an immediate action step. This will be accomplished through information mailers to homeowners; presentations by the NDEM, ACEM, ASFD, A-SNFs, and local fire departments and districts; and the development of specific promotional materials by the Core Team.
- Promote the concepts of Fire Adapted Communities program through current public information and outreach dissemination avenues throughout the SCWPP communities.
- Creation of regional or local fire councils to create the strategic planning efforts to move forward the identified goal and community initiatives.

- Place fire-danger information signs on major access roads throughout the WUI. Community bulletins and other public service announcements concerning wildfire threat and preparedness should be developed with assistance from ASFD, A-SNFs, and Navajo and Apache County fire departments.
- Place and maintain bilingual wildfire caution signs within camping areas and access routes in some areas of the WUI.
- Complete wildfire home assessments through the use of Redzone software, or an equivalent software system, and submit wildfire hazard mitigation strategies to landowners for each private property assessed within highest-risk communities.
- Replace and maintain fencing adjacent to high-use and illegal off-road-vehicle use areas within or adjacent to the WUI.

4. Encourage Use of Woody Material from WUI Fuel Mitigation Programs

The Core Team and its collaborators should continue to support and promote private contractors who perform Firewise or fire-safe mitigation work necessary to provide for survivable space and create fire-adapted communities. Navajo and Apache Counties should continue to support and promote new businesses involved in the wood-products market. Navajo and Apache Counties, A-SNFs, and local fire departments and districts encourage, as appropriate, the use of vegetative by-products from the WUI fuel management programs for use by commercial entities or community service organizations. Navajo and Apache Counties encourage the A-SNFs to continue with long-term stewardship contracting through the pending Four Forest Restoration Initiative to enhance local community economies through a sustained forest-products industry, which would allow wildland fire to return to its historical role in forest and rangeland management and would help forest communities with wildfire preparation.

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IV. NAVAJO AND APACHE COUNTY SITGREAVES COMMUNITIES' CWPP 2016 PRIORITIES: ACTION RECOMMENDATIONS AND IMPLEMENTATION

The Core Team reviewed the 2004 SCWPP *Section V: CWPP Priorities: Action Recommendations and Implementation* developed by the 2004 Core Team. The action recommendations developed by the 2015 Core Team (see Section III of this CWPP) are complimentary to those developed by the 2004 Core team to achieve the 2016 Navajo and Apache County Sitgreaves Communities' CWPP objectives. The revised 2004 SCWPP is composed of a series of recommendations that when implemented should reduce structural ignitability, improve fire prevention and suppression, and enhance public education and outreach that is based on the results of the wildfire threat, wildfire effects, and wildfire risk assessment conducted by the 2015 Core Team.

The Core Team recommends that projects implemented from these action recommendations be monitored for effectiveness of meeting the revised SCWPP objectives. For the life of the SCWPP, recommendations for additional projects should be made on the basis of project performance from previous implemented projects.

A. Administrative Oversight

The 2004 SCWPP recommended establishing a "Community Forester" for coordinating, implementing, monitoring, and reporting to the signatories the status of the current-year priority recommendations of the 2004 SCWPP. The 2015 Core Team revised this recommendation in favor of establishing a Sitgreaves communities "CWPP Work Group" and an administrator for Navajo and Apache Counties to monitor implementation of the 2015 SCWPP. Establishing a unified effort to collaboratively implement the 2015 Sitgreaves communities CWPP embraces adaptive management principles that enhance decision making and reduces inconsistency at all levels of government.

The Core Team recommends that the Work Group, administrators, and concurring agencies work toward accomplishing the recommendations for outreach and structural ignitability within the Sitgreaves communities' CWPP WUIs, which include fuel hazards removal on private lands. The Work Group should consist of representatives from local fire departments and districts and, representatives from the NCEM, ACEM, ASFD, ASLD, A-SNFs, county and local municipalities, and other concurring agencies. The Core Team may solicit communities that are not serviced by a fire department or district, as well as other interested individuals or agencies, to participate in the Work Group. NCEM and ACEM would be the administrators in coordinating the Work Group and producing monitoring reports and any updates to the CWPP.

As established in the 2004 SCWPP, the “Community Forester” was responsible for monitoring and reporting of action recommendations of the 2004 SCWPP. The 2015 Core Team recommends the future Work Group would make recommendations for prioritizing wildland fuel treatments, structural ignitability, protection capability, and public outreach projects listed in the 2015 Sitgreaves communities CWPP. Fuel modification and community planning and outreach should be prioritized by the Work Group as a whole; other projects involving firefighter training, equipment, communications, facilities, and apparatus would be recommended by the fire chiefs from Sitgreaves communities or their representatives to the Work Group. The Core Team further recommends that the Navajo and Apache County Emergency Managers accept the responsibilities of the CWPP administrators in coordinating and reporting on action recommendations of the 2015 Sitgreaves Communities CWPP.

The Work Group should be an advocate for and to provide support to fire departments and districts and agencies in the submittal of grant applications and the solicitation of funding opportunities to implement wildland fuel modification, reduced structural ignitability, enhance protection capabilities, and public outreach projects established as priorities by the Work Group. Additionally, individual agencies and fire departments and districts will be able to seek letters of support from the Work Group or partner agencies in applying for funding to implement projects identified in the 2015 Revised Sitgreaves communities CWPP.

The Work Group should compile monitoring and reporting documents from cooperating agencies to provide information on additional measures necessary to meet Sitgreaves communities CWPP goals, including additional future recommendations from fire departments and districts and agencies for inclusion in the priorities list. The Work Group may also act as an advisory group to the Navajo and Apache County Planning and Zoning Departments and to developers in outlying areas to ensure adequate public safety access and to provide vegetation mitigation and landscaping recommendations, water supplies for emergency services, and recommendations for establishing and funding fire services and equipment in residential and commercial developments.

The following general criteria will be used for prioritizing proposed projects and action items:

1. Geographic/fuel-load/residential density:
    a. In any given year, the Work Group would evaluate countywide weather, vegetation, and fuel-load conditions and projections, as well as current residential and commercial densities, to recommend short-term priority adjustments for projects in all WUI areas of the counties for that year.
    b. In any given year, the Work Group would evaluate the progress of new developments and increasing residential and commercial densities to determine potential needs and priorities within the WUI for the next 3 years following that given year.

2. Categorical/functional criteria—priorities would generally be established as listed below; these priorities are subject to review and change by the Work Group on an ongoing basis:
    a. Fuel modification projects (those in the WUIs listed in Table 4.1 that are within the jurisdictions of fire departments and districts, A-SNFs, or ASFD will have first priority)
    b. Enhanced wildland firefighter training and acquisition of personal protective equipment (PPE)
    c. Wildland-fire suppression equipment and tools, including brush engines and tenders
    d. Water-storage sites and supply facilities
    e. Community planning and outreach activities, including warning signs/systems and identification and improvement of evacuation routes
    f. Helicopter landing pads for firefighter deployment or evacuation
    g. Fire stations in areas with sufficiently high threat and population densities as recommended annually by the Work Group

The Core Team supports local community efforts and would collaborate with the communities toward accomplishing action recommendations. The A-SNFs, ASFD, NCEM, ACEM, and fire departments and districts in coordination with the established Work Group would collaborate on fuel mitigation projects within the WUI on lands managed by local, state, and federal government agencies, as well as those on private lands. The Core Team and the proposed Work Group encourage and support agencies, municipalities and local fire departments and districts in obtaining grants and soliciting opportunities to implement wildland fuel mitigation projects on private lands and to support public information, education, and outreach within the WUI. Successful award of grant funds is necessary to implement the action recommendations for private land treatments, mitigation projects for reduced structural ignitability, firefighting response, and public outreach. The A-SNFs, ASFD, NCEM, ACEM, fire departments and districts, and the Core Team also encourage soliciting grants and other funding to construct and maintain fuelbreaks as well as broader applications of wildland fuel mitigation projects within and adjacent to the WUI. Monitoring and reporting compiled by the Work Group would provide information on additional measures necessary to meet the 2015 Sitgreaves communities CWPP goals.

B. Priorities for Mitigation of Hazardous Wildland Fuels

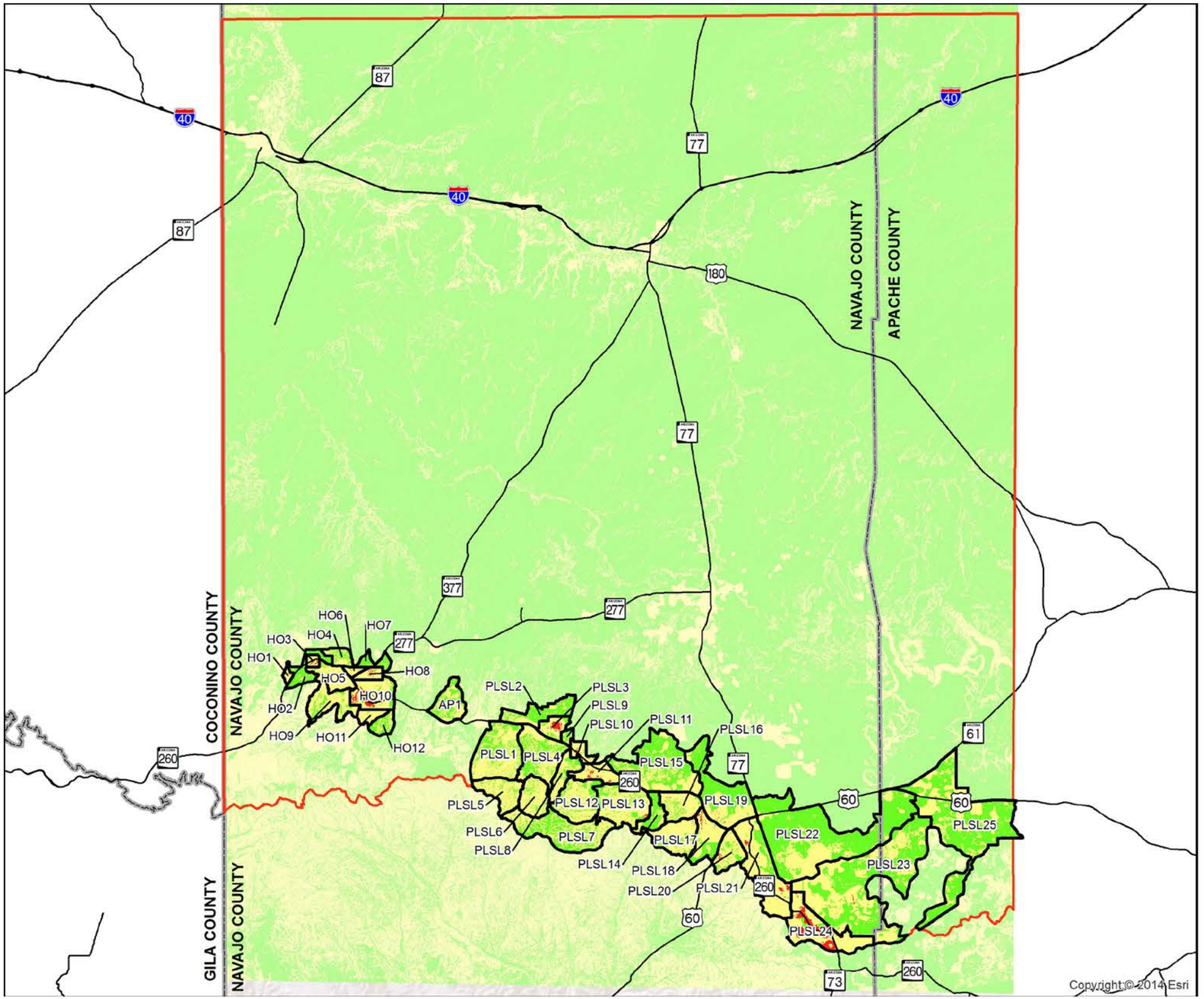
Table 4.1 displays the priorities for wildland fuel treatments within the WUIs (Figure 4.1) as recommended by the 2015 Core Team. These action recommendations should assist in reducing wildfire potential. The Core Team recognizes that not all acres within a high-risk landscape can be treated. Site-specific analysis would determine treatment acres and methods that meet forest and rangeland restoration objectives and enhances community preparedness for wildland fire.

Table 4.1. Action Recommendations for Wildland Fuel Modification

Management Area	Description	Project Partner	Estimated Treatment Cost[a]
PLSL24	A-S NFs' management area	NCEM, A-SNFs	1,734 high-risk acres, 30% of lands to be treated over 3 years estimated to be 520 acres/year in FY 2016–2018. at $350.00/acre = $182,00.00/year
PLSL3	A-S NFs' management area	NCEM, A-SNFs	284 high-risk acres, 30% of lands to be treated over 3 years estimated to be 85 acres/year in FY 2016–2018. at $350.00/acre = $29,750.00/year
PLSL21	A-S NFs' management area	NCEM, A-SNFs	237 high-risk acres, 30% of lands to be treated over 3 years estimated to be 71 acres/year in FY 2016–2018. at $350.00/acre = $24,850.00/year
PLSL20	A-S NFs' management area	NCEM, A-SNFs	93 high-risk acres, 30% of lands to be treated over 3 years estimated to be 28 acres/year in FY 2016–2018. at $350.00/acre = $24,850.00/year
PLSL23	A-S NFs' management area	NCEM, A-SNFs	55 high-risk acres, 30% of lands to be treated over 3 years estimated to be 17 acres/year in FY 2016–2018. at $350.00/acre = $5,950.00/year
HO10	A-S NFs' management area	NCEM, A-SNFs	511 high-risk acres, 30% of lands to be treated over 3 years estimated to be 153 acres/year in FY 2016–2018. at $350.00/acre = $53,550.00/year
HO3	A-S NFs' management area	NCEM, A-SNFs	49 high-risk acres, 30% of lands to be treated over 3 years estimated to be 15 acres/year in FY 2016–2018. at $350.00/acre = $5,250.00/year
Fuelbreak maintenance	1- to 3-year rotating maintenance of fine and light fuels in fuelbreaks	ASLD, ASFD, A-SNFs, NCEM, ACEM, and participating fire departments and districts	250 acres/year of light understory fuel treatments in excess of 4 acres treated/10-hour day at $1,400.00/day costs = $87,500.00/year

Note: ASFD = Arizona State Forestry Division; ASLD = Arizona State Land Department; NCEM = Navajo County Emergency Management, ACEM = Apache County Emergency Management; A-SNFs = Apache Sitgreaves National Forest; FY = fiscal year; HO = Heber-Overgaard, PLSL = Pinetop-Lakeside Show Low

[a] Total acres to be treated during the life of the plan; 30% of acres estimated to be treated based on site-specific analysis, which will determine actual acres available for treatment in each area.



TREATMENT MANAGEMENT UNITS

SITGREAVES COMMUNITIES
COMMUNITY WILDFIRE PROTECTION PLAN

Legend

- Treatment Management Unit

Wildfire Risk

- Low
- Moderate
- High

NORTH

Miles

0 5 10 15

Figure 4.1. Sitgreaves Communities' CWPP Treatment Management Units

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C. Identified Action Items for Protection Capability and Reduced Structural Ignitability

The 2015 Core Team has developed action recommendations to enhance community wildfire preparation and response facilities, capabilities, and equipment necessary to meet fire adapted community goals. Table 4.2 lists the identified action items proposed by the 2015 Core Team for consideration by individual fire departments and districts and agencies for reduced structural ignitability and enhanced public outreach within their respective jurisdictions. Table 4.3 lists the future recommendations for wildland fire protection and reduced ignitability.

After the ASFD's final approval of the 2016 Sitgreaves communities CWPP, the Work Group will meet to review projects for the upcoming year and, thereafter, will meet annually or as necessary to reevaluate projects and revise priorities as needed. Such prioritization by the Work Group will not impinge on or interfere with the fire departments' and districts', municipalities or agencies opportunities to independently seek funding for projects within their jurisdictions.

D. Priorities for Promoting Community Involvement through Education, Information, and Outreach

The NCEM, ACEM, and the Work Group will collaborate on implementation of public outreach and education programs for residents to heighten awareness and understanding of the threat that wildland fire poses to the communities and to further fire adapted community and survivable space goals of the 2015 Sitgreaves communities CWPP

Table 4.4 lists the 2015 Core Team's priority recommendations for promoting community involvement. Additional programs that could be used or developed to enhance community outreach and education may be implemented in the future. The Work Group will use the resources of the ASFD, and A-SNFs, for additional public education programs and community outreach. Community bulletins and other public service announcements concerning wildfire threat and preparedness should be developed with assistance from local fire departments and districts, ASFD, and A-SNFs.

Table 4.2. Action Recommendations for Structural Ignitability and Public Outreach

Project Partner	Project[a]	Specific Recommendation	Estimated Cost	Timeline
NCEM, ACEM, and Sitgreaves communities fire departments and districts	**E1**—Wildland Fire Protection and Reduced Ignitability	Purchase one Type 3 fire engine.	New acquisition with standard equipment: $382,000.00	Begin grant applications in FY 2016; purchase in FY 2017.
NCEM, ACEM, and Sitgreaves communities fire departments and districts	**E1**—Wildland Fire Protection and Reduced Ignitability	Purchase one Type 6 fire engine.	New acquisition with standard equipment: $143,000.00	Begin grant applications in 2016/2017; purchase in 2017/2016.
NCEM, ACEM, and Sitgreaves communities fire departments and districts	**A1**—Wildland Fire Protection and Reduced Ignitability	Construct a series of 5,000-gallon water-storage facilities located strategically throughout residential areas.	Install water-storage facilities/year: $6,500.00/facility	Locate and install one water-storage facility in FY 2016.
NCEM, ACEM, and Sitgreaves communities fire departments and districts	**A2**—Enhanced Public Education, Information, and Outreach	Develop wildfire public education brochures (e.g., Arizona 7 Steps brochure, and "Living with Wildfire" booklet).	Produce and publish community-specific wildfire informational brochures	Begin grant applications in 2016; continue on an ongoing basis starting in 2017.
NCEM, ACEM, and Sitgreaves communities fire departments and districts	**A2**—Enhanced Public Education, Information, and Outreach	Work with land-management agencies for the acquisition, operation, and maintenance of a green-waste disposal site within reasonable proximity to community.	Locate and coordinate with land-management agency; excavate pit and fence: $20,000.00	Begin planning with agencies in FY 2016/2017; implement in FY 2016/2017.
NCEM, ACEM, and Sitgreaves communities fire departments and districts	**A3**—Enhanced Public Education, Information, and Outreach	Create fire-safety and fire-awareness posters for public places.	Development, printing, and distribution costs: $5,000.00	Solicit funds for production and printing in FY 2016; publish and post in FY 2017.
NCEM, ACEM, and Sitgreaves communities fire departments and districts	**A4—**Enhanced Public Education, Information, and Outreach	Include links to relevant Firewise websites on project-partner websites. CWPP Working Group should check links annually for validity and notify partners of changes.	Staff time to add links. $1,000 per participating agency.	Implement with roll-out of CWPP. Update annually if needed.
Fire departments	**A6—**Enhanced Public Education, Information, and Outreach; Structural Ignitability	Conduct hazard assessments for homeowners. Use Firewise or similar door tags.	Solicit funds for acquisition of door tags and for volunteer staff time for distribution	Acquire door tags in2016; distribute in 2016/2017.

Continued

Table 4.2. Action Recommendations for Structural Ignitability and Public Outreach

Project Partner	Project[a]	Specific Recommendation	Estimated Cost	Timeline
NCEM, ACEM, and Sitgreaves communities and fire departments and districts	**A7—**Enhanced Public Education, Information, and Outreach	Establish and maintain roadside fire-danger warning signs and other informational and directional road signs along major roads as determined by the Sitgreaves communities and Northern Arizona Fire Chief's Association.	Construction and placement: $5,000.00	Install in FY 2016; start with roads with highest fire incidence/risk. Solicit grants from Federal Highway Administration
NCEM, ACEM, A-SNFs, ASFD, ASLD, associated fire and police departments, and Navajo and Apache County Sheriff's Office	**A8—**Enhanced Public Education, Information, and Outreach	Issue PSAs, do media spots, use social media about safe use of fireworks and open burning and reporting illegal use.	Staff time. $3,000 per participating agency annually.	Begin in FY 2016. Around July 4 and January 1.
NCEM, ACEM, A-SNFs, ASFD, ASLD, and associated fire departments	**A10—**Enhanced Public Education, Information, and Outreach	Establish and promote countywide public emergency mass notification system.	Annual operational cost of approximately $20,000.00.	Begin planning with agencies in FY 2016; implement in FY 2017.

Note: ASFD = Arizona State Forestry Division; ASLD = Arizona State Land Department; NCEM = Navajo County Emergency Management; ACEM = Apache County Emergency Management, A-SNFs = Apache Sitgreaves National Forest; DOT = department of transportation; FY = fiscal year; PSA = public service announcement.

[a] Projects are designated by project type (E = equipment; A = administrative) but not ranked in order of importance.

Table 4.3. Future Recommendations for Wildland Fire Protection and Reduced Ignitability

Project Partner	Project[a]	Equipment/Expense	Timeline
NCEM, ACEM, A-SNFs, ASFD, ASLD, and associated fire departments	**E5**—Obtain a medium-size water tender to better traverse rural landscape than larger units	1,500-gallon water tenders, 4-wheel drive: $191,000.00	Acquire tender in FY 2016/17; assess additional tender needs in FY 2017/18
NCEM, ACEM, A-SNFs, ASFD, ASLD, and associated fire departments	**A5**—Work with Sitgreaves communities and Apache County to develop a notification and evacuation plan for the community	Staff time, coordination efforts, research, and meetings: $5,000.00	Begin planning in FY 2016/15; implement in FY 2016
NCEM, ACEM, A-SNFs, ASFD, ASLD, and associated fire departments	**A6**—Work with utility and transportation agencies on vegetative management treatments within and adjacent to utility corridors where opportunities exist on private lands	Staff time, coordination efforts, research, and meetings: $5,000.00	Begin planning in FY 2016/15; implement in FY 2016

Note: ASFD = Arizona State Forestry Division; ASLD = Arizona State Land Department; NCEM = Navajo County Emergency Management; ACEM = Apache County Emergency Management, A-SNFs = Apache Sitgreaves National Forest; DOT = department of transportation; FY = fiscal year; PSA = public service announcement.

[a] Projects are designated by project type (E = equipment; A = administrative) but not ranked in order of importance.

Table 4.4. Future Recommendations for Enhanced Public Education, Information, and Outreach

Project Partner	Project[a]	Equipment/Expense	Timeline
NCEM, ACEM, A-SNFs, ASFD, ASLD, and associated fire departments	**A7**—Establish and maintain roadside fire-danger warning signs and other informational and directional road signs along major roads as determined by the CWPP Working Group	Construction and placement: $5,000.00	Construct and implement in FY 2017/2016
NCEM, ACEM, A-SNFs, ASFD, ASLD, and associated fire departments	**I2**—Acquire Redzone software, or equivalent software, and field data recorders or PDAs to complete home fire assessments and implement fire-safe recommendations	Software and data recorder: $1,300.00 Assessment completion: $2,000.00	Acquire software and complete assessments in FY 2017/2016; implement recommendations in FY 2016
NCEM, ACEM, A-SNFs, ASFD, ASLD, and associated fire departments	**I3**—Encourage private businesses that perform Firewise land treatments; encourage market development of WUI by-products from vegetative fuel mitigation programs	Marketing plan to be developed	Initiate community marketing planning meetings in FY 2017
NCEM, ACEM, A-SNFs, ASFD, ASLD, and associated fire departments	**I4**—Replace and maintain fencing adjacent to high OHV use areas	Assess in 2016; initial plan for 1 mile of new or repaired fencing	Estimate $6,000.00m per mile of standard 4-wire fencing

Note: ASFD = Arizona State Forestry Division; ASLD = Arizona State Land Department; NCEM = Navajo County Department of Emergency Management; ACEM = Apache County Department of Emergency Management, A-SNFs = Apache Sitgreaves National Forest; DOT = department of transportation; FY = fiscal year; PSA = public service announcement.

[a] Projects are designated by project type (I = Infrastructure, A = administrative) but not ranked in order of importance.

V. MONITORING PLAN

Monitoring is essential to ensure that the revised goals of the SCWPP for Navajo and Apache County are met. The 2016 SCWPP Core Team, local fire departments and districts, NCEM, ACEM, ASFD, and A-SNFs should monitor the progress of the revised SCWPP action recommendations to determine the effectiveness of ongoing and completed projects in meeting the SCWPP objectives, as well as to recommend future projects necessary to accomplish SCWPP goals.

In accordance with Section 102.g.5 of HFRA, SCWPP Communities in Navajo and Apache Counties would like to participate in any multiparty monitoring program established by state and federal agencies, or other interested parties, to assess progress toward meeting the SCWPP objectives. The Core Team believes that participation in multiparty monitoring would provide effective and meaningful ecological and socioeconomic feedback on landscape and site-specific fuel reduction projects and watershed enhancements and would also help A-SNFs, ASFD, ASLD, MCEM, ACEM, Navajo and Apache County municipalities, and fire departments and districts with future land-management planning.

This section details the performance measures that could be used to assess the effectiveness of implementing the SCWPP action recommendations. Monitoring should include assessing and evaluating the implementation of individual SCWPP projects and a given project's effectiveness in furthering the SCWPP objectives.

A. Administrative Oversight, Monitoring, and SCWPP Reporting

The CWPP Work Group composed of local fire chiefs, NCEM, ACEM, A-SNFs, ASFD, and ASLD should work toward furthering and monitoring the SCWPP action recommendations in coordination with a future-established CWPP Work Group. The CWPP Work Group should identify appropriate grant and other funding mechanisms necessary to implement the action recommendations of the SCWPP. Grant information should be routinely searched to identify current grant application opportunities.

As a product of the annual plan review, the NCEM, ACEM, in coordination with the future-established CWPP Work Group, should report on the success of SCWPP project implementation and overall progress toward meeting the SCWPP goals. The CWPP Work Group should report successful grant awards received for implementing the SCWPP action recommendations to the revised CWPP signatories. The CWPP Work Group report should include recommendations to the 2015 revised CWPP signatories for updating the Community Mitigation Plan and the Prevention and Loss Mitigation Plan portions of the SCWPP. The CWPP Work Group report should support timely decision making for all levels of government and provide input necessary for developing future work plans and for prioritizing project recommendations over the life of the SCWPP.

Appendix A provides information on the data used in the analysis of the SCWPP and the appropriate contacts for updating the CWPP. Once the SCWPP is updated, it should be submitted to the SCWPP

fire chiefs, NCEM, ACEM, Navajo County and Apache County Board of Supervisors, A-SNFs, ASFD, and BLM for their concurrence or approval.

B. Effectiveness Monitoring

Table 5.1 outlines the performance measures that the 2016 SCWPP Work Group should monitor to assess status in meeting current SCWPP performance goals. The SCWPP administrators should assess the current status of wildland fuel hazards and look for any new or developing issues not covered by the revised SCWPP. As new issues arise, such as new invasive-species infestations, further risks and recommendations for treatment should be identified, and the SCWPP should be updated or amended as necessary to meet revised SCWPP goals. To help track fuel treatments being planned and completed through local, state, and federal programs, the SCWPP administrators should cooperatively provide detailed mapping information to the Arizona State Forester's office.

Table 5.1. Performance Measures to Assess SCWPP Progress

Goal	Performance measure

Improve fire prevention and suppression	Reduction of wildland fire occurrence and acres burned (unplanned) in the WUI:
	• Type 3 fire engine acquired.
	• Type 6 brush truck acquired.
	• Effectiveness monitoring of fire prevention and suppression will include the following:
	  • Acres burned and degree of severity of wildland fire
	  • Percentage of wildland fire controlled on initial attack
	  • Number of homes and structures lost to wildland fire
	• New water sources developed in key areas.

Reduce hazardous vegetative fuels	Effective treatment of high-risk areas by acre: • Number of treated acres of nonfederal WUI lands in Condition Class 2 or 3 identified as high priorities by the SCWPP and moved to Condition Class 1 or another acceptable level of wildland fuel loading and continuity. • Acres treated to acceptable fuel levels within priority treatment management areas. • Total acres treated through any fuel-reduction measures, including prescribed fire, that are conducted in, or adjacent to, the WUI. The change of vegetation condition class should be determined for small projects or treatment areas through the use of the LANDFIRE database.
Restore watershed health	Acres of fuel reduction or watershed enhancement treatments that meet restoration treatment guidelines for riparian habitats: • Coordination with and support of NCEM, ACEM, ASFD, ASLD, A-SNFs, and BLM in implementing and determining social, economic, and environmental effects of riparian restoration treatments (Treatment 6, see Table 3.1 in the Community Mitigation Plan section).
Promote community involvement	Initiation of public outreach programs: • Community CWPP Work Group initiated. • Public outreach programs and promotions implemented to enhance volunteer efforts to reduce hazardous fuels. • Number and areas (community or dispersed residences) of private landowners supporting and implementing fuel reduction projects. • NCEM, ACEM, and local fire departments and districts developed and implemented evacuation plans for identified high-risk areas. • Roadside fire-danger warning signs in English and Spanish installed at strategic points within the WUI. • Homeowner assessments initiated. • Fire-safety awareness program, posters, and information available in public places.
Encourage economic development	Wood-products industry growth and diversification to use all sizes of material removed by fuel reduction treatments • Number of value-added wood products developed by the community. • Number of new markets (local firewood sales) for local products created. • Stewardship contract for fuel and forest treatment implemented through the Four Forest Restoration Initiative.

Note: ASFD = Arizona State Forestry Division; ASLD = Arizona State Land Department; BLM = Bureau of Land Management; NCEM = Navajo County Emergency Management, ACEM = Apache County Emergency Management; A-SNFs = Apache-Sitgreaves National Forests; CWPP = community wildfire protection plan; PPE = personal protective equipment; WUI = wildland-urban interface.

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VI. REFERENCES

Anderson, H. E. 1982. *Aids to Determining Fuel Models for Estimating Fire Behavior.* INT-122. National Wildlife Coordinating Group, Washington, DC.

Arizona State Forestry Division (ASFD). 2004. *Arizona Wildland Urban Interface Assessment*. http://www.azstatefire.org.

———. 2007. *Identifying Arizona's Wildland/Urban Interface Communities at Risk: A Guide for State and Federal Land Managers*.

———. 2009a. *Arizona-Identified Communities at Risk.* http://www.azstatefire.org.

———. 2010a. *Arizona Forest Resource Assessment*. June 18.

———. 2010b. *Arizona Forest Resource Strategy*. June 18.

Arizona Wildlands Invasive Plant Working Group (AZ-WIPWG). 2005. *Invasive Non-Native Plants that Threaten Wildlands in Arizona: A Categorized List Developed by the Arizona Wildland Invasive Plant Working Group*. August.

Brooks, M. L. 2008. Plant Invasions and Fire Regimes. In *Wildland Fire in Ecosystems: Fire and Nonnative Invasive Plants*, edited by K. Zouhar, J. K. Smith, S. Sutherland, and M. L. Brooks, 33–46. General Technical Report RMRS-GTR-42-vol. 6. USDA, Forest Service, Rocky Mountain Research Station., Ogden, UT.

Brooks, M., and M. Lusk. 2008. *Fire Management and Invasive Plans: A Handbook*. US Fish and Wildlife Service, Arlington VA.

Burgan, R. E. 1988. *1988 Revisions to the 1978 National Fire Danger Rating System*. Research Paper SE-273. USDA Forest Service, Southeastern Forest Experiment Station, Asheville, NC.

Communities Committee of the Seventh American Forest Congress, Society of American Foresters, the National Association of State Foresters (NASF), the National Association of Counties, and the Western Governors Association (WGA). 2004. *Preparing a Community Wildfire Protection Plan: A Handbook for Wildland-Urban Interface Communities*.

———. 2008. *Community Guide to Preparing and Implementing a Community Wildfire Protection Plan. A Supplemental Guide to Preparing a Community Wildfire Protection Plan: A Handbook for Wildland-Urban Interface Communities*.

Finney, M. A. 2006. An overview of FlamMap fire modeling capabilities. In *Fuels management—How to Measure Success: Conference Proceedings, 2006 March 28-30, 2006, Portland, Oregon*. Proceedings RMRS-P-41. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 213-220.

Fire Regime Condition Class (FRCC) Interagency Working Group. 2005a. Potential Natural Vegetation Group (BpS) Descriptions. *Fire Regime Condition Class (FRCC) Interagency Handbook Reference Conditions*. http://www.frames.gov/files/7313/8388/1679/FRCC_Guidebook_2010_final.pdf.

———. 2005b. *Interagency Fire Regime Condition Class Guidebook.* Version 1.2. http://www.frcc.gov/docs/1.2.2.2/Complete_Guidebook_V1.2.pdf.

———. 2010. *Interagency Fire Regime Condition Class Guidebook*. Version 3.0. September. http://www.fire.org/niftt/released/FRCC_Guidebook_2010_final.pdf.

Governor's Forest Health Councils, State of Arizona. 2007. *Statewide Strategy for Restoring Arizona's Forests*, ed. E. Aumack, T Sisk, and J. Palumbo. Arizona Public Service, Phoenix. June.

Heinsch, Faith Ann., and Patricia L. Andrews. 2010. *Fire Characteristics Charts for Fire Behavior and U.S. Fire Danger Rating.* In *Proceedings of 3rd Fire Behavior and Fuels Conference, October 25-29, 2010, Spokane, Washington.* International Association of Wildland Fire, Birmingham, AL.

Hendricks, D. M. 1985. *Arizona Soils*. College of Agriculture, University of Arizona. Tucson.

Ingalsbee, Timothy. 2010. *Getting Burned a Taxpayer's Guide to Wildfire Suppression Costs.* Firefighters United for Safety, Ethics, and Ecology (FUSEE). www.fusee.org

Karl, T. R., J. M. Melillo, and T. C. Peterson (eds.). 2009. *Global Climate Change Impacts in the United States*. Cambridge University Press, NY.

National Association of State Foresters. 2003. *Field Guidance: Identifying and Prioritizing Communities at Risk.* http://www.stateforesters.org/field-guidance-identifying-and-prioritizing-communities-risk-june-2003\

National Wildfire Coordinating Group (NWCG). 2012. *Glossary of Wildland Fire Terminology*. PMS 205. July 2012

National Resources Conservation Service (NRCS). 2002. National Conservation Practice Standards, Range Planting. Code 550. http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/technical/

———. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. p104.

NatureServe. 2004. *Southwest ReGAP Analysis Project- Land Cover Data Legend Descriptions*. http://earth.gis.usu.edu/swregap/legend_desc.html.

Presidential Policy. 2002. *Healthy Forests: An Initiative for Wildfire Prevention and Stronger Communities.* August 22.

Rehm, R. G., A. Hamins, H. R. Baum, K. B. McGrattan, D. D. Evans, 2002. *Community-Scale Fire Spread.* NIST Report NISTIR 6891. National Institute of Standards and Technology.

Rothermel, RC. 1983. *How to Predict the Spread and Intensity of Forest and Range Fires.* General Technical Report INT-143. USDA Forest Service, Intermountain Research Station. Ogden, UT.

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*. RMRS-87. USDA Forest Service, Washington, DC.

Scott, Joe H. 2012. Introduction to Wildfire Behavior Modeling. National Interagency Fuels, Fire, & Vegetation Technology Transfer. www.niftt.gov.

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. USDA, Forest Service, Rocky Mountain Research Station, Fort Collins, CO.

Southwest Strategy. 2009. *Southwest Community Wildfire Protection Plan Guide*. http://fire.az.gov/UserFiles/PDF/wildfire_plan_guide.pdf.

Stephens, S.L., J. K. Agee, P. Z. Fulé, M. P. North, W. H. Romme, T. W. Swetnam, M. G. Turner . 2013. *Managing Forests and Fire in Changing Climates*. Science. Vol. 342. October 2013.

Stratton, R. D. 2006. *Guidance on spatial wildland fire analysis: models, tools, and techniques.* General Technical Report RMRS-GTR-183. Ft. Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. (1,558 KB; 15 pages)

Swetnam, T. and Baisan, C. 1996. Historical fire regime patterns in the southwestern United States since AD 1700. In *Fire Effects in Southwestern Forest: Proceedings of the 2nd La Mesa Fire Symposium*, edited by C.D. Allen, pp. 11-32. USDA Forest Service, Rocky Mountain Research Station, General Technical Report RM-GTR-286.

US Census Bureau. 2010. Population and housing data. October 2015.

US Department of Agriculture (USDA). 2012. *Climate Change and Agriculture in the US: An Assessment of Effects and Potential for Adaption*. Technical Submission to the National Climate Assessment 2012.

US Department of Agriculture and US Department of the Interior (USDA and USDI). 2001a. Urban Wildland Interface Communities within the Vicinity of Federal Lands That Are at High Risk from Wildfire. *Federal Register* 66(3): 751–777. January 4.

———. 2001b. Urban Wildland Interface Communities within the Vicinity of Federal Lands That Are at High Risk from Wildfire. *Federal Register* 66(160): 43383–43435. August 17.

———. 2004. *The Healthy Forests Initiative and Healthy Forests Restoration Act Interim Field Guide*. FS-799. February.

———. 2005. *Wildland Fire Use Implementation Procedures Reference Guide*. May.

———. 2009. *Guidance for Implementation of Federal Wildland Fire Management Policy*. February 13. http://www.nifc.gov/policies/policies_documents/GIFWFMP.pdf.

US Forest Service (USFS). 1983. *The 1978 National Fire-Danger Rating System: Technical Documentation*. General Technical Report INT-169. USDA Forest Service, Intermountain Forest and Range Experiment Station, Ogden, UT. July.

———. 2000. *USDA Forest Service Handbook 1909*. Washington, DC.

———. 2010. Wildland Urban Interface (WUI). In *FSM 5100 – Fire Management*, Chapter 5140.5 (Definitions). USFS, Southwest Region.

———. 2011. *Landscape Conservation and Restoration Strategic Action Plan.* USDA Forest Service, Southwest Region. January 31.

———. 2015. *Southwestern Region Wildfire Risk Assessment Initial Fire Hazard Results* Southwestern Region Fire and Aviation Management Briefing Paper. October, 2015

US Forest Service and Bureau of Land Management (USFS and BLM). 2002. *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy Implementation Plan*. Western Governors' Association. August.

US Geological Survey (USGS) National GAP Analysis Program. 2005. Southwest Regional GAP Analysis Project—Land Cover Data Legend Descriptions. RS/GIS Laboratory, College of Natural Resources, Utah State University. http://ftp.nr.usu.edu/swgap/legend_desc.html.

Westerling, A. L., H. G. Hidalgo, D. R. Cayan, and T. W. Swetnam. 2006. Warming and Earlier Spring Increase Western U.S. Forest Wildfire Activity. *Science* 313(5789): 940–943.

Western Governors' Association. 2010. *Forest Health Landscape-Scale Restoration Recommendations*. Forest Health Advisory Committee. December. http://www.westgov.org/initiatives/foresthealth.

Wildland Fire Leadership Council (WFLC). 2002. Resources: Polices and Guidelines. In *National Fire Plan*. http://www.fireplan.gov/resources/policies. accessed 2013

———. 2012. A National Cohesive Wildland Fire Management Strategy-Phase II National Report**.** Washington, DC.

Zouhar, K. 2003. Tamarix spp. *Fire Effects Information System*. USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. http://www.fs.fed.us/database/feis/ (accessed May 6, 2013).

VII. DECLARATION OF AGREEMENT AND CONCURRENCE

The following cooperators in the revision of the 2004 Sitgreaves Communities Wildfire Protection Plan for Navajo and Apache County communities reviewed and do mutually agree or concur with its contents:

AGREEMENT

Chairman, Apache County Board of Supervisors	Date
Chairman, Navajo County Board of Supervisors	Date
Mayor, Town of Pinetop-Lakeside	Date
Mayor, City of Show Low	Date
Chief, Pinetop Fire Department	Date
Chief, Timber Mesa Fire and Medical	Date
Chief, Clay Springs-Pinedale Fire Department	Date
Chief, Heber-Overgaard Fire Department	Date
Chief, Vernon Fire Department	Date

CONCURRENCE

Forest Supervisor, Apache-Sitgreaves National Forests	Date
Arizona State Forester Arizona State Forestry Division	Date
Gila District Manager Bureau of Land Management	Date

APPENDIX A. INFORMATION DATA SHEET AND CONTACTS

A.1. SCWPP Base Information Data Source

Name	Type	Source	Contact / Web address
Wildland Fuel Hazards	Shapefile	Logan Simpson Design Inc.	Roy Baker (480) 967-1343; rbaker@logansimpson.com
Wildland-Urban Interface (WUI)	Shapefile	Logan Simpson Design Inc.	Roy Baker (480) 967-1343; rbaker@ logansimpson.com
Vegetation Zones	Raster	Southwest Regional Gap Analysis Project (USGS 2005)	http://earth.gis.usu.edu/swgap/
Land Ownership	Shapefile	Arizona State Land Department	Arizona Land Resources Information System, published October 17, 2014 (602) 542-2606
Land Parcel Data	Database Table	Apache County Assessor's	Steve Jensen Apache County Assessor's Office sjensen@co.apache.az.us
LANFDFIRE Existing Vegetation Type	Raster	USGS Wildland Fire Science, Earth Resources Observation and Science Center	http://www.landfire.gov
Vegetation Condition Class	Raster	USGS Wildland Fire Science, Earth Resources Observation and Science Center	http://www.landfire.gov
Ignition History	Shapefile	USGS and Arizona State Forestry Division	Arizona State Forestry Division http://rmgsc.cr.usgs.gov/outgoing/GeoMAC/historic_fire_data/
Treatment Activities	Shapefile	Apache-Sitgreaves National Forest (2004 – 2015)	Mark R. Empey Forest Fire Chief Apache-Sitgreaves National Forests Supervisors Office (928) 333-6315
FlamMap Elevation, Slope, Aspect, Fuel Models, and Canopy Cover	Raster	USGS LANDFIRE Data Distribution Site	http://landfire.cr.usgs.gov/viewer/

All final-analysis GIS data—including flammability analysis, fuel hazards analysis, ignition history and density, community values analysis, cumulative risk analysis, and treatment management units—are located at the Navajo and Apache County Offices of Emergency Services and at Logan Simpson.

A.2. SCWPP Contacts

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APPENDIX B. FUEL MODEL DESCRIPTIONS

B.1. Fuel Model Selection

The Core Team determined the appropriate fuel models for the Sitgreaves Communities' Wildfire Protection Plan (SCWPP) by reviewing the vegetation associations within the WUI that were identified and mapped using the LANDFIRE.gov Existing Vegetation Type (EVT) data layer, which represents the vegetation composition present at a given site up to 2008 (Landfire.gov, accessed November 2015). The Core Team used the EVT data to determine the general fire-carrying fuel type: grass, grass-shrub, shrub, timber litter, timber with (grass or shrub) understory, or slash or blowdown fuels. The Core Team then reviewed the LANDFIRE data sets which utilize the 40 Scott and Burgan Fire Behavior Fuel Model (FBFM40) layer to represent distinct distributions of fuel loading found among surface fuel components (live and dead), size classes, and fuel types (LANDFIRE.gov accessed November 2015).The Core Team using the current US Forest Service Regional Wildfire Risk Assessment modified where appropriate the FBFM40 by estimating which stratum of surface fuels is most likely to carry the fire. For example, the fire may be in a forested area, but if the forest canopy is open, grass, not needle litter, might carry the fire. In this case a grass model was considered.

The Core Team is aware that moisture content of live vegetation significantly affects fire behavior because vegetative fuel load shifts between live and dead, and dead fuel usually has much lower moisture content than live. The fuel moisture weighed over all the fuel classes, at which a fire will not spread, is called the extinction moisture content. The dead fuel extinction moisture assigned to the fuel model defines the moisture content of dead fuels at which the fire will no longer spread. This fuel parameter is generally associated with climate (humid versus dry). The extinction moisture content is divided into very low – low – moderate and high values over all fuel classes to provide a relative assessment of fuel moisture within a fuel bed that will carry wildland fire.

The Core Team emphasizes that homeowners manage the fuels that are the primary carrier of wildland fire. In some vegetation associations, with proper spacing, the overstory of ponderosa pine may not carry fire but an understory of needle litter or shrubs will transport fire with high rates of spread and flame lengths.

Table B.1 describes the fire-behavior models that were determined to be within the 2015 SCWPP community WUIs.

Table B.1. Standard Fire Behavior Fuel Models (Scott and Burgan 2005)

Fuel Model Name	Primary Carrier Fuel Type of Fire	Extinction Moisture Content (percent)	Fire Behavior
Non-burnable (NB1) Urban/Developed	Urban suburban development	Does not support wildland fire spread	Areas mapped as NB1 may experience structural fire losses during a wildland fire incident; however, structure ignition in those cases is either house-to-house or by firebrands, neither of which is directly modeled using fire behavior fuel models. If sufficient fuel vegetation surrounds structures such that wildland fire spread is possible, then a fuel model appropriate for the wildland vegetation is entered rather than NB1.
Agriculture (NB3)	Croplands	Agricultural lands maintained in a non-burnable condition.	There are many agricultural areas that are not kept in a non-burnable condition, grass is often allowed to grow beneath orchard trees, and wheat or similar crops are allowed to cure before harvest; in those cases you can insert a fuel model other than NB3.
Grasslands	Grass	Generally 15 percent in short grass fuel types	Grass (GR) fuels vary from heavily grazed grass stubble or sparse natural grass to dense grass more than 6 feet tall. Fire behavior varies from moderate spread rate and low flame length in the sparse grass to extreme spread rate and flame length in the tall grass models. All GR fuel models are dynamic, live herbaceous fuel load shifts from live to dead as a function of live herbaceous moisture content. The effect of live herbaceous moisture content on spread rate and intensity is strong.
Short sparse dry climate grass (GR1)	Grass	15 percent in sparse grass fuel type	The primary carrier of fire in GR1 is sparse grass, with small amounts of fine dead fuel present. The grass in GR1 is generally short, either naturally or by grazing, and may be sparse or discontinuous. GR1 is indicative of a dry climate fuelbed, but GR1 may also be applied in high-extinction moisture fuelbeds because in both cases predicted spread rate and flame length are low compared to other GR models.
Low load dry climate grass (GR2)	Grass	15 percent in short grass fuel type	The primary carrier of fire in GR2 is grass, though small amounts of fine dead fuel may be present. Grass fuel load is greater than GR1, and fuelbed may be more continuous. Shrubs, if present, do not affect fire behavior.
Grass-Shrub	Grass-Shrub combined	Generally less than 20 percent in short shrub and grass fuel type	The primary carrier of fire in the grass-shrub (GS) fuel models is grass and shrubs combined; both components are important in determining fire behavior. All GS fuel models are dynamic, live herbaceous fuel load shifts from live to dead as a function of live herbaceous moisture content. The effect of live herbaceous moisture content on spread rate and intensity is strong and depends on the relative amount of grass and shrub load in the fuel model.
Low load, dry climate, grass shrub (GS1)	Grass-Shrub combined	15 percent in short shrub and grass fuel type	The primary carrier of fire in GS1 is grass and shrubs combined. Shrubs are about 1 foot high, grass load is low. Spread rate is moderate; flame length low. Moisture of extinction is low.

Continued

Table B.1. Standard Fire Behavior Fuel Models (Scott and Burgan 2005)

Fuel Model Name	Primary Carrier Fuel Type of Fire	Extinction Moisture Content (percent)	Fire Behavior
Moderate load, dry climate grass-shrub (GS2)	Grass-Shrub combined	15 percent in short shrub and grass fuel type	The primary carrier of fire in GS2 is grass and shrubs combined. Shrubs are 1 to 3 feet high, grass load is moderate. Spread rate is high; flame length moderate. Moisture of extinction is low.
Shrub	Live and dead shrubs	The effect of live herbaceous moisture content on spread rate and flame length can be strong in those dynamic SH models	The primary carrier of fire in the SH fuel models is live and dead shrub twigs and foliage in combination with dead and down shrub litter. A small amount of herbaceous fuel may be present, especially in SH1 and SH9, which are dynamic models (their live herbaceous fuel load shifts from live to dead as a function of live herbaceous moisture content).
Low Load Dry Climate Shrub (SH1)	Short woody live and dead shrubs and litter	Generally 20 percent in short woody shrub litter fuel type	The primary carrier of fire in SH1 is woody shrubs and shrub litter. Low shrub fuel load, fuelbed depth about 1 foot; some grass may be present. Spread rate is very low; flame length very low.
Moderate Load Dry Climate Shrub (SH2)	Short woody live and dead shrubs and litter	Generally 20 percent in short woody shrub litter fuel type	The primary carrier of fire in SH2 is woody shrubs and shrub litter. Moderate fuel load (higher than SH1), depth about 1 foot, no grass fuel present. Spread rate is low; flame length low.
High Load Dry Climate Shrub (SH5)	Taller woody shrubs and litter	Moisture of extinction is high, generally 20 percent in chaparral up to 6 feet	The primary carrier of fire in SH5 is woody shrubs and shrub litter. Heavy shrub load, depth 4-6 feet. Spread rate very high; flame length very high..
Very high load dry climate shrub (SH7)	Taller woody shrubs and litter	Moisture of extinction is 15 percent in short dense shrub and litter fuel type.	Usually shrubs are short and may nearly cover the area such as regeneration shrublands after fire. The primary carrier of fire in SH5 is woody shrubs and shrub litter. Heavy shrub load, depth 4-6 feet. Spread rate very high; flame length very high.
Timber Understory (TU)	Forest litter, herbaceous and shrub fuels	Moisture of extinction is generally 25 percent in timber and litter fuel type	The primary carrier of fire in the TU fuel models is forest litter in combination with herbaceous or shrub fuels. TU1 and TU3 contain live herbaceous load and are dynamic, meaning that their live herbaceous fuel load is allocated between live and dead as a function of live herbaceous moisture content. The effect of live herbaceous moisture content on spread rate and intensity is strong and depends on the relative amount of grass and shrub load in the fuel model.
Low load dry climate timber-grass-shrub (TU1)	Grass, shrub and litter component	Moisture of extinction is 20 percent in grass, shrub and litter understory fuel type	The primary carrier of fire in TU1 is low load of grass and/or shrub with litter. Spread rate is low; flame length low.
Moderate load humid climate timber shrub (TU2)	Litter and shrub component	Moisture of extinction is high at 30 percent in grass, shrub and litter understory fuel type	The primary carrier of fire in TU2 is moderate litter load with shrub component. Spread rate is moderate; flame length low.

Continued

Table B.1. Standard Fire Behavior Fuel Models (Scott and Burgan 2005)

Fuel Model Name	Primary Carrier Fuel Type of Fire	Extinction Moisture Content (percent)	Fire Behavior
Timber litter	Dead and down woody fuel	Moisture of extinction is generally 30 in closed timber litter fuel types	The primary carrier of fire in the TL fuel models is dead and down woody fuel. Live fuel, if present, has little effect on fire behavior. Flame lengths can vary from over 10 feet to under 2 feet
Low load compact conifer litter (TL1)	Compact Forest litter	Moisture of extinction is high at 30 percent in compact litter	The primary carrier of fire in TL1 is compact forest litter. Light to moderate load, fuels 1 to 2 inches deep. May be used to represent a recently burned forest. Spread rate is very low; flame length very low.
Low load broadleaf litter (TL2)	Hardwood litter	Moisture of extinction is 25 percent in hardwood litter	The primary carrier of fire in TL2 is broadleaf (hardwood) litter. Low load, compact broadleaf litter. Spread rate is very low; flame length very low.
Moderate load conifer litter (TL3)	Conifer litter	Moisture of extinction is 20 percent in conifer litter	The primary carrier of fire in TL3 is moderate load conifer litter, light load of coarse fuels. Spread rate is very low; flame length low. Litter layer is composed of needles, leaves and twigs because little undergrowth is present in the stand
Small downed log(TL4)	Fine litter and course woody fuels	Moisture of extinction is 25 percent in litter and down logs	The primary carrier of fire in TL4 is moderate load of fine litter and coarse fuels. Includes small diameter downed logs. Spread rate is low; flame length low.
High load conifer litter (TL5)	Conifer litter, light slash, activity or mortality fuels	Moisture of extinction is 25 percent in conifer litter, and mortality fuels	The primary carrier of fire in TL5 is high load conifer litter; light slash or mortality fuel. Spread rate is low; flame length low.
Long Needle litter (TL8)	Long-needle pine litter	Moisture of extinction is high at 35 percent in pine litter	The primary carrier of fire in TL8 is moderate load long-needle pine litter, may include small amount of herbaceous load. Spread rate is moderate; flame length low.